RRB
TECHNICIAN
GRADE-I SIGNAL
ENGINEERING
MATHEMATICS

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Syllabus

Questions will be of objective type with multiple choice answers and are likely to cover topics pertaining to the following syllabus

- **General Awareness:** Knowledge of current affairs, Indian geography, culture and history of India including freedom struggle, Indian Polity and constitution, Indian and Economy, environmental issues concerning India and the World, Sports, General scientific and technological developments, etc.
- **General Intelligence and Reasoning:** Analogies, Alphabetical and Number series, Coding and Decoding, Mathematical operations, Relationships, Syllogism, Jumbling, Venn Diagram, Data Interpretation and sufficiency, Conclusions and decision making, Similarities and differences, Analytical reasoning, Classification, Directions, Statement - Arguments and Assumptions, etc.
- **Basics of Computers and Applications:** Architecture of Computers; input and output devices: Storage devices, Networking Operating System like Windows, Unix, Linux; MS Office; Various data representation; Internet and Email; Websites & Web Browsers; Computer Virus.
- **Mathematics:** Number system, Rational and irrational numbers, BODMAS rule, Quadratic Equations, Arithmetic Progression, Similar Triangles, Pythagoras Theorem, Co-ordinate Geometry, Trigonometrical Ratios, Heights and distances, Surface area and Volume; Sets: Set and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers, Universal set, Venn diagrams, Union and Intersection of sets, Difference of sets, Complement of a set, Properties of Complement; Statistics: Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data; probability occurrence of events, exhaustive events, mutually exclusive events.
- **Basic Science and Engineering:**

  Physics' fundamentals- Units, Measurements, Mass, Weight, Density, Work Power, and Energy, Speed and Velocity, heat and Temperature;

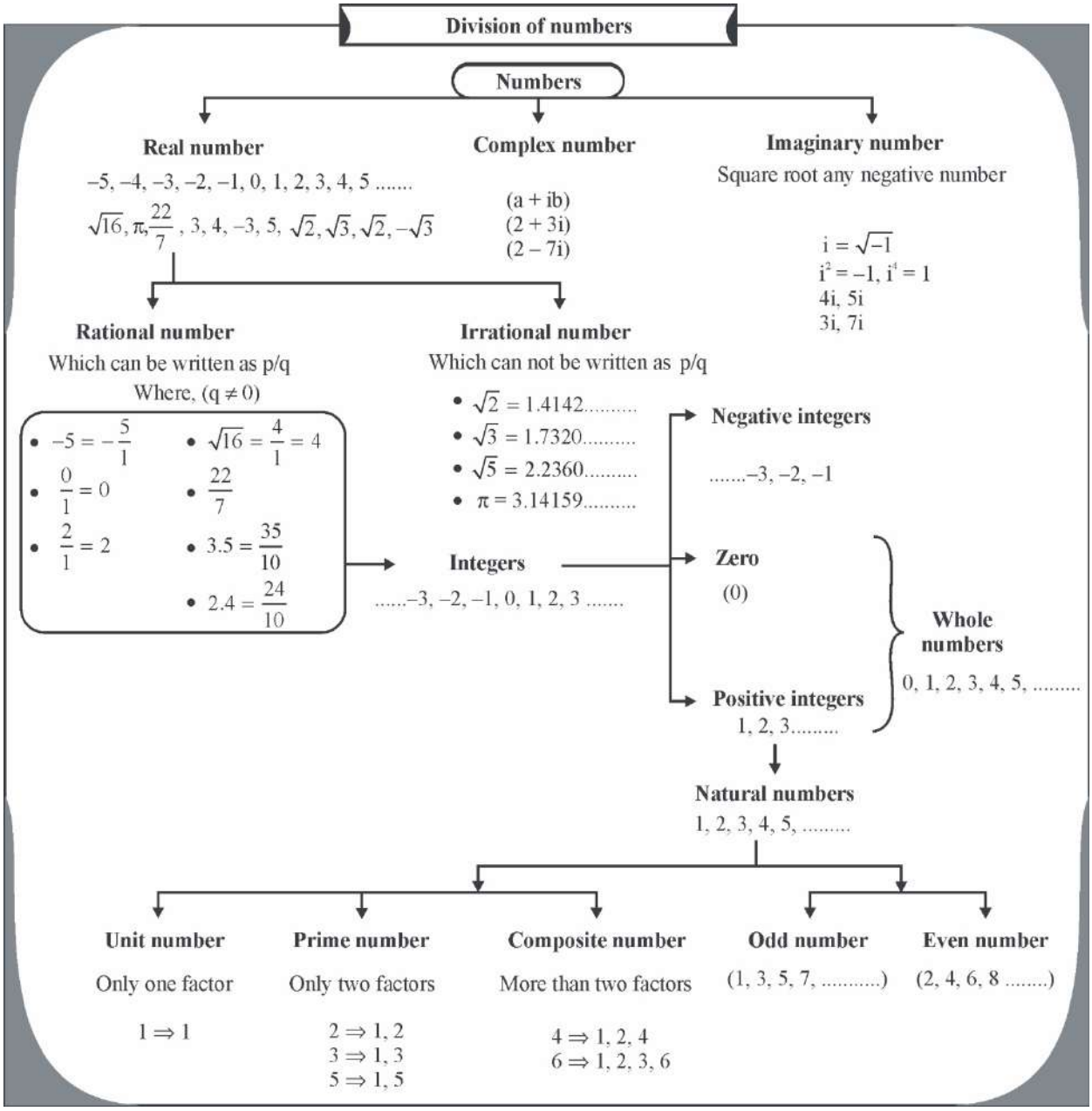
  Electricity and Magnetism-Electric Charge, Field, and intensity, Electric Potential and Potential Difference, Simple Electric Circuits, Conductors, Non-conductors/Insulators, Ohm's Law and its Limitations, Resistances in Series and Parallel of a Circuit and Specific Resistance, Relation Between Electric Potential, Energy, and Power (Wattage) Ampere's Law, Magnetic Force on Moving Charged Particle and Long Straight Conductors, Electromagnetic Induction, Faraday's Law, and Electromagnetic Flux, Magnetic Field, Magnetic Induction;

  Electronics and Measurements-basic Electronics, Digital Electronics, Electronic Devices and Circuits, Microcontroller, Microprocessor, Electronic Measurements, Measuring Systems and Principles, Range Extension methods, Cathode Ray Oscilloscope, LCD LED Panel, Transducers.

Tentative Subject-wise break-up of questions and marks for CBT of Technician Gr-I Signal		
Subjects	**No. of Questions**	**Marks for Each Section**
General Awareness	**10**	**10**
General Intelligence and Reasoning	**15**	**15**
Basics of Computers and Applications	**20**	**20**
Mathematics	**20**	**20**
Basic Science & Engineering	**35**	**35**
Total	**100**	**100**
1. Duration : 90 minutes (with 30 minutes extra time for PwBD candidates using scribe). **2. The Subject-wise distribution give above is merely indicative. The question papers may vary.**		

01 Number system

(Rational and irrational numbers & BODMAS rule)

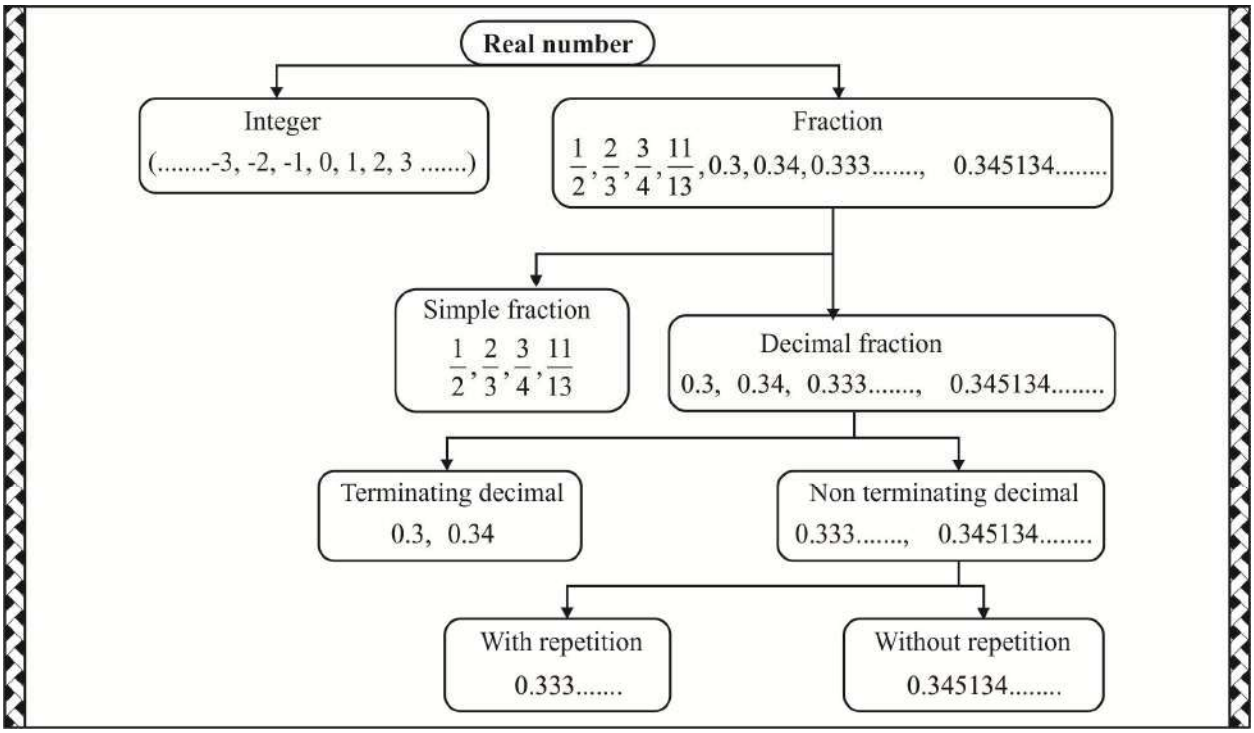


Co-prime/Relatively prime number

☞ A pair of numbers which H.C.F. (Highest common factor) is 1, is called co-prime number. **Ex.** (2, 3), (3, 4), (3, 5), (6, 7), (8, 11).

Twin-prime number

☞ A pair of prime numbers in which the difference is two is called twin prime number. Ex. (3, 5), (5, 7), (11, 13)



☞ Decimals with repetition can be expressed as rational numbers.

The test of prime number

■ Let a is any give number and n is the smallest number.

where, $\boxed{n^2 \geq a}$

Now divide the given number by 'n' and smaller than each prime number. If 'a' is not completely divisible by any of these numbers, then 'a' will be a prime number otherwise not.

Ex. Test of 241–:

$241 \Rightarrow 16^2 \geq 241$

Prime number less than 16

= 2, 3, 5, 7, 11, 13

∵ 241 is not divisible by any prime number less than 16)

∴ 241 is a prime number.

Ex. Test of 437–:

$437 \Rightarrow 21^2 \geq 437$

Prime number less than 21

= 2, 3, 5, 7, 11, 13, 17, 19,

∵ 437 is completely divisible by 19

∴ 437 is a composite number.

Number of prime numbers

Prime numbers between 1-10	**4**
Prime numbers between 1-50	**15**
Prime numbers between 1-100	**25**
Prime numbers between 1-200	**46**
Prime numbers between 1-1000	**168**

☞ First prime number = 2

☞ Each prime number can be written as (6k ± 1) form. But every (6k ± 1) from may not be necessarily prime number.

Ex. $(6 \times 2 + 1) = 13$ Prime number

$25 = (6 \times 4 + 1)$ Composite number

Divisibility Rules

Divisibility of 2, 4, 8 and 16

■ **Divisibility of 2 –:** If the digit at unit place of a number is either '0' or even number then the number is divisible by 2.

Ex. 8570, 7242, 9376

■ **Divisibility of 4 –:** If the last two digits (ten's place, units place) of a number is either '00' or divisible by 4, then the number is divisible by 4.

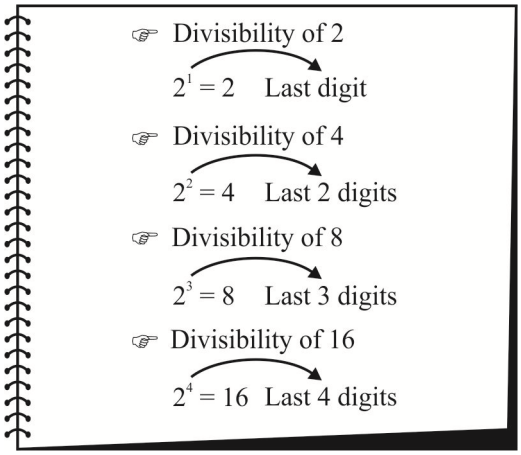
Ex. 8700, 6924, 6376

■ **Divisibility of 8 –:**If the last three digits (Hundred's place, tenth place, units place) of a number is either '000' or divisible by 8, then the number is divisible by 8.

Ex. 63000, 9248, 7464

■ **Divisibility of 16 –:** If the last three digits (Thousand's place, hundred's place, ten's place, units place) of a number is either '0000' or divisible by 16, then the number is divisible by 16.

Ex. 630000, 948464



Divisibility of 3 and 9

- **Divisibility of 3 –:** If the sum of its all digits of a number is divisible by 3, then the number is divisible by 3.

  Ex. 78141

  $\Rightarrow \frac{7+8+1+4+1}{3} = \frac{21}{3} = 7\,(\text{divisible})$

  Hence, the number 78141 will be divisible by 3

  Ex. 246753

  $\Rightarrow \frac{2+4+6+7+5+3}{3} = \frac{27}{3} = 9\,(\text{divisible})$

  Hence, the number 246753 will be divisible by 3

- **Divisibility of 9 –:** If the sum of its all digits of a number is divisible by 9, then the number is divisible by 9)

Ex. 764352

$\Rightarrow \frac{7+6+4+3+5+2}{9} \quad \frac{27}{9} = 3\,(\text{divisible})$

Hence, the number 764352 will be divisible by 9

Ex. 432432

$\Rightarrow \frac{4+3+2+4+3+2}{9} = \frac{18}{9} = 2\ \ (\text{divisible})$

Hence, the number 432432 will be divisible by 9

☞ In divisibility of 3 and 9, we can use 'digital sum' in place of sum.

Digital sum –: It is just a position of remainder when it is divided by 9. That is, the sum of the digits should be 9. If it is more than 9 then add the digits together.

Ex. $10 \xrightarrow{\text{Digtital sum}} 1+0=1$

$11 \xrightarrow{\text{Digtital sum}} 1+1=2$

$84 \xrightarrow{\text{Digtital sum}} 8+4=12 \quad 1 \quad 2 \quad 3$

$786 \xrightarrow{\text{Digtital sum}} 7+8+6=21 \quad 2 \quad 1 \quad 3$

☞ Cut all digits whose sum is 9

☞ Digital sum of a perfect square number 0 or 9, 1, 4, 7

☞ To calculate digital sum in fraction number, then always make digital sum 1 in denominator.

Denominator	Multiply	Digital sum
4	4 × 7 = 28	1
7	7 × 4 = 28	1
5	5 × 2 = 10	1
2	2 × 5 = 10	1
8	8 × 8 = 64	1

Note– If the denominator of a number is 3, 6 or 9 then 1 can not be made for the digital sum.

Divisibility of 5, 10, 25 and 100

- **Divisibility of 5 –:** If the digit at unit place of a number is either 0 or 5 then the number is divisible by 5.

  Ex. 24520, 28735

- **Divisibility of 10) –:** If the digit at unit place of a number is 0 then the number is divisible by 10.

  Ex. 570120, 4567890

- **Divisibility of 25 –:** If the last two digits (ten's, unit's place) of a number either 25, 50, 75 or 00, then the number is divisible by 25.

  Ex. 8725, 68750, 931275, 8600

- **Divisibility of 100 –:** If the last two digits (ten's, unit's place) of a number 00, then the number is divisible by 100.

  Ex. 689200

- **Divisibility of 7 –:** If the number obtained by subtracting twice the unit digit from the remaining number excluding the unit digit, is divisible by 7, then that number will be divisible by 7. Repeat this process again and again for larger numbers.

  Ex. 343

  $34\,|\,3$
  $-6\,|\,\times 2$
  $28 \Rightarrow \frac{28}{7} = \text{Integer}$

  Hence, 343 is divisible by 7

  Ex. 383838

  $38383\,|\,8\ \times 2$
  $16\,|\,2$
  $3836\,|\,7\ \times 2$
  $14\,|\,2$
  $382\,|\,2\ \times 2$
  $4\,|\,2$
  $37\,|\,8$
  $16\,|$
  $21 \Rightarrow \frac{21}{7} = 3$ Integer

  Hence, 383838 is divisible by 7

- **Divisibility of 11 –:** If the difference of the sum of the digits in even position and the sum of the digits in odd position is zero or multiple of 11.

  Ex. $\bar{3}\underline{5}\bar{2}\underline{1}\bar{4}\underline{3}$

Sum of even position = 4 + 2 + 3 = 9
Sum of odd position = 3 + 1 + 5 = 9

$\Rightarrow |9-9| = 0$

Hence, the number 352143 is divisible by 11

Ex. $\underline{7}\underline{1}\underline{9}\underline{4}\underline{0}$

Sum of even position = 4 + 1 = 5

Sum of odd position = 0 + 9 + 7 = 16

$$\Rightarrow \frac{|5-16|}{11} = 1 \text{ (Integer)}$$

Hence, the number 71940 is divisible by 11

Divisibility of 7, 11, 13

- Make pairs of three digits from the right side of a numbers. Find the difference between sum of pairs at even places and sum of pairs at odd places–
- ☞ If the difference is 0, then the number will be divisible by 7, 11 and 13.
- ☞ If the difference is divisible by any of 7, 11 and 13, then the number will also be divisible by that.

Ex. 786786

$\underline{786}\ \underline{786} = |786 - 786| \Rightarrow 0$

Hence, the number is divisible by 7, 11 and 13.

Ex. 1001

$\underline{001}\ \underline{001} = |001 - 001| \Rightarrow 0$

Hence, the number is divisible by 7, 11 and 13.

Ex. 786730

$\underline{786}\ \underline{730} = |786 - 730|$

$\Rightarrow 56$ (Divisible by 7)

Hence, the number is divisible by 7

Ex. 5786

$\underline{005}\ \underline{786} = |005 - 786|$

$\Rightarrow 781$ (Divisible by 11)

Hence, the number is divisible by 11

Ex. 91689

$\underline{091}\ \underline{689} = |091 - 689|$

$\Rightarrow 598$ (Divisible by 13)

Hence, the number is divisible by 13

Ex. 786709

$\underline{786}\ \underline{709} = |786 - 709|$

$\Rightarrow 77$ (Divisible by 7 and 11)

Hence, the number is divisible by 7 and 11.

- When a number is divisible by another number, It is also divisible by the factor of the number.

Ex. 48 is divisible by 12

Then, 48 is also divisible by factor (1, 2, 3, 4, 6, 12) of 12.

- When a number is divisible by two or more co-prime numbers, It is also divisible by their products.

Ex. 12 is divisible by 2 and 3.

$\because$ (2, 3) $\rightarrow$ Co-prime number

$\therefore$ 12, 12 is divisible by (2 × 3).

- When a number is a factor of two given number It is also a factor of their sum and difference.

Ex. $\because$ 6 is factor of 30 and 6 is factor of 18.

Then, 6 is factor of {(30 + 18) = 48} and {(30 – 18) = 12}

- When a number is a factor of another number, It is also a factor of any multiple of that number.

Ex. $\because$ 4 is factor of 12

Then, 4 is also factor of multiple (12, 24, 36, ...) of 12.

- ☞ If a number is formed by repeating a digit six times, it will be divisible by 3, 7, 11, 13, 37.

Ex. (111111), (222222), (333333)

- ☞ If a number is formed by repeating 2 digit 3 times, it will be divisible by 3, 7, 13, 37.

Ex. 383838, 171717, 595959

- ☞ If a number repeats the same digit 3, 6, 9, 12 (multiple of 3), then that number will be divisible by 3 and 37.

Ex. (111), (222222), (333333333), (444444444444)

Place value and face value

Place value –: The place value of a digit describes its place in a given number.

Ex. Place value of 7 in number 7345724–

7345724

7 × 100 = 700

7 × 1000000 = 7000000

Ex.

Number

3 5 7 2 Place value

2 × 1 = 2

7 × 10 = 70

5 × 100 = 500

3 × 1000 = 3000

Ex. Write 'Eleven thousand eleven hundred eleven' in digits–

$$\begin{array}{r} 11000 \\ 1100 \\ +\ \ 11 \\ \hline 12111 \end{array}$$

Face value –: Face value is the value of the digit itself in a number. It does not depend upon its position in the number.

Ex. Face value of 7 in number 7345724–

7345724

7

7

Ex.

Number

3 5 7 2 Face value

2

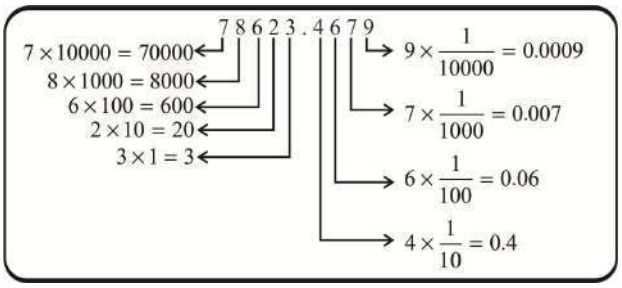
7

5

3

- ☞ The face value as well as place value of zero is always zero.

Place value of a decimal number



Significant Number

Definetion: A significant number (or significant digit) is any digit in a number that contributes to its accuracy or precision.

These are the digits that carry real meaning is terms of the measurement or value, not just placeholders.

Ex.- 123.45 → 5 Significant figures

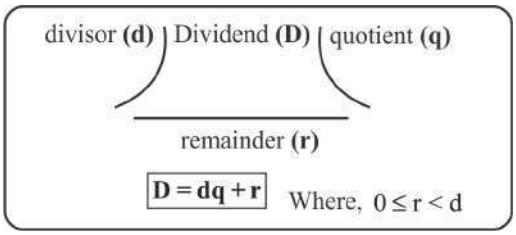
0.00789 → 3 Significant figures.

2000 → 1 Significant figure.

1.020 → 4 Significant figures

7.8900×10^{-3}= 5 Significant figure.

Division operation in numbers



Ex. Find the number in which dividing by 15 gives quotient 14 and remainder 13?

Solve– D = dq + r

D = 15 × 14 + 13

D = 223

Ex. By dividing a number by 11 and 5 successively, the remainder remains 2 and 3 respectively, what will be the remainder if the number is divided by 55?

Solve– ∵ 11 × 5 = 55

11 and 5 are factors of 55

∴ D = 11 × 3 + 2

D = 35

Ex. When two different number are divided by a divisor, the remainder becomes 547 and 349 respectively when the sum of both numbers is divided by the same divisor, the remainder is 211, find the divisor.

Solve–

First quotient = q_1

Second quotient = q_2

Common divisor = d

∴ First number = $dq_1 + 547$

Second number = $dq_2 + 349$

then, $\frac{(dq_1 + 547) + (dq_2 + 349)}{d} \xrightarrow{\text{Remainder}} 211$

∴ d = 547 + 349 – 211

d = 685

Ex. When a number is divided by 441, the remainder is 40. If the same number is divided by 21, the remainder will be?

Solve– ∵ 21 is the factor of 441

∴ $\frac{40}{21} \xrightarrow{\text{Remainder}} \mathbf{19}$

Hence, the remainder will be 19.

Ex. When a number is divided by 231, the remainder is 45. If the same number is divided by 17, the remainder will be?

Solve–

∵ 17 is not the factor of 231

∴ The remainder can not be determined

Unit digit

■ **The last digit of a number is called the unit digit.**

4364357
↳ Unit digit

- ☞ 763 + 542 ⇒ 130**5**
  ↳ Unit digit
- ☞ 765 + 849 ⇒ 161**4**
  ↳ Unit digit
- ☞ 763 – 542 ⇒ 22**1**
  ↳ Unit digit
- ☞ 765 – 347⇒ 41**8**
  ↳ Unit digit
- ☞ 765 – 947⇒ –18**2**
  ↳ Unit digit
- ☞ 765 – 943⇒ –17**8**
  ↳ Unit digit

☞ In subtraction problems, while finding the unit digit, the smaller number is subtracted from the larger number.

☞ The last digit of the answer obtained will be unit digit. The answer obtained can be positive or negative, but not the unit digit.

Finding the unit digit when number is raised to the power

■ **When the unit digit of a number is 0, 1, 5 and 6 and it has any power, then its unit digit will be the same digit.**

☞ $(1530)^{999}$ → Unit digit

☞ $(761)^{789}$ → Unit digit

☞ $(765)^{897}$ → Unit digit

☞ $(786)^{547}$ → Unit digit

■ **When the unit digit of a number is 2, 3, 4, 7, 8, and 9 and it has any power, then find the unit digit–**

☞ Digit last two digits of power by 4 and find out remainder

$$\frac{\text{Last two digits of power}}{4}$$

Remainder ⇒ 1, 2, 3, 0

Remainder	Power
1	1
2	2
3	3
0	4

☞ $[172]^{4325}$

$\frac{25}{4} \xrightarrow{\text{Remainder}} 1 \xrightarrow{\text{Power}} 1$

$2^1 \Rightarrow \mathbf{2}$ → Unit digit

☞ $[978]^{4798}$

$\frac{98}{4} \xrightarrow{\text{Remainder}} 2 \xrightarrow{\text{Power}} 2$

$8^2 \Rightarrow 64$ → Unit digit

☞ $[567]^{8759}$

$\frac{59}{4} \xrightarrow{\text{Remainder}} 3 \xrightarrow{\text{Power}} 3$

$7^3 \Rightarrow 343$ → Unit digit

☞ $[6543]^{9972}$

$\frac{72}{4} \xrightarrow{\text{Remainder}} 0 \xrightarrow{\text{Power}} 4$

$3^4 \Rightarrow 81$ → Unit digit

When the number is in the form of N!

☞ **When the power is in the form of n!-**

$1! = 1$
$2! = 2 \times 1$
$3! = 3 \times 2 \times 1$
$4! = 4 \times 3 \times 2 \times 1$
$5! = 5 \times 4 \times 3 \times 2 \times 1$
$\mathbf{5! = 5 \times 4!}$
$\mathbf{n! = n(n-1)!}$

$\frac{n!}{4} \xrightarrow{\text{Remainder}} 0 \xrightarrow{\text{Power}} 4$

Where, $\boxed{\mathbf{n! \geq 4}}$

Ex. $992^{786!}$

$\because 786! > 4! \xrightarrow{\text{Remainder}} 0 \xrightarrow{\text{Power}} 4$

$\therefore 2^4 = 16$ → Unit digit

☞ **When the number is in the form of multiplication of n!–**

Number	0!	1!	2!	3!	4!
Unit digit	1	1	2	6	4

- 5! and greater than 5! give unit digit 0.

Unit digit of multiplication by 5

☞ 5 × Odd number $\xrightarrow{\text{Unit digit}}$ 5

Ex. $5 \times 1 = 5 \xrightarrow{\text{Unit digit}} 5$

Ex. $5 \times 3 = 15 \xrightarrow{\text{Unit digit}} 5$

☞ 5 × Even number $\xrightarrow{\text{Unit digit}}$ 0

Ex. $5 \times 2 = 10 \xrightarrow{\text{Unit digit}} 0$

Ex. $5 \times 4 = 20 \xrightarrow{\text{Unit digit}} 0$

☞ 5 × Odd number × Even number $\xrightarrow{\text{Unit digit}}$ 0

Ex. $5 \times 1 \times 2 = 10 \xrightarrow{\text{Unit digit}} 0$

Ex. $5 \times 3 \times 4 = 60 \xrightarrow{\text{Unit digit}} 0$

■ The unit digit of a perfect square number can be 0, 1, 4, 5, 6 or 9 but if the unit digit of a number is 0, 1, 4, 5, 6 or 9 then it is not necessary that it is a perfect square number.

Zero Place
Number of trailing zeroes

- A zero is formed by a pair of 5 and 2, i.e. by multiplying 5 and 2, we get zero
- In any question, as many pairs of five and two are formed, The same zero is formed. Therefore, to solve the question the powers of 5 and 2 are seen and whose power is less, the same zero is created.

☞ $5 \times 2 = 10$

$5^1 \times 2^1 \xrightarrow{\text{No. of pair}} 1 \xrightarrow{\text{No. of zero}} 1$

☞ $25 \times 4 = 100$

$5^2 \times 2^2 \xrightarrow{\text{No. of pair}} 2 \xrightarrow{\text{No. of zero}} 2$

☞ $125 \times 4 = 500$

$5^3 \times 2^2 \xrightarrow{\text{No. of pair}} 2 \xrightarrow{\text{No. of zero}} 2$

(Which power less)

☞ $25 \times 8 = 200$

$5^2 \times 2^3 \xrightarrow{\text{No. of pair}} 2 \xrightarrow{\text{No. of zero}} 2$

(Which power less)

☞ $125 \times 8 = 1000$

$5^3 \times 2^3 \xrightarrow{\text{No. of pair}} 3 \xrightarrow{\text{No. of zero}} 3$

Ex. Multiplying $25 \times 16 \times 2 \times 5$ will be how many zeros on the right side.

Sol. $25 \times 16 \times 2 \times 5$

$\Rightarrow 5 \times 5 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5$

$\Rightarrow 5^3 \times 2^5$

$5^3 \times 2^4 \xrightarrow{\text{No. of pair}} 3 \xrightarrow{\text{No. of zero}} 3$

(Which power less)

Ex. Multiplying $300 \times 400 \times 24 \times 25$ will be how many zeros on right side.

Sol. $300 \times 400 \times 24 \times 25$

$\Rightarrow 3 \times 4 \times 24 \times 25 \times 10000$

$\Rightarrow 3 \times 4 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 10000$

$\Rightarrow 2^5 \times 5^2 \times 3^2 \times 10000$

$2^5 \times 5^2 \times 3^2 \times 10000$

(00) (0000)

Number of zeroes = 6

Ex. Multiplying all natural numbers from 1 to 60, how many zeros will come to the right side.

Sol. $1 \times 2 \times 3 \times \ldots\ldots\ldots \times 25 \times \ldots\ldots\times 50 \times \ldots\ldots \times 60$

$\frac{60}{5} = 12$

$\frac{12}{5} = 2 \qquad 12 + 2 = 14$ (Zeroes)

☞ In the given question it is clear that on multiplying, the power of five is less than that of 2.

☞ Stop dividing when the quotient is less than 5.

Ex. Multiplying all natural number from 1 to 100, How many zeros will come to right side.

Sol. $1 \times 2 \times 3 \times \ldots\ldots \times 25 \times \ldots\ldots\times 50 \times \ldots\ldots \times 75 \times \ldots\ldots \times 100$

$\Rightarrow \frac{100}{5} = 20$

$\frac{100}{25} = 4 \qquad 20 + 4 = 24$ (Zeroes)

Ex. Multiplying all natural numbers from 1 to 500, how many zeros will come to right side.

Sol. $1 \times 2 \times 3 \times \ldots\ldots\times 25 \times \ldots\ldots\times 50 \times \ldots\ldots\times 100\times \ldots\ldots\times 500$

$\frac{500}{5} = 100$

$\frac{100}{5} = 20$

$\frac{20}{5} = 4 \qquad 100 + 20 + 4 = 124$ (Zeroes)

Ex. Multiplying all natural numbers 1 to 1000, How many zeros will come to right side.

Ex. $1 \times 2 \times 3 \times \ldots\ldots\times 25 \times \ldots\ldots\times 50 \times \ldots\ldots\times 100\times \ldots\ldots\times 1000$

$\frac{1000}{5} = 200$

$\frac{200}{5} = 40$

$\frac{40}{5} = 8$

$\frac{8}{5} = 1 \qquad 200 + 40 + 8 + 1 = 249$ (Zeroes)

Ex. Multiplying all even numbers upto 80, How many zeros will come to right side.

Sol. $2 \times 4 \times 6 \times \ldots\ldots\ldots\ldots \times 80$

$\frac{80}{10} = 8$

$\frac{8}{5} = 1 \qquad 8 + 1 = 9$ (Zeroes)

☞ In multiplication of even number, first divide by 10, then by 5

Ex. Multiplying all the numbers 51 to 100, How many zeros will come to right side.

Sol. $51 \times 52 \times 53 \ldots\ldots\ldots\ldots 100$

$\Rightarrow [1 \times 2 \times 3 \ldots\ldots\ldots\ldots 100] - [1 \times 2 \times 3 \ldots\ldots\ldots\ldots 50]$

$\Rightarrow \frac{100}{5} = 20 \qquad \frac{50}{5} = 10$

$\frac{20}{5} = 4 \qquad \frac{10}{5} = 2$

$\Rightarrow [20 + 4 = 24] \qquad [10 + 2 = 12]$

$\Rightarrow [24] - [12] = 12$ (Zeroes)

Ex. On solving 96! how many zeros will come to right side.

Sol. $96! = 96 \times 95 \times 94 \times \ldots\ldots\ldots\ldots\ldots\ldots \times 1$

$\frac{96}{5} = 19$

$\frac{19}{5} = 3 \qquad 19 + 3 = 22$ (Zeroes)

Ex. On solving 9860!, How many zeros will come to right side.

Sol. 9860! = 9860 × 9859 ..... × 1

$\therefore \quad \frac{9860}{5} = 1972$

$\frac{1972}{5} = 394$

$\frac{394}{5} = 78$

$\frac{78}{5} = 15$

$\frac{15}{5} = 3$

$\Rightarrow$ 1972 + 394 + 78 + 15 + 3 = 2462 (Zeroes)

Ex. Multiplying all the odd numbers 1 to 100, how many zeros will come to right side.

Sol. 1 × 3 × 5 × 7 × 9 × 11 99

''Number of zeroes is zero''

☞ In the given question all the numbers are odd, no number will be divisible by 2. Hence no digit of two will appear in the product of these numbers. Hence not a single zero will be obtained at the end of the product of the given question.

Ex. Multiplying the first 100 prime numbers, How many zeros will come to right side.

Sol. 2 × 3 × 5 × 7 × 11 × 13 × 17 × 19 × ..... × 97

$\Rightarrow 2 \times 5$

$\Rightarrow 2^1 \times 5^1$

= Number of zero = 1

Ex. How many zeroes on the right end of the product of (1 × 3 × 5 × 7 × ..... × 99) × 8.

Sol. (1 × 3 × 5 × 7 × ..... × 99) × 8

(5 × 15 × 25 × 35 × ..... × 95) × 8

{For pair of 5 and 2}

$\Rightarrow 5^{12} \times 2^3$

$5^{12} \times 2^3 \xrightarrow{\text{No. of pair}} 3 \xrightarrow{\text{No. of zero}} 3$

(Which power less)

Ex. Find the number of zeroes.

$(3^{123} - 3^{122} - 3^{121})\,(2^{121} - 2^{120} - 2^{119})$

Sol. $(3^{123} - 3^{122} - 3^{121})\,(2^{121} - 2^{120} - 2^{119})$

$3^{121}\,(3^2 - 3^1 - 3^0)\,2^{119}\,(2^2 - 2^1 - 2^0)$

$3^{121}\,(9 - 3 - 1)\,2^{119}\,(4 - 2 - 1)$

$3^{121}\,(5)\,2^{119}\,(1)$

$2^{119} \times 3^{121} \times 5^1$

$2^{119} \times 5^1 \times 3^{121}$

No. of pair 1 $\rightarrow$ no. of zero = 1

Ex. If 100! divisible by 3^n then find the maximum value of n :

Sol. 100! = 100 × 99 × 98 × ..... × 1

$\frac{100}{3} = 33$

$\frac{33}{3} = 11$

$\frac{11}{3} = 3$

$\frac{3}{3} = 1$

$\Rightarrow$ 33 + 11 + 3 + 1 = 48

Hence n = 48

Ex. If 122! is divisible by 6^n then find the maximum value of n :

Sol. $\frac{122!}{6} = \frac{122!}{2 \times 3}$

To make a pair of 2 and 3, the power of 3 will be reduced.

$\frac{122}{3} = 40$

$\frac{40}{3} = 13$

$\frac{13}{3} = 4$

$\frac{4}{3} = 1$

$\Rightarrow$ 40 + 13 + 4 + 1 = 58

Hence n = 58

Ex. If 123! is divisible by 12^n then find the maximum value of n :

Sol. $\frac{123!}{12^n} = \frac{123}{3 \times 2^2}$

$\frac{123!}{3^{59} \times 2^{117}}$

$\frac{123!}{3^{59} \times (2^2)^{58} \times 2^1}$

$\frac{123!}{3^{59} \times (4)^{58} \times 2^1}$

Hence n = 58

$\frac{123}{3} = 41$

$\frac{41}{3} = 13$

$\frac{13}{3} = 4$

$\frac{4}{3} = 1$

Sum = 59

$\frac{123}{2} = 61$

$\frac{61}{2} = 30$

$\frac{30}{2} = 15$

$\frac{15}{2} = 7$

$\frac{7}{2} = 3$

$\frac{3}{2} = 1$

Sum = 117

Number of factors

Factors

Factors are positive integers that can divide a number exactly.

Ex. Factors of 12

1, 2, 3, 4, 6, 12

☞ Multiple of 12

12, 24, 36, 48, ...

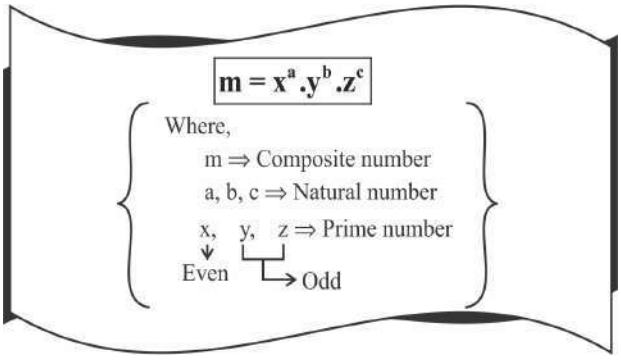
How to find factors

■ Writing any numbers as its prime factors.

Ex. $12 = 2^2 \times 3^1$

$72 = 2^3 \times 3^2$

$90 = 2^1 \times 3^2 \times 5^1$



■ The number of total factors−: **(a + 1) (b + 1) (c + 1)**

■ The number of odd factors−: **(b + 1) (c + 1)**

■ The number of even factors−: **a (b + 1) (c + 1)**

■ The sum of all factors−: **$(x^0 + x^1 + x^2 ..... x^a) \times (y^0 + y^1 + y^2 ..... y^b) \times (z^0 + z^1 + z^2 ..... z^c)$**

■ The sum of odd factors−: **$(y^0 + y^1 + ... y^b) \times (z^0 + z^1 + z^2 ..... z^c)$**

■ The sum of even factors−: **$(x^1 + x^2 + x^3 ..... x^a) \times (y^0 + y^1 ..... y^b) \times (z^0 + z^1 + z^2 ..... z^c)$**

■ The product of factors −: **$(x.y.z)^{\text{Total no. of factors}/2}$**

■ Sum of reciprocal of factors of n) = $\frac{\text{sum of factors}}{n}$

■ Average = $\frac{\text{Sum of factors}}{\text{No. of factors}}$

For the factors of 12

$12 = 2^2 \times 3^1$

■ **The number of total factors–**

$12 = 2^{\downarrow 2} \times 3^{\downarrow 1}$

$(2 + 1) \times (1 + 1)$

$3 \times 2 = \mathbf{6}$

■ **The number of odd factors–**

$12 = 2^2 \times 3^{\downarrow 1}$

$(1 + 1) = \mathbf{2}$

■ **The number of even factors–**

$12 = 2^2 \times 3^1$

$2 \times (2^{\downarrow 1} \times 3^{\downarrow 1})$

Even $(1 + 1) \times (1 + 1)$

$(2) \times (2) = \mathbf{4}$

■ **The sum of factors–**

$12 = 2^2 \times 3^1$

$= (2^0 + 2^1 + 2^2)(3^0 + 3^1)$

$= (1 + 2 + 4)(1 + 3)$

$= 7 \times 4 \Rightarrow \mathbf{28}$

■ **The sum of odd factors–**

$12 = 2^2 \times 3^1$

$\Rightarrow (3^0 + 3^1)$

$1 + 3 \Rightarrow \mathbf{4}$

☞ For the sum of odd factors, leave out even factors.

■ **The sum of even factors–**

$12 = 2^2 \times 3^1$

$\Rightarrow (2^1 + 2^2)(3^0 + 3^1)$

$\Rightarrow (2 + 4)(1 + 3)$

$\Rightarrow 6 \times 4$

$\Rightarrow \mathbf{24}$

☞ For sum of even factors, don't start from 2^0.

■ **The product of all factors–**

$12 = 2^2 \times 3^1$

Product of all factors of N = $N^{\text{Total no. of factors}/2}$

$= 12^{\frac{6}{2}}$

$= \mathbf{12^3}$

$12 = 2^{\downarrow 2} \times 3^{\downarrow 1}$

$(2 + 1) \times (1 + 1)$

$3 \times 2 = \mathbf{6}$

■ **How many factors of 864 which are multiple of 6?**

Sol. $864 = 2^5 \times 3^3$

$864 = 2 \times 3 [2^4 \times 3^2]$ {For the multiple of 6}

$= 6 [2^{\downarrow 4} \times 3^{\downarrow 2}]$

$(4 + 1)\ (2 + 1)$

$\Rightarrow 5 \times 3$

$\Rightarrow 15$

■ **How many factors of $2^7 \times 3^8 \times 5^9 \times 7^{10}$ which are completely square?**

Sol. $2^7 \times 3^8 \times 5^9 \times 7^{10}$

$\Rightarrow [(2^2)^3\ 2 \times (3^2)^4 \times (5^2)^4\ 5 \times (7^2)^5]$

{For the complete square }

$= 2 \times 5 [(2^2)^{\downarrow 3} \times (3^2)^{\downarrow 4} \times (5^2)^{\downarrow 4} \times (7^2)^{\downarrow 5}]$

$\Rightarrow \quad (3+1)\times(4+1)\times(4+1)\times(5+1)$

No. of factors = $4 \times 5 \times 5 \times 6 \Rightarrow 600$

■ **How many factors of $2^6 \times 3^8 \times 5^{10} \times 7^{12}$ which are completely cube?**

Sol. $2^6 \times 3^8 \times 5^{10} \times 7^{12}$

$\Rightarrow (2^3)^2 \times (3^3)^2 \times (3)^2 \times (5^3)^3 \times 5 \times (7^3)^4$

$\Rightarrow 3^2 \times 5[(2^3)^{\downarrow 2} \times (3^3)^{\downarrow 2} \times (5^3)^{\downarrow 3} \times (7^3)^{\downarrow 4}]$

$\Rightarrow \quad (2+1)\times(2+1)\times(3+1)\times(4+1)$

$\Rightarrow 3 \times 3 \times 4 \times 5 \Rightarrow 180$

■ **How many factors of $2^6 \times 3^{15} \times 5^{35} \times 7^{42}$ which are completely square as well as completely cube?**

Sol. $2^6 \times 3^{15} \times 5^{35} \times 7^{42}$

Power for square = 2

Power for cube = 3

LCM = 6

$\Rightarrow [(2^6)^1 \times (3^6)^2 \times 3^3 \times (5^6)^5 \times 5^5 \times (7^6)^7]$

$\Rightarrow 3^3 \times 5^5[(2^6)^1 \times (3^6)^2 \times (5^6)^5 \times (7^6)^7]$

$\Rightarrow \quad (1+1)\times(2+1)\times(5+1)\times(7+1)$

$\Rightarrow [2 \times 3 \times 6 \times 8] \quad \Rightarrow [6 \times 6 \times 8]$

$\Rightarrow [36 \times 8] \quad \Rightarrow 288$

■ **Find the sum of all factors of $2^5 \times 3^6 \times 5^4$ that are completely square.**

Sol. $2^5 \times 3^6 \times 5^4$

$\Rightarrow [2^0 + 2^2 + 2^4] [3^0 + 3^2 + 3^4 + 3^6] [5^0 + 5^2 + 5^4]$

$\Rightarrow [1 + 4 + 16] [1 + 9 + 81 + 729] [1 + 25 + 625]$

$\Rightarrow [21] \times [820] \times [651] \Rightarrow 11210220$

■ **Find the sum of all factors of $2^5 \times 3^6 \times 5^4$ that are completely cube.**

Sol. $2^5 \times 3^6 \times 5^4$

$\Rightarrow [2^0 + 2^3] [3^0 + 3^3 + 3^6] [5^0 + 5^3]$

$\Rightarrow [1 + 8] [1 + 27 + 729] [1+125]$

$\Rightarrow [9] [757] [126] \Rightarrow 858438$

■ **Find the sum of reciprocal of factors of 90.**

Sol. Sum of reciprocal of factors of n) $= \dfrac{\text{sum of factors}}{n}$

$90 = 2^1 \times 3^2 \times 5^1$

$\Rightarrow \dfrac{(2^0 + 2^1)(3^0 + 3^1 + 3^2)(5^0 + 5^1)}{90}$

$\Rightarrow \dfrac{[(1+2)(1+3+9)(1+5)]}{90}$

$\Rightarrow \dfrac{[3 \times 13 \times 6]}{90} \Rightarrow \dfrac{[39 \times 6]}{90}$

$\Rightarrow \dfrac{234}{90} \Rightarrow 2.6$

■ **Find the average of all the factors of 144.**

Sol. Average $= \dfrac{\text{Sum of factors}}{\text{No. of factors}}$

For sum of factors–

$144 = 2^4 \times 3^2$

$\Rightarrow [(2^0 + 2^1 + 2^2 + 2^3 + 2^4)(3^0 + 3^1 + 3^2)]$

$\Rightarrow [(1 + 2 + 4 + 8 + 16)(1 + 3 + 9)]$

$\Rightarrow [(31)(13)] \Rightarrow 403$

For no. of factors–

$\Rightarrow (4 + 1)(2 + 1) \Rightarrow 5 \times 3$

$\Rightarrow 15$

Average $= \dfrac{403}{15} \Rightarrow 26.86$

■ Only a perfect square number has odd number of factors.

or

If a number has odd number of factors that means number is a perfect square.

■ Square of a prime number has only 3 factors.

■ **The total number of 2 digit no's which have only 3 factors?**

Sol. ∵ Square of a prime number has only 3 factor.

$(5^2) = 25 \xrightarrow{\text{Factors}} 1, 5, 25$

$(7^2) = 49 \xrightarrow{\text{Factors}} 1, 7, 49$

$5, 7 \rightarrow$ Prime number

Hence, 2, two digit no. will have 3 factors.

■ **The total number of 3 digit no's which have only 3 factors?**

Sol.

$(11)^2 = 121 \xrightarrow{\text{Factors}} 1, 11, 121$

$(13)^2 = 169 \xrightarrow{\text{Factors}} 1, 13, 169$

$(17)^2 = 289 \xrightarrow{\text{Factors}} 1, 17, 289$

$(19)^2 = 361 \xrightarrow{\text{Factors}} 1, 19, 361$

$(23)^2 = 529 \xrightarrow{\text{Factors}} 1, 23, 529$

$(29)^2 = 841 \xrightarrow{\text{Factors}} 1, 29, 841$

$(31)^2 = 961 \xrightarrow{\text{Factors}} 1, 31, 961$

Hence, 7, three digit no. will have 3 factors.

How to find prime factor

$\mathbf{m = x^a . y^b . z^c}$

Where,

m ⇒ Composite number

x, y, z ⇒ Prime number

a, b, c ⇒ Natural number

Number of prime factors = a + b + c

Sum of prime factors = ax + by + cz

■ **Find the total number of prime factors of 144.**

Sol. $144 = 2^4 \times 3^2$

No. of prime factors $= 4 + 2 \Rightarrow 6$

■ **Find the total number of prime factor of $2^5 \times 3^6 \times 7^{12}$.**

Sol. $2^5 \times 3^6 \times 7^{12}$

No. of prime factors $= 5 + 6 + 12 \Rightarrow 23$

■ **Find the total number of prime factor of $6^6 \times 10^{10} \times 35^3$.**

Sol. $6^6 \times 10^{10} \times 35^3$

$\Rightarrow (2 \times 3)^6 \times (2 \times 5)^{10} \times (5 \times 7)^3$

$\Rightarrow 2^6 \times 3^6 \times 2^{10} \times 5^{10} \times 5^3 \times 7^3$

No. of prime factors

$= (6 + 6 + 10 + 10 + 3 + 3)$

$\Rightarrow (12 + 20 + 6)$

$\Rightarrow (18 + 20) \Rightarrow 38$

■ **Find sum of all the prime factors of $2^3 \times 3^4 \times 5^6$.**

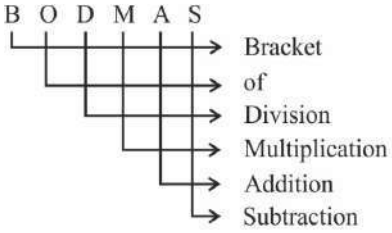
Sol. $2^3 \times 3^4 \times 5^6$

$\Rightarrow$ (2 + 2 + ... 3 times) + (3 + 3 +..... 4 times) + (5 + 5 + ... 6 times)

$\Rightarrow (2 \times 3) + (3 \times 4) + (5 \times 6)$

$\Rightarrow 6 + 12 + 30 \Rightarrow 48$

BODMAS Rule



☞ Solve the brackets from inside to outside.

Types of brackets :

- Line/Bar bracket → ——
- Circular/Small/Open bracket → **( )**
- Curly/Braces bracket → **{ }**
- Square/Closed bracket → **[ ]**

■ **To solve :**

$$\mathbf{222 - \frac{1}{3}\,of\left\{42 + \left(56 - \overline{8+9}\right)\right\} + 108}$$

Sol. $222 - \frac{1}{3}\text{of}\left\{42 + \left(56 - \overline{8+9}\right)\right\} + 108$

$222 - \frac{1}{3}\text{of}\left\{42 + (56 - 17)\right\} + 108$

$\Rightarrow 222 - \frac{1}{3}\text{of}\left\{42 + 39\right\} + 108$

$\Rightarrow 222 - \frac{1}{3}\text{of}\left\{81\right\} + 108$

$\Rightarrow 222 - \frac{1}{3}\text{of } 81 + 108$

$\Rightarrow 222 - [27 + 108]$

$\Rightarrow 222 - 135 \Rightarrow$ **87**

■ **To solve :**

19170 ÷ 54 ÷ 5

Sol. $19170 \div 54 \div 5$

$\Rightarrow 19170 \times \frac{1}{54} \times \frac{1}{5}$

$\Rightarrow \frac{355}{5}$

$\Rightarrow$ **71**

■ **To solve :**

$$\mathbf{\frac{9}{13} \div \frac{18}{26} \div \frac{90}{52}}$$

Sol. $\frac{9}{13} \div \frac{18}{26} \div \frac{90}{52}$

$\Rightarrow \frac{9}{13} \times \frac{26}{18} \times \frac{52}{90}$

$\Rightarrow \mathbf{\frac{26}{45}}$

■ **To solve:**

5.8 + (7.4 ÷ 3.7 × 5) – 6 × 2 ÷ 2.5

Sol. $5.8 + (7.4 \div 3.7 \times 5) - 6 \times 2 \div 2.5$

$\Rightarrow 5.8 + (2 \times 5) - 6 \times \frac{2}{2.5}$

$\Rightarrow 5.8 + 10 - 4.8$

$\Rightarrow 15.8 - 4.8$

$\Rightarrow$ **11**

Question based on series

- $\frac{1}{a \times b} = \frac{1}{(b-a)}\left(\frac{1}{a} - \frac{1}{b}\right)$
- $\frac{1}{a \times b \times c} = \frac{1}{(c-a)}\left(\frac{1}{ab} - \frac{1}{bc}\right)$
- $\frac{1}{a \times b \times c \times d} = \frac{1}{(d-a)}\left(\frac{1}{abc} - \frac{1}{bcd}\right)$
- $1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \ldots\ldots\ldots + n(n+1)$
  $= \frac{n(n+1)(n+2)}{3}$

■ **Find the value :**

$$\mathbf{\frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72} + \frac{1}{90}}$$

Sol. $\frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72} + \frac{1}{90}$

$\Rightarrow \frac{1}{4 \times 5} + \frac{1}{5 \times 6} + \frac{1}{6 \times 7} + \frac{1}{7 \times 8} + \frac{1}{8 \times 9} + \frac{1}{9 \times 10}$

$\Rightarrow \frac{1}{4} - \frac{1}{5} + \frac{1}{5} - \frac{1}{6} + \frac{1}{6} - \frac{1}{7} + \frac{1}{7} - \frac{1}{8} + \frac{1}{8} - \frac{1}{9} + \frac{1}{9} - \frac{1}{10}$

$= \frac{1}{4} - \frac{1}{10}$

$= \frac{5-2}{20} \Rightarrow \mathbf{\frac{3}{20}}$

■ **Find the value :**

$$\mathbf{\frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \frac{1}{10 \times 13} + \frac{1}{13 \times 16} = ?}$$

Sol. $\frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \frac{1}{10 \times 13} + \frac{1}{13 \times 16}$

$\Rightarrow \frac{1}{3}\left(\frac{3}{1 \times 4} + \frac{3}{4 \times 7} + \frac{3}{7 \times 10} + \frac{3}{10 \times 13} + \frac{3}{13 \times 16}\right)$

$\Rightarrow \frac{1}{3}\left[\frac{1}{1} - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \frac{1}{7} - \frac{1}{10} + \frac{1}{10} - \frac{1}{13} + \frac{1}{13} - \frac{1}{16}\right]$

$\Rightarrow \frac{1}{3}\left(\frac{1}{1} - \frac{1}{16}\right)$

$\Rightarrow \frac{1}{3}\left(\frac{16-1}{16}\right) = \frac{1}{3} \times \frac{15}{16}$ $\mathbf{\frac{5}{16}}$

■ **Find the value :**

$$\mathbf{\frac{2}{15} + \frac{4}{45} + \frac{7}{144} + \frac{9}{400} = ?}$$

Sol. $\frac{2}{15}+\frac{4}{45}+\frac{7}{144}+\frac{9}{400}$

$\Rightarrow \frac{2}{3\times5}+\frac{4}{5\times9}+\frac{7}{9\times16}+\frac{9}{16\times25}$

$\Rightarrow \frac{1}{3}-\frac{1}{5}+\frac{1}{5}-\frac{1}{9}+\frac{1}{9}-\frac{1}{16}+\frac{1}{16}-\frac{1}{25}$

$= \frac{1}{3}-\frac{1}{25}$

$= \frac{25-3}{75}$ $\quad \mathbf{\frac{22}{75}}$

■ **Find the value :**

$$\mathbf{\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+\frac{9}{4^2.5^2}\ldots\ldots\ldots\ldots\frac{19}{9^2.10^2}}$$

Sol. $\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+\frac{9}{4^2.5^2}\ldots\ldots\ldots\ldots\frac{19}{9^2.10^2}$

$\frac{3}{1\times4}+\frac{5}{4\times9}+\frac{7}{9\times16}+\frac{9}{16\times25}\ldots\ldots\ldots\ldots\frac{19}{81\times100}$

$\Rightarrow \frac{1}{1}-\frac{1}{4}+\frac{1}{4}-\frac{1}{9}+\frac{1}{9}-\frac{1}{16}+\frac{1}{16}-\frac{1}{25}\ldots\ldots\frac{1}{81}-\frac{1}{100}$

$\Rightarrow \frac{1}{1}-\frac{1}{100}$

$\Rightarrow \mathbf{\frac{99}{100}}$

■ **Find the value :**

$$\mathbf{1+\frac{1}{2}\quad 1+\frac{1}{3}\quad 1+\frac{1}{4}\quad \ldots\ldots\ldots\quad 1+\frac{1}{n}\quad =?}$$

Sol. $1+\frac{1}{2}\quad 1+\frac{1}{3}\quad 1+\frac{1}{4}\quad \ldots\ldots\ldots\quad 1+\frac{1}{n}$

$\frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}\ldots\ldots\ldots\ldots\frac{(n+1)}{n}$

$= \mathbf{\frac{(n+1)}{2}}$

■ **Find the value :**

$$\mathbf{1-\frac{1}{2}\quad 1-\frac{1}{3}\quad 1-\frac{1}{4}\quad \ldots\ldots\ldots\quad 1-\frac{1}{n}\quad =?}$$

Sol. $1-\frac{1}{2}\quad 1-\frac{1}{3}\quad 1-\frac{1}{4}\quad \ldots\ldots\ldots\quad 1-\frac{1}{n}$

$\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\ldots\ldots\ldots\frac{(n-1)}{n}$

$\Rightarrow \mathbf{\frac{1}{n}}$

■ **Find the value :**

$$\mathbf{1-\frac{1}{3^2}\quad 1-\frac{1}{4^2}\quad 1-\frac{1}{5^2}\quad \ldots..\quad 1-\frac{1}{11^2}\quad 1-\frac{1}{12^2}}$$

Sol. $1-\frac{1}{3^2}\quad 1-\frac{1}{4^2}\quad 1-\frac{1}{5^2}\quad \ldots..\quad 1-\frac{1}{11^2}\quad 1-\frac{1}{12^2}$

$a^2 - b^2 = (a + b)(a - b)$

$1+\frac{1}{3}\quad 1-\frac{1}{3}\quad 1+\frac{1}{4}\quad 1-\frac{1}{4}\quad \ldots\ldots\ldots\ldots\ldots\ldots$

$\ldots..\quad 1+\frac{1}{11}\quad 1-\frac{1}{11}\quad 1+\frac{1}{12}\quad 1-\frac{1}{12}$

$\Rightarrow \quad 1+\frac{1}{3}\quad 1+\frac{1}{4}\quad 1+\frac{1}{5}\quad \ldots..\quad 1+\frac{1}{12}\quad \times$

$1-\frac{1}{3}\quad 1-\frac{1}{4}\quad 1-\frac{1}{5}\quad \ldots..\quad 1-\frac{1}{12}$

$\left[\frac{4}{3}\times\frac{5}{4}\times\frac{6}{5}\ldots\ldots\frac{13}{12}\right]\quad\left[\frac{2}{3}\times\frac{3}{4}\times\ldots\ldots\frac{11}{12}\right]$

$\Rightarrow \frac{13}{3}\times\frac{2}{12}$

$\Rightarrow \frac{13}{3}\times\frac{1}{6}$

$\Rightarrow \mathbf{\frac{13}{18}}$

■ **Find the value :**

$$\mathbf{\frac{2\times8+8\times32+18\times72+\ldots\ldots\ldots}{1+16+81+\ldots\ldots\ldots\ldots}^{\frac{1}{4}}=?}$$

Sol. $\frac{2\times8+8\times32+18\times72+\ldots\ldots\ldots}{1+16+81+\ldots\ldots\ldots\ldots}^{\frac{1}{4}}$

$\Rightarrow 16\ \frac{1+16+81+\ldots\ldots\ldots}{1+16+81+\ldots\ldots\ldots}^{\frac{1}{4}}$

$\Rightarrow [16]^{\frac{1}{4}}$

$\Rightarrow 2^{4\ \frac{1}{4}}$ $\quad \mathbf{2}$

■ **Find the value :**

$$\mathbf{\frac{1.2.4+2.4.8+3.6.12+\ldots\ldots\ldots}{1.3.9+2.6.18+3.9.27+\ldots\ldots}^{\frac{1}{3}}}$$

Sol. $\frac{1.2.4+2.4.8+3.6.12+\ldots\ldots\ldots}{1.3.9+2.6.18+3.9.27+\ldots\ldots}^{\frac{1}{3}}$

$\Rightarrow \frac{8}{27}^{\frac{1}{3}}$

$= \mathbf{\frac{2}{3}}$

Exponential Series

$$\mathbf{e = 1+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\ldots\ldots\ldots\quad 2.71828}$$

■ **Find the value :**

$$\mathbf{\frac{1}{1.2.3}+\frac{1}{1.2.3.4}+\frac{1}{1.2.3.4.5}+\ldots\ldots\ldots}$$

Sol. $\frac{1}{3!}+\frac{1}{4!}+\frac{1}{5!}+\ldots\ldots\ldots$

$1+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+\ldots\ldots\ldots - 1+\frac{1}{1!}+\frac{1}{2!}$

$= (2.71828) - (1 + 1 + 0.5)$

$=$ **0.21828**

■ **Find the value :**

$\frac{\mathbf{8!\times 7!\times 6!}}{\mathbf{9!\times 5!\times 3!}} = ?$

Sol. $\frac{8!\times 7\times 6\times 5!\times 6\times 5\times 4\times 3!}{9\times 8!\times 5!\times 3!}$

$\Rightarrow 28 \times 20$

$\Rightarrow$ **560**

■ **Find the value in the form of 6! :**

[8! - 7! - 6!]

Sol. [8! - 7! - 6!]

$\Rightarrow$ [8 × 7 × 6! – 7 × 6! – 6!]

$\Rightarrow$ 6! [8 × 7 – 7 – 1]

$\Rightarrow$ 6! [56 – 8]

$\Rightarrow$ **6![48]**

■ **If a * b = 2(a + b) then find the value 1 * [2 * 3]**

Sol. 1 * [2 * 3]

$\Rightarrow$ 1 * [2 (2 + 3)]

$\Rightarrow$ 1 * [2 × 5]

$\Rightarrow$ 1 * 10

$\Rightarrow$ 2 [1 + 10]

$\Rightarrow$ 2 × 11

$=$ **22**

■ **If x * y = 3x + 2y, then find the value 2 * 3 + 3 * 4**

Sol.

2 * 3 + 3 * 4

↓ ↓ ↓ ↓

x y x y

$\Rightarrow$ (3 × 2 + 2 × 3) + (3 × 3 + 2 × 4)

$\Rightarrow$ (6 + 6) + (9 + 8)

$= 12 + 17 =$ **29**

■ **If @ is an operation such that**

$$a@b = \begin{cases} 2a \text{ यदि } > b \\ a+b \text{ यदि } a < b \\ a^2 \text{ यदि } = b \end{cases}$$

then, $\frac{(5@7)+(4@4)}{3(5@5)-(15@11)-3} = ?$

Sol. $\frac{(5+7)+(4)^2}{3(5)^2-(2\times 15)-3}$

$\Rightarrow \frac{12+16}{75-30-3}$

$\Rightarrow \frac{28}{75-33}$

$\Rightarrow \frac{28}{42} = \mathbf{\frac{2}{3}}$

■ **Find the value:**

$\mathbf{999\frac{995}{999}\times 999}$

Sol. $999\frac{995}{999}\times 999$

$\Rightarrow \quad 999+\frac{995}{999}\ \ 999$

$\Rightarrow \quad (1000-1)+\frac{995}{999}\ \ 999$

$\Rightarrow \quad \frac{(1000-1)999+995}{999}\ \times 999$

$\Rightarrow$ 999000 – 999 + 995

$=$ 999000 – 4 = **998996**

■ **Find the value :**

$\mathbf{999\frac{1}{9}+999\frac{2}{7}+999\frac{3}{7}+999\frac{4}{7}+999\frac{5}{7}+999\frac{6}{7}}$

Sol. $999\frac{1}{9}+999\frac{2}{7}+999\frac{3}{7}+999\frac{4}{7}+999\frac{5}{7}+999\frac{6}{7}$

$\Rightarrow \quad (999\times 6)+\ \frac{1}{7}+\frac{2}{7}+\frac{3}{7}+\frac{4}{7}+\frac{5}{7}+\frac{6}{7}$

$\Rightarrow \quad (1000-1)6+\ \frac{21}{7}$

$= 6000 - 6 + 3$

$= 6000 - 3 =$ **5997**

■ **Find the value :**

$\mathbf{3\frac{1}{3}+33\frac{1}{3}+333\frac{1}{3}+3333\frac{1}{3}+33333\frac{1}{3}}$

Sol. $3\frac{1}{3}+33\frac{1}{3}+333\frac{1}{3}+3333\frac{1}{3}+33333\frac{1}{3}$

$\Rightarrow$ (3 + 33 + 333 + 3333 + 33333) +

$\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$

$= \quad 37035+\frac{5}{3} \quad \Rightarrow \quad 37035+1\frac{2}{3}$

$= \quad 37036+\frac{2}{3} \quad \Rightarrow \quad \mathbf{37036\frac{2}{3}}$

Continuous fraction

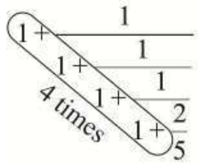
■ **To solve :**

$$\mathbf{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{2}{5}}}}}$$

Sol. Step-1 : Write the last fraction $\frac{2}{5}$ first

Step-2 : Write the numerator (2) first then the denominator (5).

Step-3 : Next number will appear as many times as one is given in the question and to find the next number, immediately add the previous number to that number.



$2,\ 5 \xrightarrow{5+2} (7) \xrightarrow{7+5} (12) \xrightarrow{12+7} (19) \xrightarrow{19+12} (31)$

$\Rightarrow \mathbf{\frac{31}{19}}$

■ **To solve :**

$$1-\cfrac{1}{1-\cfrac{1}{1-\cfrac{1}{1-\cfrac{2}{5}}}}$$

Sol.

$2,\ 5 \xrightarrow{5-2} (3) \xrightarrow{3-5} (-2) \xrightarrow{-2-3} (-5) \xrightarrow{-5-(-2)} (-3)$

Hence, the fraction = $\frac{-3}{-5}$ $\mathbf{\frac{3}{5}}$

■ **To solve :**

$$1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{4}}}$$

Sol. $1,\ 4 \xrightarrow{\times 3+1} (13) \xrightarrow{\times 2+4} (30) \xrightarrow{\times 1+13} (43)$

Hence, the fraction = $\mathbf{\frac{43}{30}}$

■ **To solve :**

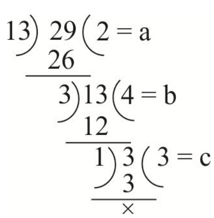
$$1-\cfrac{1}{2-\cfrac{1}{3-\cfrac{1}{4}}}$$

Sol. $1,\ 4 \xrightarrow{\times 3-1} (11) \xrightarrow{\times 2-4} (18) \xrightarrow{\times 1-11} (7)$

■ **Find the value a+ b + c :**

$$\cfrac{1}{a+\cfrac{1}{b+\cfrac{1}{c}}} = \frac{13}{29}$$

Sol.



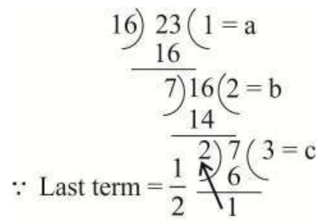
$\therefore$ a + b + c = 2 + 4 + 3

a + b + c = 9

■ **Find the value a+ b + c :**

$$\cfrac{1}{a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{2}}}} = \frac{16}{23}$$

Sol.



$\therefore$ a + b + c = 1 + 2 + 3 $\Rightarrow$ **6**

■ **Recurring decimal :**

➢ $0.\overline{a} = \frac{a}{9}$ ➢ $0.\overline{ab} = \frac{ab}{99}$

➢ $0.\overline{abc} = \frac{abc}{999}$ ➢ $0.a\overline{b} = \frac{ab-a}{90}$

➢ $0.ab\overline{c} = \frac{abc-ab}{900}$ ➢ $0.a\overline{bc} = \frac{abc-a}{990}$

■ **Find the value**

$\mathbf{8.3\overline{1} + 0.\overline{6} + 0.00\overline{2} = ?}$

Sol.

Without bar = 2

With bar = 1, 1, 1 LCM = 1

Without bar	With bar	
8.31	1	1 1 1 ....
0.66	6	6 6 6 ....
0.00	2	2 2 2 ....
8.97	9	9 9 9

$\Rightarrow$ $\mathbf{8.97\overline{9}}$

■ **Find the value :**

$\mathbf{22.\overline{4} + 11.5\overline{67} - 33.5\overline{9} = ?}$

Sol. Without bar = 1

With bar = 1, 2, 1 LCM = 2

Without bar	With bar	
22.4	4 4	4 4 ....
+11.5	6 7	6 7 ....
–33.5	9 9	9 9 ....
0.4	1 2	1 2

Surds and Indies

Surds : $\sqrt[n]{a}$

$\sqrt{}$ → Radical

n → Order of surd

a → Radicand

☞ **Entire surds :**

$\sqrt{a}, \quad (\sqrt{a}+\sqrt{b})$

☞ **Mixed surds :**

$a\sqrt{b}$

☞ **Like & Similar surds :**

$x\sqrt{b}, \ y\sqrt{b}, \ z\sqrt{b}$

☞ **Unlike & unsimilar surds :**

$x\sqrt{b}, \ y\sqrt{c}, \ z\sqrt{d}$

☞ **Conjugate surds :**

$\sqrt{7}+\sqrt{5} \xrightarrow{\text{Conjugate}} \sqrt{7}-\sqrt{5}$

$\sqrt{4}-\sqrt{3} \xrightarrow{\text{Conjugate}} \sqrt{4}+\sqrt{3}$

Product of conjugate surds is a rational number.

☞ **Quadratic surds :**

$a+\sqrt{b}, \ \sqrt{a}+\sqrt{b}+c$

☞ **Equation involving surds-**

If the surds, $a+\sqrt{b}=c+\sqrt{d}$

then, $\boxed{\begin{matrix} a=c \\ b=d \end{matrix}}$

Hence, the rational part of one side is equal to the rational part of other side and the irrational part of one side is equal to the irrational part of other side.

Rationalization–

Surds	Rationalization factor
$\sqrt{a}+\sqrt{b}$	$\sqrt{a}-\sqrt{b}$
$\sqrt{a}-\sqrt{b}$	$\sqrt{a}+\sqrt{b}$
$a+\sqrt{b}$	$a-\sqrt{b}$
$a-\sqrt{b}$	$a+\sqrt{b}$
$a^{2/3}+b^{2/3}-a^{1/3}b^{1/3}$	$(a^{1/3}+b^{1/3})$
$a^{2/3}+b^{2/3}+a^{1/3}b^{1/3}$	$(a^{1/3}-b^{1/3})$

Law of surds and indices

- $a \times a \times a \times \ldots\ldots\ldots\ldots$ m term $= a^m$
  $a \times a \times a \times \ldots\ldots\ldots\ldots$ n term $= a^n$
- $(a \times a \times \ldots\ldots$ m term$) \times (a \times a \times \ldots\ldots$ n term$)$
  $= a^m \times a^n$
  $\Rightarrow \boxed{a^{m+n}}$
- $\dfrac{a \times a \times a \times \ldots\ldots m \text{ terms}}{a \times a \times a \times \ldots\ldots n \text{ terms}} = \dfrac{a^m}{a^n} \Rightarrow \boxed{a^{m-n}}$

■ If $a > 0$, $a \neq 1$ and m, n, p are integers then,

- $a^m \times a^n = a^{m+n}$
- $a^m \times a^n \times a^p = a^{m+n+p}$
- $(a^m)^n = a^{mn}$
- $\dfrac{a^m}{a^n} = a^{m-n}$
- $a^0 = 1$
- $a^{-m} = \dfrac{1}{a^m}$
- $a^{m^n} = a^{(m^n)}$
- $a^{m^{np}} = a^{m^{(np)}} = a^{m^{(np)}}$
- $(ab)^n = a^n b^n$
- $(abc)^n = a^n b^n c^n$
- If $a^n = y$ then $a = y^{1/n}$
  If $a^x = b^y$ then $a = b^{y/x}$
  If $a^x = b^y$ then $a^{1/y} = b^{1/x}$
- $x^n = a \Rightarrow x = \sqrt[n]{a}$, $(a \in R, a \geq 0)$
- If n is an odd positive integer and $a > 0$ then,
  $\sqrt[n]{-a} = \sqrt[n]{a}$
  If m, $n \geq 2$, and a, $b > 0$ then–
- $\sqrt[n]{a} = a^{1/n}$
- $(\sqrt[n]{a})^m = a^{m/n}$
- $\sqrt[n]{a}.\sqrt[n]{b} = \sqrt[n]{ab} = (ab)^{1/n}$
- $\dfrac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\dfrac{a}{b}}$
- $\sqrt[n]{\sqrt[m]{a}} = (a^{1/m})^{1/n} = a^{1/mn}$
- $\sqrt[n]{a}.\sqrt[m]{a} = a^{1/n}.a^{1/m}$
  $\Rightarrow a^{1/n+1/m}$
  $\Rightarrow a^{\frac{m+n}{mn}} \qquad \sqrt[mn]{a^{(m+n)}}$
- $\dfrac{\sqrt[n]{a}}{\sqrt[m]{a}} = \dfrac{a^{1/n}}{a^{1/m}} = a^{\frac{1}{n}-\frac{1}{m}} \qquad a^{\frac{m-n}{mn}}$
  $\Rightarrow \sqrt[mn]{a^{(m-n)}}$
- $\sqrt[z]{\sqrt[y]{(\sqrt[x]{a})^p}^{\,q}}^{\,r} = a^{\frac{pqr}{xyz}}$

Find square root

- $(a+b)^2 = a^2+b^2+2ab$
- $(\sqrt{a}+\sqrt{b})^2 = a+b+2\sqrt{ab}$
- $(a-b)^2 = a^2+b^2-2ab$
- $(\sqrt{a}-\sqrt{b})^2 = a+b-2\sqrt{ab}$
- $(a+b+c)^2 = a^2+b^2+c^2+2ab+2bc+2ca$
- $(\sqrt{a}+\sqrt{b}+\sqrt{c})^2 = a+b+c+2\sqrt{ab}+2\sqrt{bc}+2\sqrt{ca}$
- $(a-b)(a+b) = a^2-b^2$

■ **Find the square root–**

$11 + 2\sqrt{30}$

Sol.

$\sqrt{11+2\sqrt{30}}$

$5+6 \quad 5\times 6$

$\sqrt{\left(\sqrt{5}\right)^2+\left(\sqrt{6}\right)^2+2\sqrt{5}\times\sqrt{6}}$

$\sqrt{\left(\sqrt{5}+\sqrt{6}\right)^2}$

$\left(\sqrt{\mathbf{5}}+\sqrt{\mathbf{6}}\right)$

■ **Find the square root–**

$13 + 2\sqrt{30}$

Sol.

$\sqrt{13+2\sqrt{30}}$

$10+3 \quad 10\times 3$

$\sqrt{\left(\sqrt{10}+\sqrt{3}\right)^2}$

$\left(\sqrt{\mathbf{10}}+\sqrt{\mathbf{3}}\right)$

■ **Find the square root–**

$17 - 2\sqrt{30}$

Sol.

$\sqrt{17-2\sqrt{30}}$

$15+2 \quad 15\times 2$

$\sqrt{\left(\sqrt{15}-\sqrt{2}\right)^2}$

$\left(\sqrt{\mathbf{15}}-\sqrt{\mathbf{2}}\right)$

■ **Find the square root–**

$8 - 2\sqrt{7}$

Sol.

$\sqrt{8-2\sqrt{7}}$ $\quad\{\because\ \mathbf{8=7+1,\ 7=7\times 1}\}$

$\sqrt{\left(\sqrt{7}-\sqrt{1}\right)^2}$

$\left(\sqrt{\mathbf{7}}-\sqrt{\mathbf{1}}\right)$

■ **Find the square root–**

$12 + \sqrt{140}$

Sol. $\sqrt{12+\sqrt{140}}$

$\sqrt{12+2\sqrt{35}}$

$7+5 \quad 7\times 5$

$\sqrt{\left(\sqrt{7}+\sqrt{5}\right)^2}$

$\left(\sqrt{\mathbf{7}}+\sqrt{\mathbf{5}}\right)$

■ **Find the square root–**

$8 - \sqrt{60}$

Sol. $\sqrt{8-\sqrt{60}}$

$\sqrt{8-2\sqrt{15}}$

$5+3 \quad 5\times 3$

$\sqrt{\left(\sqrt{5}-\sqrt{3}\right)^2}$

$\left(\sqrt{\mathbf{5}}-\sqrt{\mathbf{3}}\right)$

■ **Find the square root–**

$7 + 4\sqrt{3}$

Sol. $\sqrt{7+4\sqrt{3}}$

$\sqrt{7+2\sqrt{12}}$

$\sqrt{7+2\sqrt{12}}$

$4+3 \quad 4\times 3$

$\sqrt{\left(\sqrt{4}+\sqrt{3}\right)^2}$

$\left(\mathbf{2}+\sqrt{\mathbf{3}}\right)$

■ **Find the square root–**

$12 - 6\sqrt{3}$

Sol. $\sqrt{12-6\sqrt{3}}$

$\sqrt{12-2\sqrt{27}}$

$\sqrt{12-2\sqrt{27}}$

$9+3 \quad 9\times 3$

$\sqrt{\left(\sqrt{9}-\sqrt{3}\right)^2}$

$\left(\mathbf{3}-\sqrt{\mathbf{3}}\right)$

■ **Find the square root–**

$3 + \sqrt{5}$

Sol. $\sqrt{3+\sqrt{5}}$

$\sqrt{\frac{2}{2}\left(3+\sqrt{5}\right)}$

$\frac{1}{\sqrt{2}}\sqrt{6+2\sqrt{5}}$

$\frac{1}{\sqrt{2}}\sqrt{6+2\sqrt{5}}$

$5+1 \quad 5\times 1$

$\frac{1}{\sqrt{2}}\sqrt{\left(\sqrt{5}+1\right)^2}$

$\frac{\mathbf{1}}{\sqrt{\mathbf{2}}}\left(\sqrt{\mathbf{5}}+\mathbf{1}\right)$

■ **Find the square root–**

$4 - \sqrt{15}$

Sol. $\sqrt{4-\sqrt{15}}$

$\sqrt{\frac{2}{2}\left(4-\sqrt{15}\right)}$

$\frac{1}{\sqrt{2}}\sqrt{8-2\sqrt{15}}$

$\frac{1}{\sqrt{2}}\sqrt{8-2\sqrt{15}}$

$5+3 \quad 5\times 3$

$\frac{1}{\sqrt{2}}\sqrt{\left(\sqrt{5}-\sqrt{3}\right)^2}$

$\frac{\mathbf{1}}{\sqrt{\mathbf{2}}}\left(\sqrt{\mathbf{5}}-\sqrt{\mathbf{3}}\right)$

■ **Find the square root–**

$\mathbf{15+\sqrt{60}+\sqrt{84}+\sqrt{140}}$

Sol. $\sqrt{15+\sqrt{60}+\sqrt{84}+\sqrt{140}}$

$\sqrt{15+2\sqrt{15}+2\sqrt{21}+2\sqrt{35}}$

$\sqrt{15+2.\sqrt{3}.\sqrt{5}+2.\sqrt{5}.\sqrt{7}+2.\sqrt{7}.\sqrt{3}}$

$\sqrt{\left(\sqrt{3}\right)^2+\left(\sqrt{5}\right)^2+\left(\sqrt{7}\right)^2+2.\sqrt{3}.\sqrt{5}+2.\sqrt{5}.\sqrt{7}+2.\sqrt{7}.\sqrt{3}}$

$\sqrt{\left(\sqrt{3}+\sqrt{5}+\sqrt{7}\right)^2}$

$\left(\sqrt{\mathbf{3}}+\sqrt{\mathbf{5}}+\sqrt{\mathbf{7}}\right)$

Some important results

➢ If, $x=\sqrt{a\sqrt{a\sqrt{a\sqrt{a}.....\infty}}}$

then, $\boxed{\mathbf{x=a}}$

➢ If, $x=\sqrt{a\sqrt{a\sqrt{a}.....\text{n times}}}$

then, $\boxed{\mathbf{x=a^{\frac{2^n-1}{2^n}}}}$

➢ If, $x=\sqrt[n]{a\times\sqrt[n]{a\times\sqrt[n]{a}.....\infty}}$

then, $\boxed{\mathbf{x=\sqrt[(n-1)]{a}}}$

➢ If, $x=\sqrt[n]{a\div\sqrt[n]{a\div\sqrt[n]{a\div.....\infty}}}$

then, $\boxed{\mathbf{x=\sqrt[(n+1)]{a}}}$

➢ If, $x=\sqrt{a+b\sqrt{a+b\sqrt{a+.....\infty}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a+b^2}+b}{2}}}$

➢ If, $x=\sqrt{a+\sqrt{a}+\sqrt{a+.....\infty}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a+1}+1}{2}}}$

➢ If, $x=\sqrt{a-b\sqrt{a-b\sqrt{a-.....\infty}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a+b^2}-b}{2}}}$

➢ If, $x=\sqrt{a-\sqrt{a-\sqrt{a-.....\infty}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a+1}-1}{2}}}$

➢ If, $x=\sqrt{a+b\sqrt{a-b\sqrt{a+b\sqrt{a-.....\infty}}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a-3b^2}+b}{2}}}$

➢ If, $x=\sqrt{a+\sqrt{a-\sqrt{a+\sqrt{a-.....\infty}}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a-3}+1}{2}}}$

➢ If, $x=\sqrt{a-b\sqrt{a+b\sqrt{a-b\sqrt{a+b\sqrt{a-.....\infty}}}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a-3b^2}-b}{2}}}$

➢ If, $x=\sqrt{a-\sqrt{a+\sqrt{a-\sqrt{a+\sqrt{a-.....\infty}}}}}$

then, $\boxed{\mathbf{x=\frac{\sqrt{4a-3}-1}{2}}}$

LCM and H.C.F.

Difference between multiple and factor

S. N.	Multiple	Factor
1.	The multiples are defined as the numbers obtained when multiplied by other numbers	Factors are defined as the exact divisors of the given number
2.	The number of multiples is infinite	The number of factors is finite
3.	The operation used to find the multiples is a multiplication.	The operation used to find the factors is a division
4.	The outcome of the multiples should be greater than or equal to the given number	The outcome of the factors should be less than or equal to the given number.

L.C.M.

L.C.M. : Least common multiple

☞ L.C.M. is the smallest number which is completely divided by two or more numbers.

☞ The LCM of x, y and z is completely divisible by x, y, and z.

■ **L.C.M. of 12 and 16–:**

12 Multiple = 12, 24, 36, **48**, 60, 72, 84, **96**, ...
16 Multiple = 16, 32, **48**, 64, 80, **96**, 112, 128, ...
Common multiple = 48, 96
Least common multiple = 48
L.C.M. = 48

Methods of finding L.C.M.

■ In this method, divide the given numbers by common prime number until the remainder is 1.

Ex. Finding the L.C.M. of 9, 12 and 15

Sol.

2	9, 12, 15
2	9, 6, 15
3	9, 3, 15
3	3, 1, 5
5	1, 1, 5
	1, 1, 1

(L.C.M.) = 2 × 2 × 3 × 3 × 5
= **180**

■ **Prime Factor Method–:** First express the given numbers in the form of prime factors. The product of factors with highest power will be the L.C.M.

Ex. Finding the L.C.M. of 9, 12 and 15

Sol. 9 = 3 × 3
12 = 2 × 2 × 3
15 = 3 × 5
L.C.M. = 2 × 2 × 3 × 3 × 5
= **180**

Types of questions

➢	Find the smallest no. which is exactly divisible by x, y, z.	**L.C.M. of (x, y, z)**
➢	Find the smallest no. which when divided by x, y, z leaves remainder 'r' in each case.	**L.C.M. of (x, y, z) + r**
➢	Find the smallest no. which when divided by x, y, z leaves remainder a, b, c respectively.	**L.C.M. of (x, y, z) – k** Where, k = (x – a) = (y – b) = (z – c)

H.C.F.

H.C.F. : Highest common factor
(Greatest common divider)

☞ H.C.F is the largest number, which can divide two or more numbers completely.
☞ The HCF of x, y and z will divide x, y, and z completely.

■ **H.C.F. of 12 and 16–:**

12 Factor = **1**, **2**, 3, **4**, 6, 12   16 Factor = **1**, **2**, **4**, 8, 16
Common factor = 1, 2, 4   Highest common factor = 4
H.C.F. = 4

Methods of finding H.C.F.

■ **Division Method–**Find the H.C.F. of two number x and y. (Where, y > x)
On dividing y by x remainder is r_1. Then on dividing x by r_1 the remainder is r_2. Then r_1 is divided by r_2. This process will be repeated until the remainder becomes zero. Last divisor will be the H.C.F. of x and y.

Ex. Finding the H.C.F. of 12 and 16 :

Sol. 12, 16 of H.C.F.

12) 16 (1
12
―――
4) 12 (3
12
――
0

H.C.F. = 4

Ex. Finding the H.C.F. of 25, 35 and 40 :

Sol. 25, 35 and 40 of H.C.F.

25) 35 (1
25
―――
10) 25 (2
20
――
5) 10 (2
10
――
0

5) 40 (8
40
――
0

H.C.F. = 5

■ **Prime factor method–:** First, write each given numbers in the form of product of their prime factors. The product of common factors with least power will be the H.C.F. of given numbers.

Ex. Finding the H.C.F. of 12 and 16 :

Sol. 12, 16 of H.C.F.
$12 = 2 \times 2 \times 3 \Rightarrow 2^2 \times 3$
$16 = 2 \times 2 \times 2 \times 2 \Rightarrow 2^4$
H.C.F. $= 2^2 \Rightarrow 4$

Ex. Finding the H.C.F. of 25, 35 and 40 :

Sol. 25, 35 and 40 of H.C.F.
$25 = 5 \times 5 \Rightarrow 5^2$
$35 = 5 \times 7 \Rightarrow 5^1 \times 7^1$
$40 = 2 \times 2 \times 2 \times 5 \Rightarrow 2^3 \times 5^1$
H.C.F. = 5

■ **Difference method–**

Let,

H.C.F. of two numbers = h

then, numbers = hx, hy

Where, x, y → Co-prime

Difference = hx – hy

$\Rightarrow$ **h (x – y)**

☞ (x – y) = 1 → H.C.F. is a difference between numbers.

☞ (x – y) > 1 → H.C.F. is a factor of difference of numbers.

☞ H.C.F. of two numbers never greater than difference of these numbers.

Hence, H.C.F. can be either difference of these number or factor of difference.

Ex. Finding the H.C.F. of 30 and 45 :

Sol. 30, 45 of H.C.F.

30, 45

difference = 45 – 30 $\Rightarrow$ 15

H.C.F. = 15 or factor of 15

∵ 30 and 45 are completely divisible by 15

Hence, H.C.F. = 15

Types of questions

➢	Find the largest no. which can divide x, y, z. exactly	**H.C.F. of (x, y, z)**
➢	Find the largest no. which can divide x, y, z and leaves same remainder in each case.	**H.C.F. of (x– y), (y – z), (z – x)**
➢	Find the largest no. which can divide x, y, z and leaves remainder 'r' in each case.	**H.C.F. of (x– r), (y –r), (z – r)**
➢	Find the largest number which can divide x, y, z and leaves remainder a, b, c respectively.	**H.C.F. of (x– a), (y – b), (z – c)**

■ If two numbers are divided by their difference or factors of difference then leaves same remainder.

■ **A two digit number can divide 225 and 147, leaves same remainder in each case. How many such two digit numbers would be possible?**

Sol.

225 147

difference factor (two digit)

78 → 78, 39, 26, 13

Total numbers = 4

■ **The two numbers 875 and 2272 are divided by a three digit number. Then there is same remainder left in each case what will be the sum of the digits of such three digits?**

Sol.

875 2272

Difference → 1397

$11 \times 127 \longrightarrow$ Prime number

HCF = 127

Sum of digits = 1 + 2 + 7 $\Rightarrow$ **10**

Relation between L.C.M. and H.C.F.

■ First no. × second no. = L.C.M × H.C.F.

☞ If H.C.F. = h

First no. = hx

Second no. = hy

then, L.C.M. = hxy

L.C.M. and H.C.F. of fraction

■ $\text{L.C.M. of fraction} = \dfrac{\text{L.C.M. of numerator}}{\text{H.C.F. of denominator}}$

■ $\text{H.C.F. of fraction} = \dfrac{\text{H.C.F. of numerator}}{\text{L.C.M. of denominator}}$

L.C.M. and H.C.F. of indices

■ When the base of the given numbers are same, then the number with highest power will be the LCM of the given numbers.

Ex. $7^2, 7^4, 7^9$ **of L.C.M.** $= 7^9$

■ When the base is not same and there is no common factors in the base, then the product of given numbers will be the LCM.

Ex. $2^2, 3^5, 5^4$ **of L.C.M.** $= 2^2 \times 3^5 \times 5^4$

■ When the base of the given number are same, then the number with least power will be the H.C.F. of given numbers.

Ex. $7^2, 7^4, 7^9$ **of H.C.F.** $= 7^2$

■ When the base is not same and there is no common factor in the base, then the required H.C.F. of given numbers will be 1.

Ex. $2^2, 3^5, 5^4$ **of H.C.F.** $= 1$

☞ $(p^a + 1), (p^b + 1)$

H.C.F. $(p^{HCF(a, b)} + 1)$ L.C.M. $(p^{LCM(a, b)} + 1)$

Where, power (a, b) should be odd multiple of HCF.

☞ $(p^a - 1), (p^b - 1)$

H.C.F. $(p^{HCF(a, b)} - 1)$ L.C.M. $(p^{LCM(a, b)} - 1)$

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. When multiplying 3.24 by 0.006, how many significant figures should the result have?

(a) 4 (b) 2

(c) 1 (d) 3

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (c) : $3.24 \times 0.006 = 0.01944$

In multiplication or division, the significant figure is considered to be the smallest value.

2. How can a user define cell address in an MS Excel sheet?

(a) Column letter plus row number

(b) Column letter plus row letter

(c) Column number plus row number

(d) Column number plus row letter

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) : A cell address in MS Excel sheet is a combination of a column letter and a row number that identifies a cell on a worksheet. For example, A1 refers to the cell at the intersection of column A and row 1.

3. The HCF and the LCM of two numbers are 12 and 300, respectively. If one of the numbers is $\frac{4}{9}$ times of the other, what is the smaller number?

(a) 69 (b) 40

(c) 88 (d) 49

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (b) : Let the two numbers be 4x and 9x respectively,

$4x \times 9x = 12 \times 300$

$36x^2 = 3600$

$x^2 = 100$

$x = 10$

Hence, the smaller number $= 4x = 4 \times 10 = 40$

4. The value of?

$\sqrt{144} + \sqrt{0.04} - \sqrt{9} =$

(a) 9.2 (b) 8.82

(c) 6.96 (d) 11.42

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) : $\sqrt{144} + \sqrt{0.04} - \sqrt{9} = 12 + 0.2 - 3 = 9.2$

5. When dividing 0.00456 by 0.12, how many significant figures should the result be reported with?

(a) 3 (b) 1

(c) 4 (d) 2

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (d) : $\frac{0.00456}{0.12} = 0.038$

It has two significant figures.

6. Evaluate : $\frac{1}{\left(\frac{2}{3}\right)+\left(\frac{3}{5}\right)} \div \frac{8}{39}$

(a) $3\frac{16}{19}$ (b) $3\frac{28}{33}$

(c) $3\frac{65}{76}$ (d) $3\frac{17}{23}$

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (b) : Given that,

$$\frac{1}{\left(\frac{2}{3}\right)+\left(\frac{3}{5}\right)} \div \frac{8}{39}$$

$$\Rightarrow \frac{1}{\frac{10+9}{15}} \div \frac{8}{39}$$

$$\Rightarrow \frac{15}{19} \times \frac{39}{8} \Rightarrow \frac{585}{152}$$

$$\Rightarrow \frac{127 \times 4.606299}{33 \times 4.606060} \text{ (approximately)}$$

$$\Rightarrow \frac{127}{33} = 3\frac{28}{33}$$

7. The value of $3^3 - 5^2 + \left(\frac{26}{13}\right)^2 - 8 + 0 \times 9 =$ _____

(a) –2 (b) –4

(c) –5 (d) –3

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (a) : Given that,

$$3^3 - 5^2 + \left(\frac{26}{13}\right)^2 - 8 + 0 \times 9$$

$= 27 - 25 + 4 - 8 + 0$

$= 31 - 33$

$= -2$

8. The value of $1^3 - 8^2 + \left(\frac{36}{4}\right)^2 - 0 + 2 \times 5 =$ ____

(a) 28 (b) 38

(c) 27 (d) 37

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (a) : $1^3 - 8^2 + \left(\frac{36}{4}\right)^2 - 0 + 2 \times 5$

$= 1 - 64 + 81 - 0 + 10$

$= -63 + 91$

$= 28$

9. Evaluate: $\dfrac{\mathbf{1}}{\left(\frac{\mathbf{5}}{\mathbf{6}}\right)+\left(\frac{\mathbf{7}}{\mathbf{9}}\right)} \div \dfrac{\mathbf{5}}{\mathbf{23}}$

(a) $2\frac{53}{61}$ (b) $2\frac{59}{69}$

(c) $2\frac{5}{6}$ (d) $4\frac{1}{27}$

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (b) : $\dfrac{1}{\left(\frac{5}{6}\right)+\left(\frac{7}{9}\right)} \div \dfrac{5}{23}$

$= \dfrac{1}{\frac{15+14}{18}} \times \dfrac{23}{5} \quad = \dfrac{18}{29} \times \dfrac{23}{5}$

$= \dfrac{414}{145} = 2\dfrac{124}{145}$

$= 2\dfrac{59\times 2.101}{69\times 2.101}$ (approximate) $= 2\dfrac{59}{69}$

10. Evaluate : 38 – 9 ÷ 6 × 6

(a) 28 (b) 32

(c) 27 (d) 29

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : $38 - 9 \div 6 \times 6$

$= 38 - \dfrac{9}{6} \times 6 = 38 - 9$

$= 29$

11. When performing the operation (1.23456×10^3) + (1.234×10^2), how many significant figures should be reported in the result, assuming no rounding errors?

(a) 5 (b) 2

(c) 4 (d) 3

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (a) : $(1.23456 \times 10^3) + (1.234 \times 10^2)$

$\Rightarrow 1.23456 \times 10^3 + 0.1234 \times 10^3$

$\Rightarrow (1.23456 + 0.1234) \times 10^3$

$\Rightarrow 1.35796 \times 10^3$

$\Rightarrow$ Round of 4 decimal place 1.35796×10^3

Now to count the significant figure

$\Rightarrow$ 5 significant figures are in 1.3580×10^3

12. The smallest natural number which is divisible by 24, 6, 36 and 13 is:

(a) 936 (b) 1008

(c) 1011 (d) 943

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (a) : The LCM of 24, 6, 36, 13 will be

$13 = 13^1$

$36 = 2\times2\times3\times3 = 2^2\times3^2$

$24 = 2\times2\times2\times3 = 2^3\times3^1$

$6 = 2\times3 = 2^1\times3^1$

LCM $= 2^3\times3^2\times13^1$

$= 8\times9\times13$

$= 936$

So, smallest natural number divisible by 24, 6, 36, 13 is '936'

13. Evaluate : $\dfrac{\mathbf{1}}{\left(\frac{\mathbf{3}}{\mathbf{4}}\right)+\left(\frac{\mathbf{4}}{\mathbf{6}}\right)} \div \dfrac{\mathbf{2}}{\mathbf{15}}$

(a) $5\frac{5}{17}$ (b) $5\frac{2}{17}$

(c) $5\frac{6}{17}$ (d) $5\frac{4}{17}$

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (a) : $\dfrac{1}{\left(\frac{3}{4}+\frac{4}{6}\right)} \div \dfrac{2}{15}$

$= \dfrac{1}{\left(\frac{9+8}{12}\right)} \div \dfrac{2}{15}$

$= \dfrac{12}{17} \times \dfrac{15}{2} = \dfrac{90}{17} = 5\dfrac{5}{17}$

14. The value of

$\sqrt{\mathbf{144}} + \sqrt{\mathbf{0.0324}} - \sqrt{\mathbf{6.76}} =$

(a) 8.53 (b) 14.76

(c) 9.58 (d) 2.7

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (c) : $\sqrt{144} + \sqrt{0.0324} - \sqrt{6.76}$

$= 12 + 0.18 - 2.6$

$= 9.58$

15. Which of the following numbers is divisible completely by both 9 and 11 ?

(a) 277218 (b) 10098

(c) 12345 (d) 181998

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (b) : Divisibility rule of 9 -

When the sum of the digits of a number is divisible by 9 then the number is also divisible by 9.

Divisibility rule of 11 -

When the difference between the sum of the digit in even and odd place of a number is 0 (zero) or a multiple of 11, then the number will also be divisible by 11.

From option (b),

$1 + 0 + 0 + 9 + 8 = 18$

i.e. 18 is divisible by 9

$\therefore$ Option (d) us divisible by 9.

And

$10098 = (9 + 0) - (8+0+1) = 9-9 = 0$

Hence option (b) 10098, is divisible by both 9 and 11.

16. Which of the following numbers is NOT divisible by 9?

(a) 49104 (b) 77832
(c) 35253 (d) 45390

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (d) : Divisibility rule of 9 : A number whose sum of its digit is exactly divisible by 9 then the number is always divisible by 9.
from options -
(a) 49104 $\rightarrow$ 4 + 9 + 1 + 0 + 4 = 18, divisible by 9.
(b) 77832 $\rightarrow$ 7 + 7 + 8 + 3 + 2 = 27, divisible by 9.
(c) 35253 $\rightarrow$ 3 + 5 + 2 + 5 + 3 = 18, divisible by 9.
(d) 45390 $\rightarrow$ 4 + 5 + 3 + 9 + 0 = 21, not divisible by 9.

17. Which of the following number is NOT divisible by 8?

(a) 35792 (b) 35112
(c) 35412 (d) 35552

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (c) : Divisibility rule of 8- If the last three digits of a number are divisible by 8, then the number is completely divisible by 8.
from the given options -
(a) 35 $\underline{792}$
$\frac{792}{8} = 99$ (Completely divisible)
(b) 35 $\underline{112}$
$\frac{112}{8} = 14$ (Completely divisible)
(c) 35 $\underline{412}$
$\frac{412}{8} = 51.5$ (Not completely divisible)
(d) 35 $\underline{552}$
$\frac{552}{8} = 69$ (Completely divisible)
Hence, option (c) is not divisible by 8.

18. If the 7 digit number 504x5y3 is divisible by 11, then one of the values of the sum of x and y is:

(a) 11 (b) 5
(c) 17 (d) 7

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

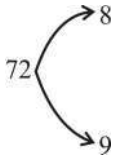
Ans. (c) : Given, 504x5y3
Divisibility rule of 11:- If the difference of the sum of digits at even place and at odd place is zero or divisible by 11 then the given number will be divisible by 11.
504x5y3
(0 + x + y) – (5 + 4 + 5 + 3)
x + y – 17 = 0
x + y = 17
Hence, Sum of x + y = 17

19. If 11-digit number 88p554085k6, k ≠ p, is divisible by 72, then what is the value of (3k + 2p)?

(a) 12 (b) 7
(c) 13 (d) 23

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (c) : Given,
88p554085k6 Where, k ≠ p
Note- The number which is divisible by 72 is also divisible by 8 and 9.
Divisibility rule of 8– If the last three digit of the number are divisible by 8, then the number will be divisible by 8.
Divisibility rule of 9– If the sum of the all digits of a given number is divisible by 9, then number will be divisible by 9.



88p554085k6
On putting, k = 3
$\frac{536}{8} = 67$ (Completely divisible by 8)
and On putting p = 2
$\frac{8+8+2+5+5+4+0+8+5+3+6}{9}$
$= \frac{54}{9} = 6$ (Completely divisible)
Then, (3k + 2p)
$= 3 \times 3 + 2 \times 2$
$= 13$

20. Find the remainder, when 171 × 172 × 173 is divided by 17.

(a) 9 (b) 8
(c) 6 (d) 7

RRB Group-D 29/08/2022 (Shift-III)

Ans. (c) : According to the question,
$\frac{171 \times 172 \times 173}{17}$
$\Rightarrow \frac{(170+1) \times (170+2)(170+3)}{17}$
$\Rightarrow \frac{1 \times 2 \times 3}{17}$
$\Rightarrow \frac{6}{17}$
$\Rightarrow$ 6 (Remainder)
Hence option (c) is correct.

21. When a number is divided by a divisor, the remainder is 16. When twice the original number is divided by the same divisor, the remainder is 3. Find the value of that divisor

(a) 29 (b) 51
(c) 23 (d) 53

RRB Group-D 30/08/2022 (Shift-II)

Ans. (a) : Let, the original number be N, the divisor be d, quotient be q.
N = dq + 16

$\therefore$ 2 N = 2(dq + 16)
2 N = 2dq + 32
When (2dq + 32) is divided d then remainder is 3.
2dq is completely divisible by d, then
$\therefore$ Required number = 32 – 3 = 29

22. If the number 6484y6 is divisible by 8, then find the least value of y?
(a) 3 (b) 4
(c) 1 (d) 7

RRB Group-D 02/09/2022 (Shift-II)

Ans. (c) : Divisibility rule of 8 - If the last three digits of the given number are divisible by 8 then it will be divisible by 8.
On putting Least value of y = 1
Number = 648416
Divided by = $\frac{416}{8} = 52$

23. If the 15 digit number 4a5124356789734 is divisible by 9, then the value of "a" is .....
(a) 1 (b) 4
(c) 5 (d) 3

RRB GROUP-D – 22/09/2022 (Shift-III)

Ans. (b) : Divisibility rule of 9 - If the sum of the digits are divisible by 9, then the number is divisible by 9.
Number - 4a5124356789734
On divided by 9 -

$$\frac{4+a+5+1+2+4+3+5+6+7+8+9+7+3+4}{9}$$

$= \frac{a+68}{9} \Rightarrow$ On putting a = 4 $\Rightarrow \frac{4+68}{9} = \frac{72}{9} = 8$
Hence the value of a = 4

24. If the 8 digit number 3x5479y4 is divisible by 88 and the 8 digit number 425139z2 is divisible by 9, then find the maximum possible value of (3x + 2y – z).
(a) 33 (b) 37
(c) 25 (d) 35

RRB Group-D 09/09/2022 (Shift-III)

Ans. (a) : On dividing 3x5479y4 by 88 i.e. 8 and 11
Divisibility rule of 8 - If the last three digits of the given number are divisible by 8, then it will be divisible by 8.
Maximum possible value = 8

$$\frac{984}{8} = 123$$

Divisibility rule of 11 - The given number can only be completely divided by 11 if the difference of the sum of digits at odd place and sum of digits at even place in a number is 0 or multiple of 11.
$3x547984 \Rightarrow (4+9+4+x) \sim (8+7+5+3)$
$17+x \sim 23 = 0$
$x = 6$
On dividing 425139z2 by 9

Divisibility rule of 9:- If the sum of the digits of a number are divisible by 9, then the number is divisible by 9.

$$\frac{4+2+5+1+3+9+z+2}{9} = \frac{26+z}{9}$$

On putting z = 1

$$\frac{26+1}{9} = \frac{27}{9} = 3$$

Hence, 3x +2y –z = 3×6+2×8–1 = 33

25. If each even digit is divided by 2 and 2 is added to each odd digit in the number 4723361, what will be the sum of the largest and the smallest digits thus formed?
(a) 12 (b) 10 (c) 11 (d) 9

RRB GROUP-D – 11/10/2022 (Shift-I)

Ans. (b) : Given, 4723361
According to the question,
New number obtained by dividing each even digit by 2 and adding 2 to each odd digit.

$$\frac{4}{2}(7+2), \left(\frac{2}{2}\right)(3+2)(3+2), \frac{6}{2}(1+2) \Rightarrow 2915533$$

Hence Sum of largest digit and smallest digit = 9 + 1
= 10

26. If 3 is added to each odd digit and 1 is subtracted from each even digit in the number 42514563, what will be difference between the highest and lowest digits thus formed?
(a) 2 (b) 7
(c) 5 (d) 8

RRB GROUP-D – 17/08/2022 (Shift-I)

Ans. (b) : Given number = 42514563
According to the question, the number obtained by adding 3 to the odd digit and subtracting 1 from the even digit of the number is = 31843856
Hence required difference = 8 – 1 = 7

27. If 3 is added to each odd digit and 2 is subtracted from each even digit in the number 6452851, what will be difference between the largest and smallest digits thus formed?
(a) 8 (b) 6
(c) 4 (d) 2

RRB GROUP-D – 27/09/2022 (Shift-I)

Ans. (a) : The number obtained by adding 3 to the odd digit and subtracting 2 from the even digit of the number is

	6	4	5	2	8	5	1
	–2	–2	+3	–2	–2	+3	+3
	4	2	8	0	6	8	4

Hence the difference of largest and smallest digits
= 8–0
= 8

28. If 1 is subtracted from each odd digit and 1 is added to each even digit in the number 92379654, what will be the sum of the digits which are second from the left and third from the right?

(a) 6 (b) 8
(c) 10 (d) 5

RRB GROUP-D – 18/09/2022 (Shift-II)

Ans. (c) : The number obtained by adding 1 to the even digit and subtracting 1 from the odd digit of the number is 92379654

$$\begin{array}{r} 9\ 2\ 3\ 7\ 9\ 6\ 5\ 4 \\ -1+1-1-1-1+1-1+1 \\ \hline 8\ 3\ 2\ 6\ 8\ 7\ 4\ 5 \end{array}$$

So the required sum = 3 + 7 = 10

29. The sum of the digits of a two-digit number is 12. The number obtained by interchanging its digits exceeds the given number by 18. The number is:

(a) 76 (b) 67
(c) 27 (d) 57

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (d) : Let the two digit number be 10x + y
Number obtained by interchanging the digits = 10y + x
According to the question,

$$x + y = 12 \text{ -------- (i)}$$

And, On reversing the digits,

$$(10y + x) - (10x + y) = 18$$
$$y - x = 2 \text{ ------- (ii)}$$

On adding eq. (i) and (ii)

$$\begin{array}{r} x + y = 12 \\ -x + y = 2 \\ \hline 2y = 14 \end{array}$$

$$y = 7$$
$$x = 5$$

Hence, number = 10x + y = 10 × 5 + 7 = 57

30. In a five digit number, the digit in the hundred's place is 2 and the digit in the unit's place is twice the digit in the hundred's place. The digit at thousands place is zero. The digit in the ten thousand's place is the sum of the digit in the hundred's place and the digit in the unit's place. The digit in the ten's place is the digit in the ten thousand's place minus 1. The number is:

(a) 60234 (b) 60224
(c) 60254 (d) 60264

RRB NTPC 09.02.2021 (Shift-I) Stage Ist

Ans. (c) : Let us assume the number = a b c d e
As per question,

$$c = 2$$
$$e = 2 \times c$$
$$e = 2 \times 2$$
$$e = 4$$
$$b = 0$$
$$a = 2 + 4$$
$$a = 6$$
$$d = 6 - 1$$
$$d = 5$$

Putting all values, then the required number = 60254

31. What is the smallest four digit number formed by using the digits 3, 5, 0, 6?

(a) 3056 (b) 0356
(c) 0536 (d) 3506

RRB NTPC 08.02.2021 (Shift-I) Stage Ist

Ans. (a) : The smallest four-digit number formed by 3,5,0,6 = 3056

32. What is the smallest five-digit number formed by using the digits 2, 3, 4, 0, 5?

(a) 23045 (b) 20435
(c) 02345 (d) 20345

RRB NTPC 04.02.2021 (Shift-I) Stage Ist

Ans. (d) : Largest 5 digit number = 99999
Smallest 5 digit number = 10000
The smallest five digit number that can be formed from the digits 2, 3, 4, 0, 5 is = 20345

33. Find sum of the smallest and the largest positive numbers of 6 digits which contains only digits 0, 4, 6 and each of these digits appears at least once.

(a) 666444 (b) 604604
(c) 666666 (d) 1066646

RRB NTPC 09.02.2021 (Shift-II) Stage Ist

Ans. (d) : According to the question-
∵ Smallest 6 digit no = 400006
Greatest 6 digit no = 666640
∴ Required sum = 400006 + 666640 = 1066646

34. How many times is digit 3 comes in counting from 301 to 399?

(a) 119 (b) 11
(c) 121 (d) 21

RRB NTPC 10.01.2021 (Shift-II) Stage Ist

Ans. (a) : In Counting from 301 to 399, the digit 3 comes a total of 119 times.

35. Find the two-digit number such that the sum of its digits is 8 and the digits of the number get reversed when 36 is added to it.

(a) 71 (b) 35
(c) 62 (d) 26

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (d) : Let number = 10x+y
According to the question,

$$x+y=8 \quad \text{…(i)}$$
$$(10x+y) + 36 = 10y + x$$
$$9y - 9x = 36$$
$$y - x = 4 \quad \text{…(ii)}$$

On solving equation (i) and equation (ii)

$$x = 2$$
$$y = 6$$

Hence, required number = 10x + y = 10 × 2 + 6 = 26

36. Find the total number of prime numbers less than 50.

(a) 13 (b) 15
(c) 17 (d) 14

RRB Group-D 06/09/2022 (Shift-III)

Ans. (b): Total number of prime number less than 50 is 15 which is as follows -
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

37. What is the positive difference between the sum of all prime numbers between 11 and 20 (both included) and the sum of all prime numbers between 30 and 50 (both included)?
(a) 139 (b) 141
(c) 137 (d) 135

RRB GROUP-D – 15/09/2022 (Shift-III)

Ans. (a) : The sum of all prime numbers between 11 and 20 (both included) = (11 + 13 + 17 + 19) = 60
The sum of all prime number between 30 and 50 (both included) = (31 + 37 + 41 + 43 + 47) = 199
$\therefore$ Required positive difference = 199 ~ 60 = 139

38. The greatest prime number less than 200 is:
(a) 199 (b) 193
(c) 197 (d) 191

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (a) : The greatest prime number less than 200 is 199.

39. Which of the following numbers is prime?
(a) 323 (b) 571
(c) 513 (d) 715

RRB NTPC 02.03.2021 (Shift-II) Stage Ist

Ans. (b) : According to option,
571 is a prime number. Whereas 323 is divisible by 17, 513 is divisible by 3 and 715 is divisible by 5.

40. Find the smallest three digit prime number?
(a) 107 (b) 109
(c) 103 (d) 101

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (d) : The smallest three-digit prime number = 101

41. Which of the following pairs of numbers are co-prime?
(a) 28, 81 (b) 12, 27
(c) 21, 56 (d) 36, 20

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (a) : Co-prime numbers are the numbers whose common factor is only 1.
Hence, in the given option (28, 81) are co-prime numbers.

42. One-third of the sum of all the prime numbers greater than 5 but less than 18 is the square of:
(a) 3 (b) 5
(c) 6 (d) 4

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (d) : Prime numbers greater than 5 but smaller than 18 = 7, 11,13, 17
According to the question-
$= \frac{7+11+13+17}{3} = \frac{48}{3} = 16 = (4)^2$
Hence, required number = 4

43. Which of the following is a prime number?
(a) 143 (b) 173
(c) 123 (d) 213

RRB NTPC 15.03.2021 (Shift-I) Stage Ist

Ans. (b) : Prime number are the numbers, which are only divisible by 1 and itself.
From the given options-
(a) 143 is divisible by 11, so it is not a prime number.
(b) 173 is divisible by 1 and itself, so it is a prime number.
(c) 123 is divisible by 3, so it is not a prime number.
(d) 213 is divisible by 3, so it is not a prime number.

44. Find the sum of prime no. between 50 and 60.
(a) 118 (b) 114
(c) 110 (d) 112

RRB NTPC 31.01.2021 (Shift-I) Stage Ist

Ans. (d) : The prime number between 50 and 60–
53 and 59
Required Sum = 53 + 59 = 112

45. Find the number of all prime numbers less than 55.
(a) 18 (b) 17
(c) 16 (d) 15

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (c) : The number of all prime numbers less than 55 is 16
i.e. $\Rightarrow$ (2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53)

46. The number of pairs of twin primes between 1 and 100 are:
(a) 7 (b) 8
(c) 10 (d) 9

RRB NTPC 26.07.2021 (Shift-I) Stage Ist

Ans. (b) : The number of pairs of twin primes between 1 and 100 are 8.
The numbers are -
$\{(3,5),(5,7),(11,13),(17,19),(29,31),(41,43),(59,61),(71,73)\}$
Note- Twins prime numbers are that numbers whose difference is 2.

47. If each packet contains the same number of pencils and there are 96 pencils in all in 12 packets, how many packets will one have to purchase if one requires 304 pencils?
(a) 39 (b) 38
(c) 33 (d) 36

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (b) : $\because$ Pencils present in 12 packets = 96
$\because$ Pencils present in 1 packet $= \frac{96}{12} = 8$ Pencils
Number of packets required for 304 pencils
$= \frac{304}{8} = 38$ Packets.

48. From 3/4 of a number P, Ramakrishna subtracts 2/3 of another number Q and obtain 5/8 as the difference. What is the answer Ramakrishna should obtain if he subtracts eight times of Q from nine times of P?

(a) $\frac{15}{2}$ (b) $\frac{25}{4}$

(c) $\frac{20}{3}$ (d) $\frac{25}{3}$

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (a) : According to the question,

$$P\times\frac{3}{4}-Q\times\frac{2}{3}=\frac{5}{8}$$

$$\Rightarrow \frac{3P}{4}-\frac{2Q}{3}=\frac{5}{8}\Rightarrow \frac{9P-8Q}{12}=\frac{5}{8}$$

$$\Rightarrow 9P-8Q=\left(\frac{5}{8}\right)\times 12 \Rightarrow 9P-8Q=\frac{60}{8}$$

$$\therefore\ 9P-8Q=\frac{15}{2}$$

49. In a class of 80 students $\frac{1}{10}$ of the class likes chocolate D and $\frac{1}{20}$ of the class likes chocolate E. What is the difference between the number of students who like chocolate D and the number of students who like chocolate E ?

(a) 2 (b) 9

(c) 5 (d) 4

RRB NTPC (Stage-2) 17/06/2022 (Shift-I)

Ans. (d) : Students who likes chocolate D $= 80\times\frac{1}{10}$

$= 8$

Students who likes chocolate E $= 80\times\frac{1}{20} = 4$

Hence, the required difference = 8–4 = 4

50. Sunita won 3/5 of the marbles that were there in the beginning of the game. Ravi won 2/3 of the remaining marbles while Sunny won the remaining 60 marbles. How many marbles did Sunita Win?

(a) 255 (b) 240

(c) 285 (d) 270

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (d) : Let, number of marbles be x.

Won by Sunita $=\frac{3x}{5}$

Number of remaining marbles $= x-\frac{3x}{5}=\frac{2x}{5}$

Won by Ravi $=\frac{2x}{5}\times\frac{2}{3}=\frac{4x}{15}$

According to the question,

$$\frac{3x}{5}+\frac{4x}{15}+60=x$$

$$60=x-\left(\frac{3x}{5}+\frac{4x}{15}\right)$$

$$60=x-\frac{13x}{15}$$

$\because \frac{2x}{15}=60\Rightarrow x=450$

Number of marbles Won by Sunita $=450\times\frac{3}{5}=270$

51. The difference between two numbers is 18. If the difference between their squares is 360, find the larger number.

(a) 18 (b) 15

(c) 19 (d) 16

RRB GROUP-D – 29/09/2022 (Shift-I)

Ans. (c) : Let the smaller number = y

and larger number = x

According to the question,

$x - y = 18$ ..... (i)

$x^2 - y^2 = 360$

$(x + y)(x - y) = 360$

$(x + y)\ 18 = 360$

$x + y = 20$ .....(ii)

On adding equation (i) and equation (ii) -

$$\begin{array}{r} x+y=20 \\ \underline{x-y=18} \\ 2x=38 \end{array}$$

$x = 19$

$y = 20 - x$

$= 20 - 19$

$= 1$

Hence larger number = 19 and smaller number = 1

52. A 91 cm long wire is cut into two pieces so that the length of one piece is three-fourth of the other. Find the length of the shorter piece.

(a) 36.23 m (b) 39 cm

(c) 42.17 cm (d) 38 cm

RRB Group-D 22/08/2022 (Shift-I)

Ans. (b) : Let the length of second piece = x cm

Length of first piece $= x\times\frac{3}{4}=\frac{3x}{4}$

According to the question,

$$\Rightarrow \frac{3x}{4}+x=91$$

$$\Rightarrow 7x=91\times 4$$

$$\Rightarrow x=\frac{91\times 4}{7}$$

length of second piece (x) = 52 cm

Length of first piece $= 52 \times \frac{3}{4}$

$= 39$ cm

Hence the length of the shorter piece = 39 cm

53. A 3 digit number is such that the ratio of its units digit, tens digit and hundreds digit is 1 : 2 : 3. The sum of this number and the reversed number obtained by reversing the order of its digits is 1332. Find the number.

(a) 246 (b) 414

(c) 123 (d) 369

RRB Group-D 26/08/2022 (Shift-III)

Ans. (d) :

Let three digit number = $100 \times 3x + 10 \times 2x + x$

$= 300x + 20x + x = 321x$

New number obtained by reversing the digits

$= 100 \times x + 10 \times 2x + 3x$

$= 100x + 20x + 3x = 123x$

According to the question,

$321x + 123x = 1332$

$444x = 1332$

$X = 3$

Hence number = $100 \times 3 + 10 \times 2 \times 3 + 3 \times 3$

$= 300 + 60 + 9 = 369$

54. A man plants 21,025 mango trees in his garden in such a way that there are as many rows as there are mango trees in each row. Find the number of rows.

(a) 135 (b) 125

(c) 145 (d) 130

RRB Group-D 30/08/2022 (Shift-II)

Ans. (c) : Let the number of rows in garden = x

And number of tree in each row = x

According to the question,

$x \times x = 21025$

$x = \sqrt{21025}$

$x = 145$

Hence, Number of rows in garden = 145

55. The sum of two numbers is 27. Five times one number is equal to 4 times the other. The smaller of the two numbers is :

(a) 12 (b) 11 (c) 13 (d) 15

RRB Group-D 30/08/2022 (Shift-II)

Ans. (a) : Let the numbers be x and y

According to the question :

$\because \rightarrow x + y = 27$ ————(i)

$\because \rightarrow 5x = 4y$

$5x - 4y = 0$ ————(ii)

On solving equation (i) and (ii) :

$y = 15$

$x = 12$

Hence, the smaller number is 12.

56. There are two consecutive natural numbers such that the sum of their squares is 313. Find smaller of these two numbers.

(a) 12 (b) 14 (c) 15 (d) 13

RRB Group-D 24/08/2022 (Shift-I)

Ans. (a) :

Let two consecutive natural numbers are x and (x + 1)

According to the question.

$x^2 + (x + 1)^2 = 313$

$x^2 + x^2 + 1 + 2x = 313$

$2x^2 + 2x = 312$

$x^2 + x = 156$

$x (x + 1) = 13 \times 12$

$\boxed{x = 12}$

Hence, smaller of these two numbers = 12

57. Find the least number which when added to 1780 makes the sum a perfect square.

(a) 46 (b) 49

(c) 69 (d) 72

RRB JE - 27/05/2019 (Shift-II)

Ans : (c) On adding 69 to the number 1780 it will be 1849, which is a perfect square number.

Thus-

$1780 + 69 = 1849$

$1849 = 43 \times 43$

$(43)^2 = 1849$

58. Find the smallest integer whose cube is equal to itself.

(a) -1 (b) 2

(c) 1 (d) 0

RRB JE - 22/05/2019 (Shift-I)

Ans : (a) –1 and 1 are such integers whose cube is equal to itself.

Hence, the smallest integer = –1

$\because (-1)^3 = -1$

59. If the cube of a number is subtracted from $(153)^2$ the result gives 1457. Find the number.

(a) 18 (b) 16

(c) 28 (d) 24

RRB JE - 24/05/2019 (Shift-I)

Ans : (c) Let the number be x.

According to the question,

$(153)^2 - x^3 = 1457$

$x^3 = (153)^2 - 1457$

$x^3 = 23409 - 1457$

$x^3 = 21952$

$\therefore x = \sqrt[3]{21952} = \sqrt[3]{28 \times 28 \times 28} = 28$

60. Five times of a positive integer is 3 less than twice of its square. Find the integer.

(a) 3 (b) 8

(c) 2 (d) 5

RRB RPF Constable -19/01/2019 (Shift-I)

Ans: (a) Let the positive integer is x.
According to the question-
$5x = 2x^2 - 3$
$2x^2 - 5x - 3 = 0$
$2x^2 - 6x + x - 3 = 0$
$2x(x-3) + 1(x-3) = 0$
$(x-3)(2x+1) = 0$
$x - 3 = 0$
$2x + 1 = 0$
$x = 3$ or $x = -½$ (Invalid)

61. Which of these square numbers cannot be expressed as the sum of two prime numbers?
(a) 81 (b) 49
(c) 121 (d) 144

RRB JE - 30/05/2019 (Shift-II)

Ans : (c)
$81 \rightarrow 2 + 79$ (both of which are prime number)
$49 \rightarrow 2 + 47$ (both of which are prime number)
$144 \rightarrow 3 + 141$(both of which are prime number)
$121 \rightarrow 2 + 119$ (but 119 is not prime number)
Hence, option (c) cannot be expressed as the sum of two prime numbers.

62. Three times the square of a number subtracting by 4 times the number is equal to 50 more than the number. Find the number.
(a) 5 (b) 4
(c) 6 (d) 10

RRB JE - 28/05/2019 (Shift-II)

Ans : (a) Let the number be = x
According to the question,
$3x^2 - x \times 4 = x + 50$
$3x^2 - 4x - x - 50 = 0$
$3x^2 - 5x - 50 = 0$
$3x^2 - 15x + 10x - 50 = 0$
$3x(x-5) + 10(x-5) = 0$
$(x-5)(3x+10) = 0$
$x - 5 = 0$
$x = 5$

63. Which of the following is not a perfect square?
(a) 2025 (b) 16641
(c) 1250 (d) 9801

RRB RPF Constable -20/01/2019 (Shift-I)

Ans : (c) From options-
$1250 = (35.36)^2$ is not a perfect square
$2025 = (45)^2$
$16641 = (129)^2$
$9801 = (99)^2$
Hence 1250 is not a perfect square, while others are perfect squares.

64. Which of these numbers is not a sum of two squares?
(a) 41 (b) 13
(c) 23 (d) 37

RRB JE - 26/06/2019 (Shift-I)

Ans : (c) From options-
(a) $41 = 5^2 + 4^2$ (b) $13 = 2^2 + 3^2$
(c) 23 (d) $37 = 6^2 + 1^2$
Hence the number 23 is not the sum of two squares.

65. Which of these is a perfect square?
(a) 9801 (b) 9887
(c) 9013 (d) 9016

RRB JE - 01/06/2019 (Shift-III)

Ans. (a) From option (a),

	99
9	98 01
9	81
189	17 01
9	17 01
	××××

Hence, 9801 is a perfect square of 99.

66. If the last digit of the square of a number is 1. Find the last digit of its cube.
(a) Only 9 (b) 1 or 9
(c) Any odd number (d) Only 1

RRB JE - 27/06/2019 (Shift-I)

Ans : (b) Let the number be 9. The last digit of whose square is 1. Which is as follows-
$9^2 = 81$
Last digit of 729 which is cube of 9 = 9
Let the number be 11. The last digit of whose square is 1. Which is as follows-
$11^2 = 121$
The last digit of the cube of 11-
$11^3 = 1331$
Hence the last digit = 1
Hence the number will be 1 or 9.

67. Find the sum of prime factors of $9^6 \times 12^4 \times 7^7$
(a) 13 (b) 12
(c) 14 (d) 11

RRB Group-D 26/08/2022 (Shift-III)

Ans. (b) : $9^6 \times 12^4 \times 7^7$
$= 3^{12} \times 3^4 \times 2^8 \times 7^7$
$= 3^{16} \times 2^8 \times 7^7$
Sum of prime factors = 3+2+7 = 12

68. For any natural number n, $6^n - 5^n$ always ends with ;
(a) 7 (b) 1
(c) 5 (d) 3

RRB NTPC 28.12.2020 (Shift-II) Stage Ist

Ans. (b) : The unit value of $6^n - 5^n$ for any natural number 'n' will always be 1 because 6 can be any natural number in the power that units number in the power of 5 has its unit digit as 5.

69. What is the total number of odd and even divisors of 120, respectively?
(a) 12,4 (b) 16,0
(c) 4,12 (d) 8,8

RRB NTPC 01.02.2021 (Shift-II) Stage I

Ans. (c): Divisors of 120–
1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24
30, 40, 60, 120
Number of even divisors – 12,
Number of odd divisors – 4

70. If the sum of five consecutive multiples of 2 is 660, then find the largest number.
(a) 162 (b) 130
(c) 125 (d) 136

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (d) : Let five consecutive multiple of 2 –
2x, 2x+2, 2x+4, 2x+6, 2x+8
According to the question,
$2x + 2x + 2 + 2x + 4 + 2x + 6 + 2x + 8 = 660$
$10x+20=660$
$10x=640$
$\boxed{x = 64}$
Hence, largest number = $2x + 8 = 2\times64+8 = 128+8$
$= \boxed{136}$

71. How many factors of $2^7 \times 3^4 \times 5^3 \times 7$ are even ?
(a) 40 (b) 280
(c) 320 (d) 84

RRB NTPC 31.01.2021 (Shift-I) Stage Ist
RRB NTPC 14.03.2021 (Shift-I) Stage Ist

Ans. (b) : $2^7 \times 3^4 \times 5^3 \times 7$ Number of factors.
$= (7 + 1)(4 + 1)(3 + 1)(1 + 1)$
$= 8 \times 5 \times 4 \times 2 = 320$
$\therefore$ Number of even factors = 320 – total no. of odd factors.
$= 320 - \{(4 + 1)(3 + 1)(1 + 1)\}$
$= 320 - \{5 \times 4 \times 2\}$
$= 320 - 40 = 280$

72. Find the digit in the unit's place of $124^n + 124^{(n+1)}$, where n is any whole number.
(a) 4 (b) 8
(c) 2 (d) 0

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (d) : $124^n + 124^{(n+1)}$
On putting n =1
$= 124 + (124)^2$
For unit digit 4 + 6 = 10
Hence, It is clear that the digit come in the unit place will be '0'.

73. What is the unit digit in the following product? 91×92×93×.....×99
(a) 2 (b) 1 (c) 4 (d) 0

RRB NTPC 09.02.2021 (Shift-II) Stage Ist

Ans. (d) : $\because 91\times92\times93\times94\times95\times96\times97\times98\times99$
It is clear that multiplying by taking unit digits of all the numbers will give '0' i.e. where 2×5 comes then its unit digit is always zero.

74. Find the number of factors of 4200.
(a) 48 (b) 56 (c) 64 (d) 46

RRB NTPC 26.07.2021 (Shift-II) Stage Ist

Ans. (a): $4200 = 2\times2\times2\times5\times5\times3\times7$
$=2^3\times5^2\times3^1\times7^1$
The number of factors = $(3+1)\times(2+1)\times(1+1)\times(1+1)$
$= 4\times3\times2\times2$
$= 48$

75. How many factors does the number 12288 have?
(a) 24 (b) 26
(c) 28 (d) 22

RRB NTPC 23.07.2021 (Shift-I) Stage Ist

Ans. (b) : $12288 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 2^{12} \times 3^1$
Hence numbers of factors = $(12 + 1) \times (1 + 1)$
$= 13 \times 2$
$= 26$

76. If a positive number N, when divided by 5 leaves a remainder 3, then the unit's place digit of N is?
(a) 0 or 5
(b) 0 or 2
(c) 3 or 8
(d) 1 or 5

RRB NTPC 25.01.2021 (Shift-I) Stage Ist

Ans. (c) : Required positive number
$= 5K+3$ ($\because$ K = 0,1,2…..)
$= 5\times0+3 = 3$ (On putting K = 0)
$= 5\times1+3 = 8$ (On putting K = 1)
Hence, unit digit of N = 3 or 8

77. What is the place value of 5 in the number 56789214?
(a) 5×10^6 (b) 5×10^4
(c) 5×10^7 (d) 5×10^5

RRB NTPC 29.01.2021 (Shift-II) Stage I

Ans. (c) : The place value of 5 in 56789214 –
56789214
$\rightarrow 5\times10^7$

78. Find the sum of the place value and the face value of 7 in the number 53736.
(a) 77 (b) 707
(c) 770 (d) 777

RRB NTPC 29.01.2021 (Shift-II) Stage Ist

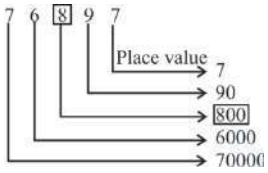
Ans. (b) : The place value and the face value of 7 in the number 53736.
Place value of 7 = 700
Face value of 7 = 7
Required sum = 700 + 7 = 707

79. In the number 76897, what is the place value of 8?

(a) 8 (b) 8000
(c) 800 (d) 80

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (c) :



Hence, place value of 8 in 76897 will be 800.

80. The face value of 8 in 758639 is :

(a) 8000 (b) 80
(c) 800 (d) 8

RRB NTPC 25.01.2021 (Shift-II) Stage Ist

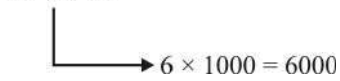
Ans. (d) : In the given number = 758639
The face value of 8 = 8

81. Find the difference of the place and face values of 6 in 516372

(a) 5998 (b) 6698
(c) 5394 (d) 5994

RRB NTPC 25.01.2021 (Shift-II) Stage Ist

Ans. (d) : The place values of 6 in 516372–



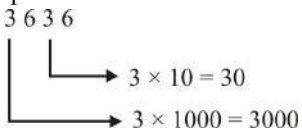
the face values of 6 = 6
Required difference = 6000 – 6 = 5994

82. The sum of the place values of 3 in 3636 is:

(a) 330 (b) 3030
(c) 3 (d) 3003

RRB NTPC 25.01.2021 (Shift-II) Stage Ist

Ans. (b) : The place value of 3 in 3636.



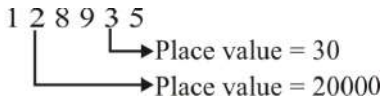
Sum of place values of 3 = 3000 + 30 = 3030

83. The difference between the place values of 2 and 3 in the number 128935 is:

(a) 300 (b) 19970
(c) 20000 (d) 30

RRB NTPC 02.03.2021 (Shift-I) Stage Ist

Ans. (b) :



Required difference = 20000 – 30 = 19970

84. The sum of the place values of 9 in 96961 is:

(a) 9000 (b) 18
(c) 9090 (d) 90900

RRB NTPC 19.01.2021 (Shift-I) Stage Ist

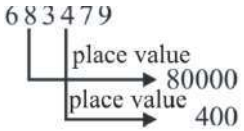
Ans. (d) : Sum of the place value of 9 in number 96961
= 90000+ 900
= 90900
Hence, option (d) is correct.

85. Find the difference between the place values of 8 and 4 in the number 683479.

(a) 7 (b) 80000
(c) 79600 (d) 76600

RRB NTPC 04.03.2021 (Shift-II) Stage Ist

Ans. (c) :



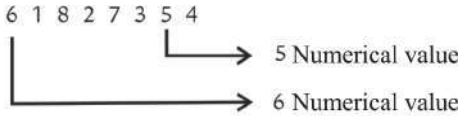
Hence, required difference = 80000 – 4000 = 79600

86. Find the sum of the face values of 6 and 5 in 61827354

(a) 60000300 (b) 30
(c) 40 (d) 11

RRB NTPC 12.01.2021 (Shift-II) Stage Ist

Ans. (d) :



Required sum = 6 + 5 = 11

87. By how much is $\frac{1}{6}$th of 432 smaller than $\frac{3}{4}$th of 216?

(a) –90 (b) 72
(c) 90 (d) 162

RRB NTPC 15.03.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question-

$\frac{1}{6}$ part of $432 = 432 \times \frac{1}{6} = 72$

and $\frac{3}{4}$ part of $216 = 216 \times \frac{3}{4} = 162$

Required difference = 162 – 72
= 90

88. Terry consumes 1700 mL of milk every day. How many litres of milk will she consume in 5 weeks?

(a) 59 L (b) 60 L
(c) 58.5 L (d) 59.5 L

RRB NTPC 09.02.2021 (Shift-II) Stage I

Ans. (d) :

$\because$ Terry consumes in 1 day = 1700 mL

$\therefore$ In 5 weeks = 35 days $= \frac{1700 \times 35}{1000}$

$= \frac{59500}{1000}$ L

$= 59.5$L

89. Mohan earns ₹60 on first day and spends ₹50 on the second day. He again earns ₹60 on the third day and spends ₹50 on the fourth day and so on. On which day will he have ₹200 with him before spending?

(a) 10^{th} (b) 14^{th}
(c) 28^{th} (d) 29^{th}

RRB NTPC 24.07.2021 (Shift-II) Stage Ist

Ans. (d) : Mohan earns on the first day = ₹60
and spends on the second day = ₹50
Thus, in 2 days Mohan saves = ₹10
Hence, Mohan saves in 28 days= ₹140
Mohan will earn on 29^{th} day = ₹60
So, On the 29^{th} day Mohan has = 140 + 60
= ₹200

90. In a farmer's house, there are chickens and goats. The total number of their heads is 42 and the total number of their legs is 138. Find the number of chickens.

(a) 15 (b) 18
(c) 20 (d) 22

RRB NTPC 01.02.2021 (Shift-I) Stage Ist

Ans. (a) : Let the number of chickens = x
Number of goats = y
According to the question,
$x + y = 42$ ____(i)
$2x + 4y = 138$ ____ (ii)
On solving the equation (i) × 4 and (ii)

$$4x + 4y = 168$$
$$\underline{-2x \pm 4y = \pm 138}$$
$$2x = 30$$
$$\boxed{x = 15}$$

Hence, the number of chickens = x = 15

91. Two bus tickets from city P to Q and three tickets from city P to R cost ₹99, but three tickets from city P to Q and two tickets from city P to R cost ₹91. What are the respective fares from city P to Q and from city P to R.

(a) ₹23, ₹15 (b) ₹51, ₹32
(c) ₹15, ₹23 (d) ₹32, ₹51

RRB NTPC 31.01.2021 (Shift-I) Stage Ist

Ans. (c) : Let the fares from city P to Q = ₹x
and the fares from city P to R = ₹y
According to the question,
$2x + 3y = 99$ ...(i)
$3x + 2y = 91$ ...(ii)
On multiplying by 3 in equation (i) and 2 in equation (ii)
$6x + 9y = 297$ ...(iii)
$6x + 4y = 182$ ...(iv)
From equation (iii) & (iv) we have –
$5y = 115$
$\boxed{y = ₹23}$

On putting the value of y in equation (i),
$2x + 3 \times 23 = 99$
$2x + 69 = 99$
$2x = 99 - 69$
$x = \frac{30}{2}$
$\boxed{x = ₹15}$
Hence the fares from city P to Q and the fares from city P to R are ₹15, ₹23 respectively.

92. There are 40 persons in a palace. If every person shakes hands with every other person, what will be the total number of handshakes?

(a) 750 (b) 780
(c) 800 (d) 790

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (b) : Total number of handshakes $= \frac{n(n-1)}{2}$

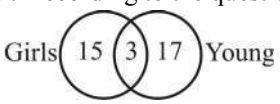
$$= \frac{40(40-1)}{2}$$
$$= \frac{40 \times 39}{2}$$
$$= 20 \times 39$$
$$= 780$$

93. In a group of 35 persons, 20 are young and 18 are girls. How many young girls are there in the group ?

(a) 1 (b) 3
(c) 18 (d) 2

RRB NTPC 17.01.2021 (Shift-II) Stage Ist

Ans. (b) : According to the question,



Number of young girls in the group = (20+18) – 35
= 38 – 35 = 3

94. Find the value of (919+9.019+0.919+9.0019)

(a) 937.3999 (b) 973.9399
(c) 937.9399 (d) 973.9939

RRB NTPC (Stage-2) 14/06/2022 (Shift-I)

Ans. (c) : 919 + 9.019 + 0.919 + 9.0019
= 919 + 18.9399
= 937.9399

95. 484.71 + 285.33 – 827.38 +73.9 = ?

(a) 19.78 (b) 36. 54
(c) 16.56 (d) 15.78

RRB NTPC (Stage-2) 17/06/2022 (Shift-I)

Ans. (c) : 484.71 + 285.33 – 827.38 + 73.9 = ?
= 484.71 + 285.33+73.9 – 827.38
= 843.94 – 827.38
= 16.56

96. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?

67.69 + 5.12 - 0.89 ÷ 31.88 = ?

(a) 150 (b) 35
(c) 73 (d) 48

RRB NTPC (Stage-2) 12/06/2022 (Shift-I)

Ans. (c) : 67.69 + 5.12 – 0.89 ÷ 31.88 = ?
Assuming approximately

$$= 68 + 5 - \frac{1}{32}$$

$$= 73 - 0.031 \times 73$$

97. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?
895.98 + 185.01 + 851.86 + 524.09 = ?

(a) 2460 (b) 1490
(c) 2010 (d) 3540

RRB NTPC (Stage-2) 16/06/2022 (Shift-III)

Ans. (a) : 895.98 + 185.01 + 851.86 + 524.09
Almost assuming
= 896 + 185 + 852 + 524
= 2457 ≈ 2460

98. 19 × 19 = 361. What will be the value of 190 × 0.0019?

(a) 0.00361 (b) 0.361
(c) 3.61 (d) 0.0361

RRB NTPC 17.02.2021 (Shift-II) Stage I

Ans. (b) : 19 × 19 = 361
$\Rightarrow$ 190 × 0.0019
= 0.361

99. Find the quotient of 0.5 ÷ 0.71 (correct to three decimal places)

(a) 0.706 (b) 0.714
(c) 0.705 (d) 0.704

RRB NTPC 03.02.2021 (Shift-II) Stage I

Ans. (d) : Given that,

$$\frac{0.5}{0.71} = \frac{500}{710} = 0.704$$

100. What will the value of the following be (correct to three decimal points)?
160.342 – 32.124

(a) 128.340 (b) 128.242
(c) 128.218 (d) 128.337

RRB NTPC 01.02.2021 (Shift-II) Stage I

Ans. (c) : Given that,
160.342 – 32.124 = 128.218

101. Simplify the following.
5 × 0.5 × 0.05 × 0.005 × 500

(a) 3125 (b) 0.3125
(c) 0.003125 (d) 31.25

RRB NTPC 28.01.2021 (Shift-I) Stage I

Ans. (b) : 5 × 0.5 × 0.05 × 0.005 × 500

$$= 5 \times \frac{5}{10} \times \frac{5}{100} \times \frac{5}{1000} \times 500$$

$$= \frac{5 \times 5 \times 5 \times 5 \times 5}{10000} = \frac{3125}{10000}$$

= 0.3125

102. The value of 80.6 ÷ 4030 = ?
80.6 ÷ 4030 = ?

(a) 0.2 (b) 2
(c) 0.02 (d) 20

RRB NTPC 18.01.2021 (Shift-II) Stage Ist

Ans. (c) : 80.6 ÷ 4030

$$= \frac{80.6}{4030} = \frac{806}{40300}$$

$$= \frac{2}{100}$$

= 0.02

103. How many one-thirds are in 72?

(a) 24 (b) 288
(c) 144 (d) 216

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (d) : From question,

No. of one-third in 72 = $\frac{72}{\frac{1}{3}} = 216$

104. Simplify the following expression :
(15 ÷ 3) –[{(19 – 1) ÷ 2} – {5 × 20 – (7 × 9 – (– 2))}]

(a) 21 (b) 31
(c) – 21 (d) 35

RRB NTPC (Stage-2) 16/06/2022 (Shift-I)

Ans. (b) :
(15 ÷ 3) –[{(19 – 1) ÷ 2} – {5 × 20 – (7 × 9 – (– 2))}]
= 5 – [{(19 – 1)÷ 2} – {5×20 – (7×9 – (– 2))}]
= 5 – [{18 ÷ 2} – {100 – (63 + 2) }]
= 5 – [9 – {100 – 65}]
= 5 – [9 – 35]
= 5 +26
= 31

105. Find the value of 84÷32×8–15÷8×(19–35)

(a) 38 (b) 45
(c) 51 (d) 42

RRB NTPC (Stage-2) 14/06/2022 (Shift-I)

Ans. (c) : 84 ÷ 32 × 8 – 15 ÷ 8 × (19 – 35)
= 84 ÷ 32 × 8 – 15 ÷ 8 × (–16)

$$= \frac{84}{32} \times 8 - \frac{15}{8} \times (-16) = 21 + 30 = 51$$

106. Find the value of 72 ÷ 4 × { 8 × 4 – (14 – 19)}

(a) 666 (b) 444
(c) 222 (d) 1296

RRB NTPC (Stage-2) 14/06/2022 (Shift-I)

Ans. (a) : 72 ÷ 4 × { 8 × 4 – (14 – 19)}
= 72÷ 4{8×4–(–5)}
= 72÷ 4{8×4 + 5}
= 72 ÷4{32 + 5}
= 72 ÷4 × 37
= 18 × 37 = 666

107. Find the value of 529 ÷ 23 × 61 – 1403

(a) 0 (b) 2
(c) 3 (d) 1

RRB Group-D 01/09/2022 (Shift-III)

Ans. (a) : 529 ÷ 23 ×61 – 1403
= 23 × 61 – 1403
= 1403 – 1403 = 0

108. Simplify the given expression using BODMAS :

$$\frac{4}{11}\times\frac{121}{16}\times 24(75^2-55^2)\times\frac{1}{100}$$

(a) 1736 (b) 1726
(c) 1746 (d) 1716

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (d) : $\frac{4}{11}\times\frac{121}{16}\times 24\left(75^2-55^2\right)\frac{1}{100}$

From BODMAS,

$=\frac{11}{4}\times 24\left[(75+55)(75-55)\right]\times\frac{1}{100}$

We know that, $\left[\because a^2-b^2=(a+b)(a-b)\right]$

$=66\times(130\times 20)\times\frac{1}{100}$

$=66\times 2600\times\frac{1}{100}$

= 1716

109. The value of 3 + [3 × {3 – (3 + 3) ÷ 6}] is:

(a) 3 (b) 9
(c) 6 (d) -3

RRB NTPC 13.03.2021 (Shift-I) Stage I

Ans. (b) : The value of 3 + [3 × {3 – (3 + 3) ÷ 6}]
= 3 + [3 × {3 – 6 ÷ 6}]
= 3 + [3 × {3 – 1}]
= 3 + [3 × 2]
= 3 + 6 = 9

110. Using BODMAS, simplify the following.

$$\frac{7}{9}\times\frac{21}{5}\times 25(65^2-55^2)$$

(a) 42000 (b) 86000
(c) 98000 (d) 84000

RRB NTPC 28.01.2021 (Shift-I) Stage I

Ans. (c) : Given expression,

$\frac{7}{9}\times\frac{21}{5}\times 25\left(65^2-55^2\right)$

$=\frac{49\times 5}{3}\left[(65+55)(65-55)\right]$

$=\frac{49\times 5}{3}\times 120\times 10$

= 49 × 5 × 40 × 10 = 98000

111. What is the value of $\frac{2}{7}\times[2+\{2(11+4-2)\}]-2$

(a) 7 (b) 9
(c) 8 (d) 6

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (d): From question,

$\frac{2}{7}\times[2+\{2(11+4-2)\}]-2$

From BODMAS

$=\frac{2}{7}\times[2+\{2\times 13\}]-2$

$=\frac{2}{7}\times[2+26]-2$

$=\frac{2}{7}\times 28-2$

= 2 × 4 –2
= 6

112. The value of 15×14 – 30 + (3^2 + 17) is:

(a) 154 (b) 266
(c) 124 (d) 206

RRB NTPC 04.01.2021 (Shift-I) Stage Ist

Ans. (d) : Given expression,
15 × 14 – 30 + (3^2 + 17) = ?
= 210 – 30 + 26
= 210 – 4 = 206

113. Solve it

79 + [37 – {45 – (1 – 36 ÷ 6 × 8)}]=?

(a) 33 (b) 24
(c) 59 (d) 41

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (b) : According to the question,
79 + [37 – {45 – (1 – 36 ÷ 6 × 8)}]
Solving by BODMAS rule-
= 79 + [37 – {45 – (1 – 6 × 8)}]
= 79 + [37 – {45 – (1 – 48)}]
= 79 + [37 – {45 + 47}]
= 79 + [37 –92]
= 116 –92 = 24

114. Simplify the following expression.

$$\frac{(5.5)^3-4^3}{30.25+22+16}$$

(a) 0.75 (b) 14.25
(c) 1.5 (d) 9.5

RRB NTPC (Stage-2) 16/06/2022 (Shift-II)

Ans. (c) : Given expression -

$\frac{(5.5)^3-4^3}{30.25+22+16}$

$=\frac{(5.5-4)(30.25+22+16)}{(30.25+22+16)}$

$[(a^3-b^3)=(a-b)(a^2+ab+b^2)]$

= 5.5 – 4 = 1.5

115. Simplify the following expression :

$$\frac{15^3+20^3+25^3-22500}{15^2+20^2+25^2-300-500-375}$$

(a) 50 (b) 60
(c) 80 (d) 75

RRB NTPC (Stage-2) 16/06/2022 (Shift-I)

Ans. (b):

$$(a+b+c) = \frac{a^3+b^3+c^3-3abc}{\left(a^2+b^2+c^2-ab-bc-ca\right)}$$

where a = 15, b = 20, c = 25

$$(a+b+c) = \frac{15^3+20^3+25^3-22500}{15^2+20^2+25^2-300-500-375}$$

= 15+20+25 = 60

116. Expression $(3.7)^3 - 3 \times (3.7)^2 \times (0.7) + 3(3.7) \times (0.7)^2 - (0.7)^3$ is equal to which of the following?

(a) 10 (b) 27
(c) 30 (d) 35

RRB GROUP-D – 19/09/2022 (Shift-III)

Ans. (b) : $(a-b)^3 = a^3-3a^2b+3ab^2-b^3$

$(3.7)^3-3\times(3.7)^2\times(0.7)+3(3.7)\times(0.7)^2-(0.7)^3$

$= (3.7-0.7)^3$

$= (3)^3 = 27$

117. If a + b = 25 and a - b =13 is then find the value of $(a+b)^2$

(a) 625 (b) 225
(c) 525 (d) 496

RRB Group-D 29/08/2022 (Shift-III)

Ans. (a) : a + b = 25 ....(i)

a – b = 13 ....(ii)

From eq. (i) and eq. (ii)

a = 19, b = 6

$(a+b)^2 = (19+6)^2 = 625$

118. If x + y + z = 11 and xy + yz + zx = 42 is the find the value of $x^2 + y^2 + z^2$

(a) 39 (b) 37
(c) 43 (d) 41

RRB GROUP-D – 17/08/2022 (Shift-I)

Ans. (b) : Given–

x + y + z = 11

xy + yz + zx = 42

$\because (x+y+z)^2 = x^2+y^2+z^2+2(xy+yz+zx)$

$\Rightarrow (11)^2 = x^2+y^2+z^2+2\times 42$

$\Rightarrow x^2+y^2+z^2 = 121-84$

$\therefore x^2+y^2+z^2 = 37$

119. If $\frac{x}{y}=\frac{3}{2}$ is then find the value of $\frac{x^2+y^2}{x^2-y^2}$

(a) $\frac{7}{5}$ (b) $\frac{11}{5}$
(c) $\frac{13}{5}$ (d) $\frac{9}{5}$

RRB GROUP-D – 17/08/2022 (Shift-III)

Ans. (c) : If $\frac{x}{y}=\frac{3}{2}$ In $\frac{x^2+y^2}{x^2-y^2}$

x = 3 and y = 2

$$\frac{x^2+y^2}{x^2-y^2} = \frac{(3)^2+(2)^2}{(3)^2-(2)^2}$$

$$= \frac{9+4}{9-4} = \frac{13}{5}$$

$$\frac{x^2+y^2}{x^2-y^2} = \frac{13}{5}$$

120. Find the value of $\frac{(9.8\times 9.8-5.8\times 5.8)}{2\times(7.8)}$

(a) 6 (b) 5
(c) 4 (d) 3

RRB Group-D 08/09/2022 (Shift-II)

Ans. (c) : $\frac{9.8\times 9.8-5.8\times 5.8}{2\times(7.8)}$

$= \frac{(9.8-5.8)(9.8+5.8)}{2\times 7.8}$ [From $(a^2-b^2) = (a-b)(a+b)$]

$= \frac{4\times 15.6}{15.6} = 4$

121. The value of $\left(\sqrt{2}+\sqrt{3}\right)\left(\sqrt{2}-\sqrt{3}\right)$ is equal to:

(a) –1 (b) 2
(c) 3 (d) –3

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (a) : $\left(\sqrt{2}+\sqrt{3}\right)\left(\sqrt{2}-\sqrt{3}\right)$

We know that,

$\because (a+b)(a-b) = a^2-b^2$

$= \left(\sqrt{2}\right)^2-\left(\sqrt{3}\right)^2$

= 2 – 3

= – 1

122. Find the value of the following equation:

$$\frac{(469+144)^2-(469-144)^2}{2(469\times 144)} = ?$$

(a) –2 (b) –1
(c) 1 (d) 2

RRB RPF Constable -19/01/2019 (Shift-II)

Ans : (d) Formula:- $\frac{(a+b)^2-(a-b)^2}{2ab} = \frac{4ab}{2ab}$

From the given expression,

$$\frac{(469+144)^2-(469-144)^2}{2(469\times 144)} = ?$$

a = 469, b = 144

$$= \frac{(a+b)^2-(a-b)^2}{2(ab)} = \frac{4ab}{2ab} = 2$$

123. Find the value of : $\frac{(82+28)^2-(82-28)^2}{82\times 28}$

(a) 220 (b) 4
(c) 8 (d) 110

RRB JE - 28/06/2019 (Shift-III)

Ans. (b) Formula:

$$\frac{(a+b)^2-(a-b)^2}{ab}=\frac{4ab}{ab} \quad \{a=82,\ b=28\}$$

From the given expression,

$$\because \quad \frac{(82+28)^2-(82-28)^2}{82\times 28}$$

$$=\frac{4\times 82\times 28}{82\times 28}=4$$

124. Find the value of $39 \div \left\{6\times\left(\frac{6}{7} \text{ of } \frac{7}{8}\right)\right\}$

(a) $\frac{26}{3}$ (b) $\frac{25}{3}$

(c) $\frac{23}{3}$ (d) $\frac{28}{3}$

RRB Group-D 09/09/2022 (Shift-I)

Ans. (a) : $39\div\left\{6\times\left(\frac{6}{7}\text{ of }\frac{7}{8}\right)\right\}$

$=39\div\left\{6\times\left(\frac{6}{7}\times\frac{7}{8}\right)\right\}$

$=39\div\left\{6\times\left(\frac{3}{4}\right)\right\}$

$=39\times\frac{2}{9}$

$=\frac{26}{3}$

125. Find the value of $2+\left[2+2\div\left\{2+2\div\left(2+\frac{1}{3}\right)\right\}\right]$

(a) $\frac{57}{10}$ (b) $\frac{37}{10}$

(c) $\frac{47}{10}$ (d) $\frac{67}{10}$

RRB Group-D 08/09/2022 (Shift-I)

Ans. (c) : $2+\left[2+2\div\left\{2+2\div\left(2+\frac{1}{3}\right)\right\}\right]$

$=2+\left[2+2\div\left\{2+2\times\frac{3}{7}\right\}\right]$

$=2+\left[2+2\times\frac{7}{20}\right]$

$=2+\left[2+\frac{7}{10}\right]$

$=\text{›}\ 2+\frac{27}{10}\Rightarrow\frac{47}{10}$

126. Find the value of $20+\frac{24}{7}\times\{(1\div 2)+(2\div 3)\}$

(a) 34 (b) 28

(c) 24 (d) 32

RRB Group-D 08/09/2022 (Shift-II)

Ans. (c): $20+\frac{24}{7}\times\{(1\div 2)+(2\div 3)\}$

$=20+\frac{24}{7}\times\left\{1\times\frac{1}{2}+2\times\frac{1}{3}\right\}$

$=20+\frac{24}{7}\times\left\{\frac{1}{2}+\frac{2}{3}\right\}$

$=20+\frac{24}{7}\times\frac{7}{6}=20+4=24$

127. Simplify the following expression :
$3.5 \times 0.5 \times (4.4 - 0.625 \div 1.5625)$

(a) 10.5 (b) 7

(c) 14 (d) 1.75

RRB NTPC (Stage-2) 17/06/2022 (Shift-III)

Ans. (b) : $3.5 \times 0.5 \times (4.4 - 0.625 \div 1.5625)$

$= 1.75\times(4.4-0.4)$

$= 1.75\times4 = 7$

128. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?
$15.95 - 4.01 + 13.99 \times 5.13 = ?$

(a) 75 (b) 82

(c) 80 (d) 77

RRB Group-D 29/08/2022 (Shift-I)

Ans. (b) : $15.95 - 4.01 + 13.99 \times 5.13 = ?$

Approx. value $16 - 4 + 14 \times 5 = ?$

$12 + 70 = ?$

$? = 82$

129. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?
$18.96 + 12.96 + 15.16 - 17.89 \times 2.04 + 49.93 \div 5.1 = ?$

(a) 23 (b) 22

(c) 24 (d) 21

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (d) : To the nearest value -

$= 19+13+15-18\times2+50\div5$

$= 47-36+50\div5$

$= 47 - 36 + 10$

$= 21$

130. Find the value of

$$\frac{(34.2\times6.84)\div(102.6\times0.00171)}{(12.5\times0.8)\div0.03}$$

(a) 4 (b) 0.004

(c) 0.04 (d) 0.4

RRB NTPC (Stage-2) 16/06/2022 (Shift-III)

Ans. (a) : According to the question

$$\frac{(34.2\times6.84)\div(102.6\times0.00171)}{(12.5\times0.8)\div0.03}$$

$$=\frac{34.2\times6.84}{(102.6\times0.00171)}\times\frac{0.03}{(12.5\times0.8)}$$

$$= \frac{34.2\times6.84\times0.03}{102.6\times0.00171\times12.5\times0.8}$$
$$= \frac{342\times684\times3\times1000}{1026\times171\times125\times8}$$
$$= 4$$

131. Find the value of

$$\frac{\left(11\frac{11}{12}\times1\frac{3}{13}\div2\frac{3}{4}\right)\div\left(\frac{7}{10}\div\left(\frac{3}{4}\times1\frac{2}{5}\right)\right)}{\frac{1}{4}\times\frac{2}{3}\times2\frac{2}{5}}$$

(a) 10 (b) $3\frac{1}{5}$

(c) $1\frac{1}{5}$ (d) 20

RRB NTPC (Stage-2) 13/06/2022 (Shift-II)

Ans. (d) :

$$\frac{\left(11\frac{11}{12}\times1\frac{3}{13}\div2\frac{3}{4}\right)\div\left[\frac{7}{10}\div\left(\frac{3}{4}\times1\frac{2}{5}\right)\right]}{\frac{1}{4}\times\frac{2}{3}\times2\frac{2}{5}}$$
$$= \frac{\left(\frac{143}{12}\times\frac{16}{13}\times\frac{4}{11}\right)\div\left[\frac{7}{10}\div\left(\frac{3}{4}\times\frac{7}{5}\right)\right]}{\frac{1}{4}\times\frac{2}{3}\times\frac{12}{5}}$$
$$= \frac{\left(\frac{143}{12}\times\frac{16}{13}\times\frac{4}{11}\right)\div\left[\frac{7}{10}\times\frac{20}{21}\right]}{\frac{1}{4}\times\frac{2}{3}\times\frac{12}{5}}$$
$$= \frac{\frac{16}{3}\times\frac{21}{14}}{\frac{2}{5}}$$
$$= \frac{\frac{16}{2}}{\frac{2}{5}} = \frac{16}{2}\times\frac{5}{2} = \frac{80}{4}$$
$$= 20$$

132. If $1\frac{1}{4}\times\left(5\frac{3}{4}\div\frac{2}{7}\text{ of }k\right)\div2\frac{7}{8}-3\frac{3}{4}=(17-4)\div2\text{ of }2$ is then find the value of $\frac{k+1}{k-1}$

(a) $\frac{5}{2}$ (b) 9

(c) 7 (d) $\frac{11}{3}$

RRB NTPC (Stage-2) 16/06/2022 (Shift-III)

Ans. (b) :

$$\Rightarrow1\frac{1}{4}\left(5\frac{3}{4}\div\frac{2}{7}\text{ of }k\right)\div2\frac{7}{8}-3\frac{3}{4}=(17-4)\div2\text{ of }2$$
$$\Rightarrow\frac{5}{4}\times\left(\frac{23}{4}\div\frac{2k}{7}\right)\div\frac{23}{8}-\frac{15}{4}=13\div4$$
$$\Rightarrow\frac{5}{4}\times\frac{161}{8k}\times\frac{8}{23}-\frac{15}{4}=\frac{13}{4}$$
$$\Rightarrow\frac{35}{4k}=\frac{28}{4}$$
$$\Rightarrow\frac{35}{4k}=7$$
$$\Rightarrow k=\frac{35}{4\times7}=\frac{5}{4}$$
$$\frac{k+1}{k-1}=\frac{\frac{5}{4}+1}{\frac{5}{4}-1}=\frac{9}{1}=9$$

133. Simplify the following expression :

$$2\frac{1}{6}\times\left\{1\frac{19}{26}+\frac{15}{13}\times\left(\frac{5}{7}\div\frac{25}{14}\right)\right\}$$

(a) $4\frac{5}{6}$ (b) $4\frac{3}{4}$

(c) $4\frac{4}{5}$ (d) $4\frac{2}{3}$

RRB NTPC (Stage-2) 16/06/2022 (Shift-III)

Ans. (b) : $2\frac{1}{6}\times\left\{1\frac{19}{26}+\frac{15}{13}\times\left(\frac{5}{7}\div\frac{25}{14}\right)\right\}$
$$= \frac{13}{6}\times\left\{\frac{45}{26}+\frac{15}{13}\times\frac{5}{7}\times\frac{14}{25}\right\}$$
$$= \frac{13}{6}\times\left\{\frac{45}{26}+\frac{6}{13}\right\}$$
$$= \frac{13}{6}\times\left(\frac{45+12}{26}\right)$$
$$= \frac{13}{6}\times\frac{57}{26}=\frac{19}{4}=4\frac{3}{4}$$

134. Find the value of $5\sqrt{12}+6\sqrt{27}-4\sqrt{75}+\sqrt{192}$

(a) $20\sqrt{3}$ (b) $22\sqrt{3}$

(c) $18\sqrt{3}$ (d) $16\sqrt{3}$

RRB NTPC (Stage-2) 17/06/2022 (Shift-I)

Ans. (d) : $5\sqrt{12}+6\sqrt{27}-4\sqrt{75}+\sqrt{192}$
$$=5\sqrt{4\times3}+6\sqrt{9\times3}-4\sqrt{25\times3}+\sqrt{64\times3}$$
$$=5\times2\sqrt{3}+6\times3\sqrt{3}-4\times5\sqrt{3}+8\sqrt{3}$$
$$=\sqrt{3}(10+18-20+8)$$
$$=\sqrt{3}(16)=16\sqrt{3}$$

135. Find the positive value of

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+.....+\frac{1}{\sqrt{15}+\sqrt{16}}$$

(a) 1 (b) 3

(c) 4 (d) 2

RRB NTPC (Stage-2) 16/06/2022 (Shift-III)

Ans. (b):

$$=\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+.....+\frac{1}{\sqrt{15}+\sqrt{16}}$$

$$=\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+.....+\frac{1}{\sqrt{16}+\sqrt{15}}$$

After rationalizing the denominator

$$=\frac{\sqrt{2}-1}{2-1}+\frac{\sqrt{3}-\sqrt{2}}{3-2}+\frac{\sqrt{4}-\sqrt{3}}{4-3}+.....+\frac{\sqrt{16}-\sqrt{15}}{16-15}$$

$$=\sqrt{2}-1+\sqrt{3}-\sqrt{2}+\sqrt{4}-\sqrt{3}+.....\sqrt{16}-\sqrt{15}$$

$$=-1+\sqrt{16}=-1+4=3$$

136. Find the value of $\left\{\left(234^5-243^8+\frac{1}{72}\right)^{-8}\right\}^0+8$

(a) 9 (b) 234
(c) 243 (d) 10

RRB Group-D 29/08/2022 (Shift-I)

Ans. (a) : $\left\{\left(234^5-243^8+\frac{1}{72}\right)^{-8}\right\}^0+8$

Any number to the power '0' has the value 1.
Hence, 1 + 8 = 9

137. Find the value of $5\sqrt{6}-\sqrt{\left[3(4-2)\right]}+\left(\frac{12}{\sqrt{6}}\right)$

(a) $8\sqrt{6}$ (b) $6\sqrt{6}$
(c) $5\sqrt{6}$ (d) $7\sqrt{6}$

RRB Group-D 08/09/2022 (Shift-III)

Ans. (b) : $5\sqrt{6}-\sqrt{\left[3(4-2)\right]}+\left(\frac{12}{\sqrt{6}}\right)$

$$=5\sqrt{6}-\sqrt{6}+2\sqrt{6}$$
$$=7\sqrt{6}-\sqrt{6}$$
$$=6\sqrt{6}$$

138. Find the value of $\sqrt{729}+\sqrt{1681}+\sqrt{576}-\sqrt{1849}$

(a) 55 (b) 37
(c) 49 (d) 64

RRB Group-D 23/08/2022 (Shift-II)

Ans. (c) : $\sqrt{729}+\sqrt{1681}+\sqrt{576}-\sqrt{1849}$
= 27 + 41 +24 -43
= 49

139. If a = 5 then find the value of $\sqrt{\left(4a^2-4a+1\right)}+6a$

(a) 69 (b) 39
(c) 49 (d) 59

RRB Group-D 02/09/2022 (Shift-III)

Ans. (b) : Given-
a = 5

$$\sqrt{\left(4a^2-4a+1\right)}+6a$$
$$=\sqrt{\left(4(5)^2-4\times5+1\right)}+6\times5$$
$$=\sqrt{100-20+1}+6\times5$$
$$=\sqrt{81}+6\times5$$
$$=9+30=39$$

140. Simplify $\frac{8^2\times3^3}{\sqrt{64}\times\sqrt{81}}$

(a) 24 (b) 27
(c) 64 (d) 72

RRB Group-D 18/08/2022 (Shift-III)

Ans. (a) : According to the question -

$$=\frac{8^2\times3^3}{\sqrt{64}\times\sqrt{81}}$$
$$=\frac{8\times8\times3\times3\times3}{8\times3\times3}=24$$

141. Find the value of $\sqrt{2+\sqrt{2+\sqrt{2.....}}}$

(a) 1.75 (b) 2
(c) 2.5 (d) 1.5

RRB GROUP-D – 30/09/2022 (Shift-I)

Ans. (b) : Let $x=\sqrt{2+\sqrt{2+\sqrt{2.....}}}$

Squaring the both side

$x^2=2+\sqrt{2+\sqrt{2+\sqrt{2.....}}}$
$x^2=2+x$
$x^2-x-2=0$
$x^2-2x+x-2=0$
$x(x-2)+1(x-2)=0$
$(x-2)(x+1)=0$
$x=2$

142. The possible value of x in the given equation -:

$$\sqrt{\frac{x}{1-x}}+\sqrt{\frac{1-x}{x}}=\frac{25}{12}$$

(a) $\frac{12}{25}$ or $\frac{13}{25}$ (b) $\frac{8}{25}$ or $\frac{17}{25}$
(c) $\frac{19}{25}$ or $\frac{6}{25}$ (d) $\frac{9}{25}$ or $\frac{16}{25}$

RRB NTPC 02.02.2021 (Shift-I) Stage Ist

Ans. (d) : $\sqrt{\frac{x}{1-x}}+\sqrt{\frac{1-x}{x}}=\frac{25}{12}$

$$\frac{x+1-x}{\sqrt{x}\left(\sqrt{1-x}\right)}=\frac{25}{12}$$

$$\frac{1}{\sqrt{x-x^2}}=\frac{25}{12}$$

On Squaring on both sides,

$$\left(\frac{1}{\sqrt{x-x^2}}\right)^2=\left(\frac{25}{12}\right)^2$$

$$\frac{1}{x-x^2}=\frac{625}{144}$$

$$625x - 625x^2 = 144$$
$$625x^2 - 625x + 144 = 0$$
$$625x^2 - 400x - 225x + 144 = 0$$
$$25x(25x - 16) - 9(25x - 16) = 0$$
$$(25x - 16)(25x - 9) = 0$$
$$(25x - 16) = 0 \quad (25x - 9) = 0$$
$$x = \frac{16}{25} \quad x = \frac{9}{25}$$

143. What is the value of the following expression?

$$\frac{\sqrt{225}}{14} \times \frac{\sqrt{196}}{22} \times \frac{\sqrt{484}}{15}$$

(a) 14 (b) 1
(c) 2 (d) 3

RRB NTPC 02.02.2021 (Shift-I) Stage Ist

Ans. (b) :

$$= \frac{\sqrt{225}}{14} \times \frac{\sqrt{196}}{22} \times \frac{\sqrt{484}}{15}$$
$$= \frac{15}{14} \times \frac{14}{22} \times \frac{22}{15}$$
$$= 1$$

144. Find the simplified form of $\frac{a^{10} \times b^{-7} \times c^{-4}}{a^{-5} \times b^2 \times c^5}$

(a) $a^{15} \times b^{-9} \times c^{-9}$ (b) $a^5 \times b^9 \times c^{-9}$
(c) $a^{15} \times b^9 \times c^9$ (d) $a^5 \times b^{-9} \times c^{-9}$

RRB Group-D 30/08/2022 (Shift-III)

Ans. (a) : $\frac{a^{10} \times b^{-7} \times c^{-4}}{a^{-5} \times b^2 \times c^5}$

$\Rightarrow a^{10} \times a^5 \times b^{-7} \times b^{-2} \times c^{-4} \times c^{-5}$

$\Rightarrow a^{15} \times b^{-9} \times c^{-9}$

145. If a : b = $\sqrt{7} : \sqrt{3}$, then the value of (3a + 2b) : (3a-2b) is equal to:

(a) $\frac{2+\sqrt{21}}{(-2+\sqrt{21})}$ (b) $\frac{2+\sqrt{21}}{(2-\sqrt{21})}$

(c) $\frac{2+\sqrt{21}}{(-2-\sqrt{21})}$ (d) $\frac{2-\sqrt{21}}{(2+\sqrt{21})}$

RRB NTPC 16.01.2021 (Shift-II) Stage Ist

Ans. (a) : Given,

$$a : b = \sqrt{7} : \sqrt{3} \Rightarrow \frac{a}{b} = \frac{\sqrt{7}}{\sqrt{3}}$$

Let $a = \sqrt{7}$, $b = \sqrt{3}$

then, (3a + 2b) : (3a – 2b)

$= (3\times\sqrt{7} + 2\times\sqrt{3}) : (3\times\sqrt{7} - 2\times\sqrt{3})$

$= (3\sqrt{7} + 2\sqrt{3}) : (3\sqrt{7} - 2\sqrt{3})$

$$= \frac{3\sqrt{7} + 2\sqrt{3}}{3\sqrt{7} - 2\sqrt{3}}$$

On multiplying by $\sqrt{7}$ in numerator and denominator,

$$= \frac{21 + 2\sqrt{21}}{21 - 2\sqrt{21}} = \frac{\sqrt{21}(\sqrt{21} + 2)}{\sqrt{21}(\sqrt{21} - 2)}$$
$$= \frac{2 + \sqrt{21}}{-2 + \sqrt{21}}$$

146. Find the value of $\{1 + (1 - 2)^{-1} + 2 - (1 - 2)^{-2}\}^2$

(a) 8 (b) 0
(c) 1 (d) 9

RRB Group-D 13/09/2022 (Shift-III)

Ans. (c) : $\{1 + (1-2)^{-1} + 2 - (1-2)^{-2}\}^2$
$= \{1 + (-1)^{-1} + 2 - (-1)^{-2}\}^2$
$= \{1 - 1 + 2 - (-1/1)^2\}^2$
$= \{0 + 2 - 1\}^2$
$= \{1\}^2 = 1$

147. Simplify $(3^2)^3 + (2^3)^2$

(a) 739 (b) 729
(c) 793 (d) 379

RRB GROUP-D – 17/08/2022 (Shift-II)

Ans. (c) : $(3^2)^3 + (2^3)^2$
$= (9)^3 + (8)^2$
$= 729 + 64$
$= 793$

148. If x : y = 2 : 3 then what is the value of (5x+3y) : (5x-3y)

(a) 19 : 3 (b) 19 : 2
(c) 9 : 1 (d) 19 : 1

RRB NTPC 16.01.2021 (Shift-II) Stage Ist

Ans. (d) : $x : y = 2 : 3 \Rightarrow \frac{x}{y} = \frac{2}{3}$

Let- x = 2, y = 3
then, (5x + 3y) : (5x – 3y)
= (5 × 2 + 3 × 3) : (5 × 2 – 3 × 3)
= (10 + 9) : (10 – 9)
= 19 : 1

149. If a : b = 3 : 2, then $(7a + 9b) : (5a + 7b)$ = ?

(a) 29 : 19 (b) 29 : 39
(c) 39 : 29 (d) 19 : 39

RRB NTPC 27.02.2021 (Shift-I) Stage Ist

Ans. (c) : Let a = 3x and b = 2x

then, $\frac{7a + 9b}{5a + 7b} = \frac{7\times3x + 9\times2x}{5\times3x + 7\times2x}$

$$= \frac{21x + 18x}{15x + 14x}$$
$$= \frac{39x}{29x} = \frac{39}{29} = 39 : 29$$

150. On simplification $\frac{2^{10}-3^{10}}{5^{10}-6^{10}}$ is:

(a) A positive rational number
(b) A negative rational number
(c) Neither a positive nor a negative rational number
(d) Can not be defined

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (a) : From question,

$$\frac{2^{10}-3^{10}}{5^{10}-6^{10}} = \frac{1024-59049}{9765625-60466176} = \frac{-58025}{-50700551}$$

$$= \frac{58025}{50700551} \quad \text{(A positive rational number)}$$

151. How will you write 2.84 hours in hours, minutes and seconds?

(a) 2 hours 8 minutes 4 seconds
(b) 3 hours 24 minutes
(c) 2 hours 50 minutes 24 seconds
(d) 2 Hours 50 minutes 4 seconds

RRB NTPC 03.02.2021 (Shift-I) Stage Ist

Ans. (c) :
2.84 hours = 2 hours +.84 ×60 minutes
= 2 hours +50.4 minutes
= 2 hours +50 minutes + 0.4 ×60 seconds
= 2 hours +50 minutes + 24 seconds

152. Find the value

$$\frac{(0.01)^2+(0.22)^2+(0.333)^2+(0.4444)^2}{(0.001)^2+(0.022)^2+(0.0333)^2+(0.04444)^2}$$

(a) 50 (b) 75
(c) 125 (d) 100

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (d) :

$$\frac{(0.01)^2+(0.22)^2+(0.333)^2+(0.4444)^2}{(0.001)^2+(0.022)^2+(0.0333)^2+(0.04444)^2}$$

$$= (10)^2\left[\frac{\left((1)^2+(22)^2+(333)^2+(4444)^2\right)}{(1)^2+(22)^2+(333)^2+(4444)^2}\right]$$

$$= 100$$

153. How will you write 8.17 hours in hours, minutes and seconds?

(a) 8 hours, 17 minutes
(b) 8 hours, 10 minutes, 12 seconds
(c) 8 hours, 10 minutes, 7 seconds
(d) 8 hours, 12 minutes

RRB NTPC 27.02.2021 (Shift-I) Stage Ist

Ans. (b) : 8.17 hours

$$= 8 \text{ hours} + \frac{17}{100}\times 60 \text{ minutes}$$

$$= 8 \text{ hours} + 10.2 \text{ minutes}$$

$$= 8 \text{ hours} + 10 \text{ minutes} + \frac{2}{10}\times 60 \text{ seconds}$$

= 8 hours, 10 minutes, 12 seconds

154. $0.\overline{23}$ is

(a) An irrational number
(b) A rational number
(c) A prime number
(d) A composite number

RRB NTPC 20.01.2021 (Shift-I) Stage Ist

Ans. (b) : Let us assume

$y = 0.\overline{23}$.....(i)

Multiplying by 100 in equation (i)-

$100y = 23\cdot\overline{23}$ ..... (ii)

Subtracting eq^n (i) from eq^n (ii)

$99y = 23$

$y = \frac{23}{99}$ (Rational number)

155. $(\sqrt{3}+\sqrt{11})^2$ is a/an

(a) Natural number (b) Whole number
(c) Irrational number (d) Rational number

RRB NTPC 20.01.2021 (Shift-I) Stage Ist

Ans. (c) :

$(\sqrt{3}+\sqrt{11})^2 = 3+11+2\times\sqrt{3}\times\sqrt{11}$

$(\sqrt{3}+\sqrt{11})^2 = 14+2\sqrt{33}$

Therefore $(\sqrt{3}+\sqrt{11})^2$ is an irrational number

156. The product of $\sqrt{2}$ and $\sqrt{3}$ is:

(a) Sometimes a rational number and sometimes an irrational number
(b) Equal to 4
(c) A rational number
(d) An irrational number

RRB NTPC 20.01.2021 (Shift-I) Stage Ist

Ans. (d) : From above question,

$\sqrt{2}\times\sqrt{3} = \sqrt{6}$ (irrational number)

An irrational number is a real number that can't be expressed in the form p/q , q≠0

for example - $\sqrt{2}, \sqrt{5}, \sqrt{7}$, etc.

157. The number of rational number between 5 and 7 is :

(a) 2 (b) 0
(c) Infinite (d) 1

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (c) : Note:- There are infinite number of rational numbers between any two integers.
Hence, there are infinite number of rational numbers that occurs between 5 and 7.

158. $3+2\sqrt{5}$ is :

(a) Rational number (b) Irrational number
(c) Composite number (d) Natural number

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (b): Irrational number: The set of real numbers that cannot be represented in form of p/q is called irrational number that means the number which is not rational is called irrational number.

Example- $\sqrt{2}$, $\sqrt{3}$ .....

$\therefore 3+2\sqrt{5}$ is an irrational number.

159. Which of the following rational number lies between $\frac{1}{4}$ and $\frac{1}{2}$.

(a) $\frac{1}{6}$ (b) $\frac{1}{8}$

(c) $\frac{3}{5}$ (d) $\frac{3}{8}$

RRB NTPC 31.01.2021 (Shift-II) Stage Ist

Ans. (d) :

$$=\frac{\frac{1}{4}+\frac{1}{2}}{2}=\frac{\frac{1+2}{4}}{2}=\frac{3}{8}$$

Therefore, rational number $\frac{3}{8}$ will lie between $\frac{1}{4}$ and $\frac{1}{2}$.

160. Express $\frac{-40}{56}$ as a rational number whose numerator is –5.

(a) $-\frac{5}{6}$ (b) $-\frac{5}{8}$

(c) $-\frac{5}{7}$ (d) $-\frac{5}{18}$

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (c) : $-\frac{40}{56}=-\frac{8\times5}{8\times7}=-\frac{5}{7}$

It is clear that option (c) is the required rational number.

161. $\frac{\left(3\sqrt{5}+\sqrt{125}\right)}{\left(\sqrt{80}+6\sqrt{5}\right)}$ .....is

(a) A rational number (b) A natural number

(c) An integer (d) An irrational number

RRB NTPC 13.01.2021 (Shift-I) Stage Ist

Ans. (a) : Given,

$$\frac{3\sqrt{5}+\sqrt{125}}{\sqrt{80}+6\sqrt{5}}$$

$$=\frac{3\sqrt{5}+5\sqrt{5}}{4\sqrt{5}+6\sqrt{5}}$$

$=\frac{8\sqrt{5}}{10\sqrt{5}}=\frac{8}{10}=\frac{4}{5}$ (rational number)

Therefore $\frac{3\sqrt{5}+\sqrt{125}}{\sqrt{80}+6\sqrt{5}}$ is a rational number

162. Number 0.232323 can be written in rational form as:

(a) $\frac{23}{999}$ (b) $\frac{23}{99}$ (c) $\frac{23}{9}$ (d) $\frac{23}{990}$

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (b) : 0.232323....

$=0.\overline{23}$

$=\frac{23}{99}$

163. Which of the following rational number lies between 9.2 and 10.5?

(a) 9.15 (b) 9.55

(c) 10.67 (d) 9.08

RRB NTPC 03.03.2021 (Shift-I) Stage Ist

Ans. (b) $\because$ 9.55 is the rational number lies between 9.2 and 10.5.

164. Which of the following fractions is the largest?

$\frac{7}{9}, \frac{6}{7}, \frac{22}{25}$ and $\frac{11}{13}$

(a) $\frac{11}{13}$ (b) $\frac{22}{25}$

(c) $\frac{7}{9}$ (d) $\frac{6}{7}$

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (b) :

$\frac{7}{9}=0.777$ $\frac{6}{7}=0.857$

$\frac{22}{25}=0.88$ $\frac{11}{13}=0.846$

Hence, fraction $\frac{22}{25}=0.88$ is the largest.

165. Which of the following fractions is the smallest?

(a) $\frac{9}{11}$ (b) $\frac{11}{12}$

(c) $\frac{8}{13}$ (d) $\frac{10}{14}$

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (c) : From option,

$\frac{9}{11}=0.8181$

$\frac{11}{12}=0.916$

$\frac{8}{13}=0.615$

$\frac{10}{14}=0.714$

Hence, it is clear that smallest fraction is $\frac{8}{13}$.

166. Which is the smallest fraction among the following fractions?

$\frac{3}{9}, \frac{8}{14}, \frac{5}{8}, \frac{4}{9}$

(a) $\frac{4}{9}$ (b) $\frac{8}{14}$

(c) $\frac{3}{9}$ (d) $\frac{5}{8}$

RRB NTPC 02.03.2021 (Shift-I) Stage Ist

Ans. (c) : From question,

$\frac{3}{9} = 0.33$ $\frac{8}{14} = 0.57$

$\frac{5}{8} = 0.62$ $\frac{4}{9} = 0.44$

The smallest fraction is $\frac{3}{9}$

167. Find the greatest fraction out of $-\frac{3}{2}, \frac{3}{2}, \frac{11}{4}, \frac{5}{2}$:

(a) $\frac{3}{2}$ (b) $\frac{11}{4}$

(c) $\frac{5}{2}$ (d) $-\frac{3}{2}$

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (b) :

$-\frac{3}{2} = -1.5$

$\frac{3}{2} = 1.5$

$\frac{11}{4} = 2.75$

$\frac{5}{2} = 2.5$

It is clear that greatest fraction is $\frac{11}{4}$

168. The descending order of the fractions $\frac{2}{3}, \frac{1}{6}, \frac{1}{5}, \frac{3}{7}$ is:

(a) $\frac{3}{7}, \frac{2}{3}, \frac{1}{6}, \frac{1}{5}$ (b) $\frac{2}{3}, \frac{3}{7}, \frac{1}{5}, \frac{1}{6}$

(c) $\frac{3}{7}, \frac{1}{6}, \frac{1}{5}, \frac{2}{3}$ (d) $\frac{1}{6}, \frac{1}{5}, \frac{3}{7}, \frac{2}{3}$

RRB NTPC 15.03.2021 (Shift-II) Stage I

Ans. (b) : $\frac{2}{3} = 0.666$

$\frac{1}{6} = 0.166$

$\frac{1}{5} = 0.200 \Rightarrow \frac{3}{7} = 0.428$

The descending order = 0.666>0.428>0.200>0.166

$\frac{2}{3} > \frac{3}{7} > \frac{1}{5} > \frac{1}{6}$

$\Rightarrow \frac{2}{3}, \frac{3}{7}, \frac{1}{5}, \frac{1}{6}$

169. Arrange the following fractions in the ascending order.

$\frac{2}{3}, \frac{4}{8}, \frac{5}{9}$ **and** $\frac{9}{11}$

(a) $\frac{4}{8} < \frac{5}{9} < \frac{2}{3} < \frac{9}{11}$ (b) $\frac{5}{9} < \frac{2}{3} < \frac{4}{8} < \frac{9}{11}$

(c) $\frac{5}{9} < \frac{2}{3} < \frac{9}{11} < \frac{4}{8}$ (d) $\frac{4}{8} < \frac{5}{9} < \frac{9}{11} < \frac{2}{3}$

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (a) : From question,

$\frac{2}{3}, \frac{4}{8}, \frac{5}{9}$ and $\frac{9}{11}$

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

0.67 0.50 0.55 0.81

(Ascending order),

0.50 0.55 0.67 0.81

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

$\frac{4}{8} < \frac{5}{9} < \frac{2}{3} < \frac{9}{11}$

170. The fractions $\frac{1}{3}, \frac{4}{7}, \frac{2}{5}$ written in ascending order are:

(a) $\frac{1}{3}, \frac{4}{7}, \frac{2}{5}$ (b) All fractions are equal

(c) $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}$ (d) $\frac{4}{7}, \frac{1}{3}, \frac{2}{5}$

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (c) : $\frac{1}{3} = 0.33$

$\frac{4}{7} = 0.57$

$\frac{2}{5} = 0.4$

Hence ascending order = $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}$

171. Select the option that given decimal numbers 0.25, 1.24, 0.0882 and 2.67 are arranged in ascending order.

(a) 2.67, 1.24, 0.25, 0.0882

(b) 0.25, 1.24, 0.08821, 2.67

(c) 1.24, 0.25, 2.67, 0.0882

(d) 0.0882, 0.25, 1.24, 2.67

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (d) : On arranging the given decimal numbers in ascending order-

$0.0882 \rightarrow 0.25 \rightarrow 1.24 \rightarrow 2.67$

Hence, option (d) is correct.

172. The decimal expansion of $\frac{31}{2.5}$ will terminate after:

(a) two decimal places
(b) three decimal places
(c) more than three decimal places
(d) one decimal place

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (d) : $\frac{31}{2.5}=\frac{31\times10\times4}{2.5\times10\times4}=\frac{1240}{100}=12.4$

i,e. the decimal expansion ends after one decimal place

173. Which of the following has terminating decimal representation?

(a) $1\frac{1}{5}$ (b) $4\frac{1}{9}$

(c) $3\frac{1}{7}$ (d) $2\frac{1}{3}$

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (a) : If the denominator of the given rational number is 5 then the rational number will represent the terminating decimal.

From option (a) $1\frac{1}{5}=\frac{6}{5}=1.2$ (Terminating decimal)

(b) $4\frac{1}{9}=\frac{37}{9}=4.\overline{1}$ (Non-Terminating decimal)

(c) $3\frac{1}{7}=\frac{22}{7}=3.\overline{142857}$ (Non-Terminating decimal)

(d) $2\frac{1}{3}=\frac{7}{3}=2.\overline{3}$ (Non-Terminating decimal)

174. Which of the following numbers has a terminating decimal?

$\frac{15}{600},\frac{29}{343},\frac{7}{2^2\times7^2},\frac{77}{210}$

(a) $\frac{7}{2^2\times7^2}$ (b) $\frac{29}{343}$

(c) $\frac{15}{600}$ (d) $\frac{77}{210}$

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (c) : In according to options, converting the fractions into decimals

(a) $\frac{7}{2^2\times7^2}=\frac{7}{196}=0.0357.....$

(b) $\frac{29}{343}=0.0845.....$

(c) $\frac{15}{600}=0.025$

(d) $\frac{77}{210}=0.3\overline{6}$

Hence, from above $\frac{15}{600}$ is terminating decimal.

175. Decimal expansion of $\frac{109}{100}$ is:

(a) $1+\frac{0}{10}+\frac{9}{100}$ (b) $10+\frac{9}{100}$

(c) $1+\frac{9}{100}$ (d) $100+9+\frac{0}{100}$

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (a) : Decimal expansion of $\frac{109}{100}=\frac{100}{100}+\frac{0}{10}+\frac{9}{100}$

$=1+\frac{0}{10}+\frac{9}{100}$

Hence, option (a) is required answer.

176. The value of $0.1\overline{6}+0.1\overline{5}-0.1\overline{3}$ is

(a) $\frac{23}{63}$ (b) $\frac{17}{90}$

(c) $\frac{34}{45}$ (d) $\frac{19}{99}$

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Ans. (b) : $0.1\overline{6}+0.1\overline{5}-0.1\overline{3}$

$=\frac{16-1}{90}+\frac{15-1}{90}-\frac{13-1}{90}$

$=\frac{15}{90}+\frac{14}{90}-\frac{12}{90}$

$=\frac{15+14-12}{90}=\frac{17}{90}$

177. The value of $9.46\overline{7}-2.46\overline{7}+4.46\overline{7}$

(a) $\frac{10321}{1100}$ (b) $\frac{10321}{900}$

(c) $\frac{10521}{900}$ (d) $\frac{10521}{1100}$

RRB GROUP-D – 15/09/2022 (Shift-I)

Ans. (b) : $x=9.46\overline{7}-2.46\overline{7}+4.46\overline{7}$

$x=11.46\overline{7}$

$x=11.46777$ ....(i)

$100x=1146.777$ ....(ii)

$1000x=11467.77$ ....(iii)

eq^n. (iii) – eq^n. (ii)

$900x=10321$

$x=\frac{10321}{900}$

178. Express $0.4\overline{24}$ in the form $\frac{p}{q}$, where p and q are integers and $q\neq0$.

(a) $\frac{41}{165}$ (b) $\frac{13}{33}$

(c) $\frac{14}{33}$ (d) $\frac{41}{990}$

RRB GROUP-D – 17/08/2022 (Shift-II)

Ans. (c) : Given,

$\Rightarrow 0.4\overline{24}$ space where p and q are integers and $q \neq 0$

$\Rightarrow \dfrac{424-4}{990}$ integers and q + o

$\Rightarrow \dfrac{420}{990} = \dfrac{14}{33}$

179. If $0.3\overline{72} = \dfrac{x}{y}$ where x and y are co-prime, then the value of (x + y) ?

(a) 143 (b) 186

(c) 151 (d) 134

RRB Group-D 26/08/2022 (Shift-I)

Ans. (c) : $\dfrac{x}{y} = 0.3\overline{72} = \dfrac{372-3}{990}$

$\dfrac{x}{y} = \dfrac{369}{990}$

$\dfrac{x}{y} = \dfrac{41}{110}$

$x + y = 41+110 = 151$

180. The sum of $\dfrac{1}{2}+\dfrac{1}{6}+\dfrac{1}{12}+....+\dfrac{1}{n(n+1)}$ is:

(a) $\dfrac{n+1}{n}$ (b) $\dfrac{n(n+1)}{2}$

(c) $\dfrac{n+1}{2n}$ (d) $\dfrac{n}{n+1}$

RRB NTPC 02.03.2021 (Shift-II) Stage Ist

Ans. (d) : $\dfrac{1}{2}+\dfrac{1}{6}+\dfrac{1}{12}+.....+\dfrac{1}{n(n+1)}$

$= \dfrac{1}{1\times 2}+\dfrac{1}{2\times 3}+\dfrac{1}{3\times 4}+.....+\dfrac{1}{n(n+1)}$

$= \dfrac{1}{1}-\dfrac{1}{2}+\dfrac{1}{2}-\dfrac{1}{3}+\dfrac{1}{3}-\dfrac{1}{4}+.....+\dfrac{1}{n}-\dfrac{1}{(n+1)}$

$= \dfrac{1}{1}-\dfrac{1}{(n+1)}$

$= \dfrac{n+1-1}{n+1} = \dfrac{n}{n+1}$

181. Express 32 : 20 in its lowest form.

(a) 8 : 5 (b) 8 :10

(c) 16 : 10 (d) 24 : 15

RRB NTPC 31.01.2021 (Shift-I) Stage Ist

Ans. (a) : $32 : 20 = \dfrac{32}{4} : \dfrac{20}{4} = 8 : 5$

182. Solve the following-

$\dfrac{\sqrt{144}}{6}\times\dfrac{\sqrt{121}}{8}\times\dfrac{132}{\sqrt{484}} = ?$

(a) 4 (b) $\dfrac{155}{36}$

(c) $\dfrac{33}{2}$ (d) $\dfrac{3}{4}$

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (c): $\dfrac{\sqrt{144}}{6}\times\dfrac{\sqrt{121}}{8}\times\dfrac{132}{\sqrt{484}}$

$= \dfrac{12}{6}\times\dfrac{11}{8}\times\dfrac{132}{22} = \dfrac{33}{2}$

183. Find the value of $\dfrac{1}{1.4}+\dfrac{1}{4.7}+\dfrac{1}{7.10}+....+\dfrac{1}{47.50}$

(a) $\dfrac{49}{50}$ (b) $\dfrac{47}{150}$

(c) $\dfrac{47}{50}$ (d) $\dfrac{49}{150}$

RRB NTPC 16.02.2021 (Shift-II) Stage Ist

Ans. (d) :

$\dfrac{1}{1.4}+\dfrac{1}{4.7}+\dfrac{1}{7.10}+.....+\dfrac{1}{47.50}$

Given expression 1, 4, 7, ….47, and 4, 7, 10, …..50 are in arithmetic series whose difference is 3. In this case sum of given term–

$\dfrac{1}{\text{Difference}}\left(\dfrac{1}{\text{First term}}-\dfrac{1}{\text{Last term}}\right)$

$= \dfrac{1}{3}\left(\dfrac{1}{1}-\dfrac{1}{50}\right)$

$= \dfrac{1}{3}\times\dfrac{49}{50}$

$= \dfrac{49}{150}$

184. What will be the value if you multiply $\dfrac{2}{11}$ by the reciprocal of $-\dfrac{5}{14}$?

(a) $\dfrac{28}{55}$ (b) $-\dfrac{28}{55}$

(c) $\dfrac{2}{3}$ (d) $-\dfrac{10}{153}$

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (b) : Reciprocal of $-\dfrac{5}{14} = -\dfrac{14}{5}$

$\therefore \quad \dfrac{2}{11}\times\left(-\dfrac{14}{5}\right) = -\dfrac{28}{55}$

185. The reciprocal of the sum of the reciprocals of 5/7 and 9/5 is:

(a) $\dfrac{35}{88}$ (b) $\dfrac{88}{45}$

(c) $\dfrac{45}{88}$ (d) $\dfrac{88}{35}$

RRB NTPC 27.02.2021 (Shift-I) Stage Ist

Ans. (c) : The sum of reciprocals of $\dfrac{5}{7}$ and $\dfrac{9}{5}$

$= \dfrac{7}{5}+\dfrac{5}{9}$

$$= \frac{63+25}{45} = \frac{88}{45}$$

Hence, the inverse of the sum of reciprocal of $\frac{5}{7}$ and $\frac{9}{5}$

$= \frac{45}{88}$

186. The sum of A fraction and its inverse is $2\frac{25}{66}$. Find the greater number of the two:

(a) $1\frac{15}{22}$ (b) $1\frac{5}{6}$

(c) $1\frac{20}{33}$ (d) $1\frac{5}{11}$

RRB Group-D – 05/10/2018 (Shift-II)

Ans : (b) Let the fraction be x and its inverse be $\frac{1}{x}$.

According to the question,

$$x + \frac{1}{x} = 2\frac{25}{66} ----- (I)$$

From option (b),

Putting the value $x = 1\frac{5}{6} = \frac{11}{6}$ in equation (I),

$$\frac{11}{6} + \frac{6}{11} = 2\frac{25}{66}$$

$$\Rightarrow \frac{121+36}{66} = 2\frac{25}{66}$$

$$\Rightarrow \frac{157}{66} = 2\frac{25}{66}$$

$$\Rightarrow 2\frac{25}{66} = 2\frac{25}{66}$$

Hence greatest fraction $= 1\frac{5}{6}$

187. The difference between a positive fraction and its inverse is $6\frac{39}{160}$. Find the fraction.

(a) $\frac{32}{5}$ (b) $\frac{13}{8}$

(c) $\frac{15}{8}$ (d) $\frac{16}{5}$

RRB Group-D – 15/10/2018 (Shift-II)

Ans : (a) Let the positive fraction be x

So, inverse $= \frac{1}{x}$

According to the question,

$$x - \frac{1}{x} = 6\frac{39}{160}$$

$$\frac{x^2-1}{x} = \frac{999}{160}$$

$160x^2 - 160 = 999x$

$160x^2 - 999x - 160 = 0$

$160x^2 - (1024-25)x - 160 = 0$

$160x^2 - 1024x + 25x - 160 = 0$

$32x(5x - 32) + 5(5x - 32) = 0$

$(32x + 5)(5x - 32) = 0$

$32x + 5 = 0, \quad 5x - 32 = 0$

$32x = -5, \quad 5x = 32$

$\boxed{x = \frac{-5}{32}}, \quad \boxed{x = \frac{32}{5}}$

188. Which of the following fractions should be added to $\frac{5}{9}$ obtain $\frac{11}{6}$ as the sum?

(a) $1\frac{5}{18}$ (b) $1\frac{1}{3}$

(c) $1\frac{5}{15}$ (d) $1\frac{7}{18}$

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (a) Let the fraction to be added is $= \frac{x}{y}$

According to the question, $\frac{5}{9} + \frac{x}{y} = \frac{11}{6}$

$$\frac{x}{y} = \frac{11}{6} - \frac{5}{9} = \frac{33-10}{18}$$

$$\frac{x}{y} = \frac{23}{18}$$

or $\frac{x}{y} = 1\frac{5}{18}$

189. Sum of $\frac{5}{11}$ and $\frac{11}{5}$ =?

(a) $\frac{146}{55}$ (b) $\frac{16}{16}$

(c) $\frac{16}{55}$ (d) $\frac{110}{55}$

RRB Group-D – 26/09/2018 (Shift-II)

Ans. (a) : $\frac{5}{11} + \frac{11}{5} = \frac{25+121}{55} = \frac{146}{55}$

190. What is the sum of $\frac{1}{3}, \frac{4}{3}$ and $\frac{3}{4}$

(a) $\frac{26}{12}$ (b) 2

(c) $\frac{27}{12}$ (d) $\frac{29}{12}$

RRB NTPC 01.02.2021 (Shift-II) Stage I

Ans. (d) : From question,

$$\frac{1}{3} + \frac{4}{3} + \frac{3}{4} = \frac{4+16+9}{12} = \frac{29}{12}$$

191. What is the difference between the biggest and the smallest fraction among $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}$ and $\frac{5}{6}$?

(a) $\frac{1}{30}$ (b) $\frac{1}{6}$

(c) $\frac{1}{12}$ (d) $\frac{1}{20}$

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (b) : $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}$

For equaling denominator we have to multiply and divide each fraction by LCM of 3, 4, 5 and 6 = 60.

$\Rightarrow \frac{2}{3}\times\frac{60}{60}, \frac{3}{4}\times\frac{60}{60}, \frac{4}{5}\times\frac{60}{60}, \frac{5}{6}\times\frac{60}{60}$

$\Rightarrow \frac{40}{60}, \frac{45}{60}, \frac{48}{60}, \frac{50}{60}$

Hence, biggest fraction $= \frac{5}{6}$

Smallest fraction $= \frac{2}{3}$

Required difference $= \frac{5}{6} - \frac{2}{3} = \boxed{\frac{1}{6}}$

192. The value of 0.0006697 to three digits of decimal will be :

(a) 0.000670 (b) 0.00669

(c) 0.001 (d) 0

RRB RPF Constable -22/01/2019 (Shift-I)

Ans : (c) The value of 0.0006697 till three digits of decimal = 0.001,
After decimal if the right digit is 5 or more than 5, then we add 1 to the left digit.

193. Which fraction is not equal to $\frac{15}{23}$?

(a) $\frac{105}{162}$ (b) $\frac{75}{115}$

(c) $\frac{45}{69}$ (d) $\frac{30}{46}$

RRB RPF-SI -12/01/2019 (Shift-I)

Ans : (a) From options–

(a) $\frac{105}{162} = \frac{35}{54}$ (b) $\frac{75}{115} = \frac{15}{23}$

(c) $\frac{45}{69} = \frac{15}{23}$ (d) $\frac{30}{46} = \frac{15}{23}$

Hence, it is clear that option (a) is not equal to $\frac{15}{23}$.

194. 0.065 × 0.4 = ?

(a) 0.26 (b) 0.026

(c) 2.6 (d) 0.0026

RRB RPF-SI -11/01/2019 (Shift-I)

Ans : (b) Given,
0.065 × 0.4 = 0.026

195. Find the value of 0.1404 ÷ 0.06 = ?

(a) 0.234 (b) 2.34

(c) 234 (d) 23.4

RRB RPF Constable -18/01/2019 (Shift-I)

Ans :(b) Given,

$0.1404 \div 0.06$

$= \frac{0.1404\times10000}{0.06\times10000} = \frac{1404}{600} = 2.34$

196. Which of the following fractions is greater than 7/12, and smaller than 11/16?

(a) 1/2 (b) 5/8

(c) 7/8 (d) 3/8

RRB JE - 27/06/2019 (Shift-I)

Ans : (b) From the given fractions,

$\frac{7}{12} = 0.58$ $\frac{11}{16} = 0.68$

From options–

(a) $\frac{1}{2} = 0.50$ (b) $\frac{5}{8} = 0.62$

(c) $\frac{7}{8} = 0.87$ (d) $\frac{3}{8} = 0.37$

Hence, option (b) is 0.62, which is greater than 0.58 and smaller than 0.68.

197. Which of the following is correct?

(a) $\frac{9}{16} \le \frac{13}{24}$ (b) $\frac{9}{16} > \frac{13}{24}$

(c) $\frac{9}{16} = \frac{13}{24}$ (d) $\frac{9}{16} < \frac{13}{24}$

RRB Group-D – 17/09/2018 (Shift-I)

Ans : (b) From options,

(a) $\frac{9}{16} \le \frac{13}{24} = 0.56 \le 0.54$ (wrong)

(b) $\frac{9}{16} > \frac{13}{24} = 0.56 > 0.54$ (right)

(c) $\frac{9}{16} = \frac{13}{24} = 0.56 = 0.54$ (wrong)

(d) $\frac{9}{16} < \frac{13}{24} = 0.56 < 0.54$ (wrong)

198. Find the smallest of the following decimals.

(a) 0.1 × 0.1 × 0.1 (b) 0.03 / 3

(c) 0.01 / 2 (d) 0.1 × 0.02 × 0.2

RRB NTPC 05.04.2016 Shift-1

Ans : (d) From options–

(a) 0.1 × 0.1 × 0.1 = 0.001

(b) 0.03 / 3 = 0.01

(c) 0.01 / 2 = 0.005

(d) 0.1 × 0.02 × 0.2 = 0.0004

Hence option (d) is the smallest.

199. Find the smallest of the following decimals.

(a) 0.2 × 0.2 × 0.2 (b) 0.02 / 3

(c) 0.01 / 2 (d) 0.1 × 0.02 × 2

RRB NTPC 31.03.2016 Shift : 2

Ans: (d) From options–

(a) $0.2 \times 0.2 \times 0.2 = 0.008$

(b) $\frac{0.02}{3} = 0.0067$

(c) $\frac{0.01}{2} = 0.005$

(d) $0.1 \times 0.02 \times 2 = 0.004$

Hence, it is clear that option (d) is the smallest.

200. The numerator of a fraction is one less than the denominator. If 6 is added to the numerator, the fraction will be equal to $\frac{5}{4}$ Find the fraction.

(a) $-\frac{20}{21}$ (b) $\frac{19}{20}$

(c) $-\frac{21}{20}$ (d) $\frac{20}{21}$

RRB Group-D 30/08/2022 (Shift-I)

Ans. (b) : Let, denominator be x

then, Numerator = x – 1

$\therefore$ Fraction = x – 1/x

According to the question,

$\frac{x-1+6}{x} = \frac{5}{4}$

$4x + 20 = 5x$

$x = 20$

Hence, fraction $\boxed{\frac{x-1}{x} \Rightarrow \frac{19}{20}}$

201. Convert 25 grams to kilogram and express the answer as a fraction.

(a) $\frac{1}{40}$ kg (b) $\frac{1}{400}$ kg

(c) $\frac{1}{4000}$ kg (d) $\frac{1}{4}$ kg

RRB Group-D 06/09/2022 (Shift-I)

Ans. (a) : 1000 gm = 1kg

$1gm = \frac{1}{1000}kg$

so,

$\therefore$ $25\ gm = \frac{25}{1000}kg = \frac{1}{40}kg$

202. If we add 1 to the numerator and subtract 1 from the denominator of a given fraction, it becomes 1. It becomes $\frac{2}{3}$ if 1 is added to the denominator of the given fraction while the numerator is left unchanged. The fraction originally given is:

(a) $\frac{5}{8}$ (b) $\frac{3}{8}$ (c) $\frac{1}{8}$ (d) $\frac{6}{8}$

RRB GROUP-D – 15/09/2022 (Shift-III)

Ans. (d): Let the fraction be $\frac{x}{y}$

According to first condition,

$\frac{x+1}{y-1} = 1$

$x + 1 = y - 1$

$x - y = -2$ ..... (i)

According to second condition,

$\frac{x}{y+1} = \frac{2}{3}$

$3x = 2y + 2$

$3x - 2y = 2$ ..... (ii)

On multiplying by 3 in eq. (i) and subtracting eq. (ii) -

$-y = -8$

$\therefore$ $y = 8$

$x = -2 + 8$ [$\therefore$ From eq. (i)]

$x = 6$

Hence the original fraction $= \frac{x}{y} = \frac{6}{8}$

204. Which fraction bears the same ratio to $\frac{1}{27}$ as $\frac{3}{11}$ does to $\frac{5}{9}$?

(a) $\frac{1}{99}$ (b) $\frac{1}{27}$

(c) $\frac{1}{55}$ (d) $\frac{1}{15}$

RRB NTPC 03.02.2021 (Shift-II) Stage Ist

Ans. (c) : Let the fraction = $\frac{x}{y}$

According to the question-

$\frac{x}{y} : \frac{1}{27}$

$27x : y$ ...(i)

$\frac{3}{11} : \frac{5}{9}$

$27 : 55$ ....(ii)

On comparing eq^n (i) and (ii),

$x = 1$, $y = 55$

Hence, the fraction = $\frac{1}{55}$

203. 200 g as a fraction of 1 kg is:

(a) $\frac{1}{10}$ (b) $\frac{3}{10}$

(c) $\frac{2}{5}$ (d) $\frac{1}{5}$

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (d) : According to the question–

$200g = \frac{200}{1000}kg = \frac{1}{5}kg$

Therefore, 200g is a 1/5 part of 1 kg.

204. Which of the following number is closest to zero?

(a) $(1-0.09)^2$ (b) $1-(0.09)^2$

(c) 0.009 (d) $(0.09)^2$

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (d) : From the given options-

(a) $(1-0.09)^2$

$1 + 0.0081 - 0.18$

$= 0.8281$

(b) $1-(0.09)^2$

$1 - 0.0081$

$= 0.9919$

(c) 0.009

(d) $(0.09)^2$

$= 0.0081$

Hence, option (d) is closest to zero.

205. Which of the following fraction falls between $\frac{3}{4}$ and $\frac{6}{7}$?

(a) $\frac{11}{9}$ (b) $\frac{9}{10}$

(c) $\frac{5}{9}$ (d) $\frac{9}{11}$

RRB NTPC 26.07.2021 (Shift-I) Stage Ist

Ans. (d) : The given fractions $\frac{3}{4} = 0.75$

and $\frac{6}{7} = 0.857$

Now from options-

(a) $\frac{11}{9} = 1.22$ (b) $\frac{9}{10} = 0.9$

(c) $\frac{5}{9} = 0.55$ (d) $\frac{9}{11} = 0.818$

$\because$ 0.818 lies between 0.75 and 0.85

Hence, $\frac{9}{11}$ lies between $\frac{3}{4}$ and $\frac{6}{7}$

206. If 58 out of 100 students in a school are boys, then express the part of the school that consists of boys in decimals.

(a) 0.5 (b) 0.58

(c) 0.8 (d) 0.85

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (b) : Hence, the part of the school that consists of boys in decimals = $\frac{58}{100} = 0.58$

207. What is the LCM of 98, 28 and 112 ?

(a) 784 (b) 1176

(c) 392 (d) 1568

RRB NTPC (Stage-2) 15/06/2022 (Shift-III)

Ans. (a): LCM of 98, 28 and 112

$98 = 7\times7\times2$

$28 = 7\times2\times2$

$112 = 2\times2\times2\times2\times7$

L.C.M. $= 2\times2\times2\times2\times7\times7$

$= 784$

208. The LCM of the numbers 36, 54, 72 and 96 is :

(a) 1064 (b) 764

(c) 864 (d) 964

RRB Group-D 09/09/2022 (Shift-I)

Ans. (c) : The LCM of the numbers 36, 54, 72 and 96 is

$36 = 2 \times 2 \times 3 \times 3$

$54 = 2 \times 3 \times 3 \times 3$

$72 = 2 \times 2 \times 2 \times 3 \times 3$

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

Hence the LCM of 36, 54, 72, 96

$= 2\times2\times2\times 2 \times 2 \times 3 \times 3 \times 3$

$= 32 \times 27$

$= 864$

209. The LCM of the numbers 24, 42 and 56 is :

(a) 816 (b) 186

(c) 168 (d) 618

RRB Group-D 01/09/2022 (Shift-I)

Ans. (c) : Factors of 24, 42, 56

$24 = 2\times2\times2\times3$

$42 = 2\times3\times7$

$56 = 2\times2\times2\times7$

LCM $= 2\times2\times2\times3\times7 = 168$

210. The LCM of the numbers 70, 28 and 42 is :

(a) 116 (b) 420

(c) 280 (d) 700

RRB Group-D 13/09/2022 (Shift-III)

Ans. (b) : LCM of (70, 28, 42)

2	70,	28,	42
2	35,	14,	21
3	35,	7,	21
5	35,	7,	7
7	7,	7,	7
	1,	1,	1

Hence LCM of 70, 28 and 42 $= 2 \times 2 \times 3 \times 5 \times 7$

$= 420$

211. What is the smallest natural number that should be added to 1225 such that a remainder of 3 is left when the resulting number is divided by each of the numbers 12, 18, 21 and 28?

(a) 41 (b) 38

(c) 35 (d) 43

RRB Group-D 05/09/2022 (Shift-III)

Ans. (b): LCM of 12, 18, 21 and 28

2	12,	18,	21,	28
2	6,	9,	21,	14
3	3,	9,	21,	7
3	1,	3,	7,	7
7	1,	1,	7,	7
	1,	1,	1,	1

L.C.M = $2\times2\times3\times3\times7 = 252$

$252\overline{)1225}(4$
1008
217

Hence, required number = (252 – 217) + 3 = 38

212. The largest four-digit number which when divided by 7, 11, and 13 leaves remainder 4 in each case is :

(a) 9999 (b) 9009
(c) 1005 (d) 9013

RRB Group-D 09/09/2022 (Shift-II)

Ans. (c) : LCM of 7, 11 and 13 = $7 \times 11 \times 13$
$= 1001$
Hence, required number = 1001 + 4 = 1005

213. The least number which on being divided by 2, 3, 4, 5 and 6 leaves a remainder of 1 but no remainder when divided by 7 is :

(a) 322 (b) 301
(c) 308 (d) 315

RRB NTPC 03.02.2021 (Shift-II) Stage Ist

Ans. (b) : The smallest number = LCM of 2, 3, 4, 5 and 6 = 60,
According to the question-
$(60x+1)$, is divisible by 7.
$\therefore$ Taking x = 5
Required number = $60 \times 5 + 1 = 301$

214. Find the least number that when divided by 9, 8, 10 and 12 leaves a remainder 3 in each case.

(a) 365 (b) 361
(c) 363 (d) 367

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (c) : L.C.M. of 9, 8, 10 and 12 = 360
According to question, in each case the remainder is 3
Number = 360 + 3
So, number will be 363.

215. Ravi has 1530 eggs with him while Vinita has 2380 eggs with her that needs to be placed in cartons. What is the maximum number of eggs that each carton should hold so that both Ravi as well as Vinita finds such cartons acceptable to use, leaving no empty space, nor having any egg unpacked?

(a) 170 (b) 255
(c) 340 (d) 85

RRB NTPC (Stage-II) 17/06/2022 (Shift-III)

Ans. (a) : HCF of 1530 and 2380
$1530 = 2 \times 5 \times 17 \times 3 \times 3$
$2380 = 2 \times 5 \times 17 \times 2 \times 7$
HCF = $2 \times 5 \times 17 = 170$
Hence, Maximum number of eggs = 170

216. Kiran has 24 white beads and Resham has 18 black beads. They want to arrange the beads in such a way that each row contains equal number of beads and each row must contain either only black beads or only white beads. What is the greatest number of beads that can be arranged in a row?

(a) 8 (b) 3
(c) 6 (d) 12

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (c) : Kiran has 24 white beads and
Resham has 18 black beads.
$24 = 2\times2\times2\times3$
$18 = 2\times3\times3$
HCF = $2\times3=6$
So maximum number of beads is 6 that can be arranged in a row.

217. What is the HCF of 144, 360 and 504 ?

(a) 24 (b) 36
(c) 72 (d) 18

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (c) : HCF of 144, 360 and 504
$144 = 2\times2\times2\times2\times3\times3$
$360 = 2\times2\times2\times3\times3\times5$
$504 = 2\times2\times2\times3\times3\times7$
HCF = $2\times2\times2\times3\times3$
Hence required HCF = 72

218. If $x = 2^3 \times 3^2 \times 5 \times 7^3$, $y = 2^2 \times 3^3 \times 5^2 \times 7^2$, and $z = 2^4 \times 3 \times 5^3 \times 7$. Then the HCF of x, y and z is:

(a) 1260 (b) 840
(c) 420 (d) 630

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (c) : Given,
$x = 2^3 \times 3^2 \times 5 \times 7^3$
$y = 2^2 \times 3^3 \times 5^2 \times 7^2$
$z = 2^4 \times 3 \times 5^3 \times 7$
HCF of x, y and z = $2^2 \times 3 \times 5 \times 7$
$= 4\times 3 \times 5 \times 7$
$= 420$

219. The greatest number, which divides 2000 and 2200 to leave 22 and 38 respectively as remainders, is:

(a) 46 (b) 39
(c) 42 (d) 36

RRB GROUP-D – 18/09/2022 (Shift-II)

Ans. (a) : According to the question,
2000 – 22 = 1978
2200 – 38 = 2162 HCF = 46

$1978\overline{)2162}(1$
1978
$184\overline{)1978}(10$
1840
$138\overline{)184}(1$
138
$46\overline{)138}(3$
138
$\times$

Hence, the greatest number is 46.

220. Let x be the greatest number which divides 7072, 8505 and 9925 leaving remainders 22, 45 and 55 respectively. Find the sum of the digit of x.

(a) 6 (b) 5
(c) 7 (d) 8

RRB Group-D 06/09/2022 (Shift-I)

Ans. (a) : According to the question,
7072 – 22 = 7050
8505 – 45 = 8460
9925 – 55 = 9870
HCF = 1410
sum of digit of x = 1 + 4 + 1 + 0
= 6

221. Find the greatest number by which when the numbers 158 and 215 are divided, it leaves remainders 4 and 5, respectively.

(a) 21 (b) 18
(c) 7 (d) 14

RRB Group-D 02/09/2022 (Shift-I)

Ans. (d) :
According to the question,
First number = 158–4 = 154
Second Number = 215 – 5 = 210

154)210(1
154
56)154(2
112
42)56(1
42
14)42(3
42
××

Hence, the greatest required number = 14

222. The largest number which divides 55, 72 and 123 leaving the remainders 3, 7 and 6 respectively is:

(a) 13 (b) 66
(c) 26 (d) 117

RRB NTPC 09.01.2021 (Shift-II) Stage Ist

Ans. (a) : According to the question,
55 – 3 = 52
72 – 7 = 65
123 – 6 = 117
HCF of 52, 65 and117 = 13
Hence the required largest number = 13

223. The HCF of fractions is calculated as $\frac{\text{HCF of the numerators}}{\text{LCM of the denominators}}$. Find the HCF of $\frac{2}{3}, \frac{4}{5}$ and $\frac{3}{2}$.

(a) $\frac{1}{40}$ (b) $\frac{1}{30}$
(c) $\frac{5}{30}$ (d) $\frac{3}{50}$

RRB GROUP-D – 29/09/2022 (Shift-III)

Ans. (b) : $\text{HCF} = \frac{\text{HCF of the numerators}}{\text{LCM of the denominators}}$

$= \frac{\text{HCF of } (2,4,3)}{\text{LCM of } (3,5,2)}$

$= \frac{1}{30}$

224. The LCM of fractions is calculated as $\frac{\text{LCM of the numerators}}{\text{HCF of denomination}}$. Find the LCM of $\frac{5}{6}, \frac{6}{5}$, and $\frac{3}{2}$,

(a) 20 (b) 15
(c) 30 (d) 25

RRB GROUP-D – 28/09/2022 (Shift-II)

Ans. (c) :

LCM of fractions $\frac{\text{LCM of the numerators}}{\text{HCF of denominator}}$

LCM of $\frac{5}{6}, \frac{6}{5}$ and $\frac{3}{2} = \frac{\text{LCM of 5, 6 and 3}}{\text{HCF of 6, 5 and 2}}$

$= \frac{30}{1}$

$= 30$

225. The LCM of $\frac{2}{3}, \frac{4}{9}, \frac{7}{12}, \frac{3}{5}$ is:

(a) 98 (b) 94
(c) 84 (d) 86

RRB NTPC 13.03.2021 (Shift-I) Stage Ist

Ans. (c) : L. C. M of $\frac{2}{3}, \frac{4}{9}, \frac{7}{12}, \frac{3}{5}$

$\frac{\text{L.C.M. of numerator}}{\text{H.C.F. of denominator}} = \frac{\text{L.C.M. of 2, 4, 7 and 3}}{\text{H.C.F. of 3, 9, 12 and 5}}$

$= \frac{4 \times 7 \times 3}{1}$

$= 84$

226. Find the greatest possible length that can be used to measure exactly the lengths $3\frac{1}{2}$m and $8\frac{3}{4}$m.

(a) $\frac{11}{4}$m (b) $\frac{7}{4}$m
(c) $\frac{3}{4}$m (d) $\frac{9}{4}$m

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (b):

HCF of $3\frac{1}{2}$ and $8\frac{3}{4} = \frac{\text{HCF of numerator}}{\text{LCM of denominator}}$

HCF of $\frac{7}{2}$ and $\frac{35}{4} = \frac{\text{HCF of } 7, 35}{\text{LCM of } 2, 4} = \frac{7}{4}$

Hence, greatest possible length $= \frac{7}{4}$ m

227. The ratio of the two numbers is 3 : 4 and their LCM is 480. Find their HCF.

(a) 40 (b) 160

(c) 30 (d) 120

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (a) : Given,

Ratio of two numbers = 3: 4

LCM = 3 × 4 × x

Then 3× 4 × x = 480

12x = 480

x = 40

Hence, the HCF of 3x and 4x HCF are 40.

228. If the sum of two numbers is 54 and the LCM and HCF of these numbers are 84 are 6, respectively, then the sum of the reciprocal of the numbers is :

(a) $\frac{9}{28}$ (b) $\frac{7}{28}$

(c) $\frac{3}{28}$ (d) $\frac{5}{28}$

RRB Group-D 29/08/2022 (Shift-II)

Ans. (c) : Let the two numbers be x and y.

According to the question,

$\therefore$ x + y = 54 .....(i)

$\because$ x y = LCM × HCF

$\therefore$ xy = 84 × 6 ..... (ii)

Sum of reciprocal of the numbers = $\frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy}$

From equation (i) & (ii) $\Rightarrow \frac{y+x}{xy} = \frac{54}{84 \times 6} = \frac{3}{28}$

229. If the product of two numbers, not necessarily distinct from each other, is 25 and their HCF is 5, then their LCM is :

(a) 7 (b) 4

(c) 5 (d) 6

RRB Group-D 01/09/2022 (Shift-III)

Ans. (c) : Let the numbers 5x and 5y

$5x \times 5y = 25$

$xy = \frac{25}{25} = 1$

Therefore, the value of x and y each will be 1 then LCM of the numbers 5x and 5y = 5x and 5y = 5 × 1 = 5

230. The HCF and the LCM of two numbers are 1080 and 30240, respectively. If one of the numbers is 4320, then the other number is_____

(a) 30240 (b) 1080

(c) 7560 (d) 8640

RRB Group-D 13/09/2022 (Shift-II)

Ans. (c) : I^{st} number × II^{nd} number = LCM × HCF

4320 × II^{nd} number = 1080×30240

II^{nd} number = $\frac{1080 \times 30240}{4320} = 7560$

231. Two natural number are in the ratio of 6:5 and the product of their LCM and HCF is 6750. What is the sum of the numbers ?

(a) 180 (b) 165

(c) 160 (d) 145

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (b) : Let the two numbers be 6 x and 5x.

and product of LCM and HCF = 6,750

$\because$ 1^{st} number × 2^{nd} number = LCM × HCF

$6x \times 5x = 6{,}750$

$30x^2 = 6{,}750$

$x^2 = \frac{6{,}750}{30}$

$x^2 = 225$

$\boxed{x = 15}$

1^{st} number = 6x 2^{nd} number = 5x

= 6 × 15 = 90, = 5 × 15

= 75

Hence Sum of both numbers = 90 + 75 = 165

232. The LCM of two numbers is 20 times their HCF, and the sum of the LCM and the HCF is 504. If the difference of the numbers is 24, then find the sum of the numbers.

(a) 210 (b) 216

(c) 225 (d) 180

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (b) : According to the question,

L = 20 H —— (i)

and, L + H = 504 ——(ii)

H(a – b) = 24 ——(iii)

From equation (iii) a – b = 1

20H + H = 504 $\Rightarrow$ H = 24

equation (iii) and (a – b) = 1

$\because$ L = H.a.b

$\therefore$ H.a.b = 20H [from equation (i)]

ab = 20

$(a + b)^2 = (a – b)^2 + 4ab$

= 1 + 80 = 81

$\Rightarrow$ (a + b) = 9

Hence, Sum of numbers = H(a + b)

= 24×9 = 216

233. The ratio of two numbers is 11:4 and their HCF is 16. What is the sum of these two numbers?

(a) 240 (b) 320
(c) 256 (d) 224

RRB NTPC (Stage-II) –13/06/2022 (Shift-I)

Ans. (a) :
Let the two numbers are 11x and 4x respectively.
Given, x = HCF = 16
First Number = 11 × 16 = 176
Second number = 4 × 16 = 64
Sum of numbers = 176 + 64 = 240

234. The LCM of two numbers is 84. If the numbers are in the ratio 2: 3, then find the sum of the numbers.

(a) 40 (b) 70
(c) 25 (d) 60

RRB Group-D 24/08/2022 (Shift-I)

Ans. (b) : Let two numbers are a and b then,
a : b = 2 : 3 = 2x : 3x
HCF of 2x and 3x = x
According to the questions,
a × b = LCM × HCF
2x × 3x = x × 84
x = 14
Sum of the numbers = (2x + 3x) = 5x = 5 × 14
= 70

235. A rectangular courtyard is 18 m 72 cm long and 13 m 20 cm broad. It is to be paved with square tiles all of the same size. Find the least possible number of such tiles required.

(a) 4292 (b) 4290
(c) 4294 (d) 4295

RRB NTPC 28.01.2021 (Shift-I) Stage Ist

Ans. (b) : Given that,
Length (l) = 18 m 72 cm = 1872 cm
Broad (b) = 13 m 20 cm = 1320 cm
For minimum number of tiles, we have to calculate HCF of 1872 and 1320.
$1872 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 13$
$1320 = 2 \times 2 \times 2 \times 3 \times 5 \times 11$
$\therefore$ HCF = 2 × 2 × 2 × 3 = 24 cm
Therefore, the maximum size of the tile should be square tile of side 24 cm.
So, required of minimum tiles

$$= \frac{1872 \times 1320}{24 \times 24} = 78 \times 55$$
$$= 4290$$

236. Flooring of a room 12 m long and 8 m wide is to be designed by squares of maximum possible area. Find the number of square designs required.

(a) 6 (b) 4
(c) 5 (d) 8

RRB NTPC 04.02.2021 (Shift-II) Stage Ist

Ans. (a) :
Side of one Square design = HCF of 12 and 8 = 4

$$\text{Required number} = \frac{\text{Area of floor of room}}{\text{Area of one square design}}$$

$$= \frac{12 \times 8}{4 \times 4} = 6$$

237. The floor of a hall measuring 16 meters in length and 12 meters in width is to be paved with square tiles. If the least number of tiles are to be used, then what is the length of each square tile?

(a) 4 meters (b) 12 meters
(c) 48 meters (d) 24 meters

RRB NTPC 08.01.2021 (Shift-I) Stage Ist

Ans. (a) : Length of floor = 16m
Breadth of floor = 12m
$\therefore$ HCF of 16 & 12 = 4
Hence the length of each square tiles = 4 meter

238. What is the length of the side of the largest square tile, which is used for constructing the floor of tile of 13.92m length and 5.22m breadth.

(a) 58 cm (b) 1 m 16 cm
(c) 1 m 74 cm (d) 87 cm

RRB Group-D – 24/10/2018 (Shift-III)

Ans. (c) : The side of the largest square tile = HCF of 13.92m and 5.22m,
On finding the HCF by division method,

$522\overline{)1392}\,(2$
$\underline{1044}$
$348\overline{)522}\,(1$
$\underline{348}$
$174\overline{)348}\,(2$
$\underline{348}$
$\times\times\times$

So, the HCF is 174.
Hence, the length of the side = 174cm = 1m 74cm.

239. Five bells commence tolling together and toll at intervals of 3, 6, 12, 15 and 18 seconds respectively. They tolled at 9:58:45 hours then at which time they will again toll together?

(a) 10:02:45 (b) 10:01:45
(c) 10:01:15 (d) 10:00:15

RRB NTPC (Stage-2) 16/06/2022 (Shift-II)

Ans. (b) : LCM of 3, 6, 12, 15 and 18.

3	3,	6,	12,	15	18
2	1,	2,	4,	5,	6
2	1,	1,	2,	5,	3
3	1,	1,	1,	5,	3
5	1,	1,	1,	5,	1
	1,	1,	1,	1,	1

= 3×2×2×3×5
= 180 sec or 3 minutes

According to the question,

The bells rings at 9 : 58 : 45

9 : 58 : 45

: 3 :

10 : 01 : 45 The bells rang together again

Hence, At 10:01:45 hours they will again toll together.

240. There are three consecutive road crossings at which traffic lights change after every 35 seconds, 42 seconds and 90 seconds, respectively. if the lights are set on simultaneously at 8:00, then after how much time will they change again simultaneously?

(a) 10 minutes 30 seconds
(b) 9 minutes 10 seconds
(c) 7 minutes 20 seconds
(d) 9 minutes 30 second

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (a) : L.C.M of 35, 42 and 90.

2	35, 42, 90
3	35, 21, 45
3	35, 7, 15
5	35, 7, 5
7	7, 7, 1
	1, 1, 1

$= 2 \times 3 \times 3 \times 5 \times 7$

= 630 Seconds

= 10 minute 30 seconds

After 10 minutes 30 seconds light will again change simultaneously.

241. There are four table clocks. They ring every 10 min, 15 min, 20 min and 25 min respectively. If they all ring together at 10 am, then at what time will they ring together again?

(a) 10:00 a.m. (b) 3:00 p.m.
(c) 10:00 p.m. (d) 3:30 p.m.

RRB NTPC 12.01.2021 (Shift-II) Stage Ist

Ans. (b) :
L.C.M. of 10,15,20 and 25 = 300 min = 5 hours
Hence the table clock will again ring at 10:00 am + 5 hours simultaneously = 3 : 00 pm

242. What is the largest number that will divide both 288 and 468 without leaving any remained?

(a) 18 (b) 72
(c) 36 (d) 39

RRB NTPC (Stage-II) –16/06/2022 (Shift-I)

Ans. (c) : According to the question,

$\therefore$ $288 = 2\times2\times2\times2\times2\times3\times3$

and $468 = 2\times2\times3\times3\times13$

$\therefore$ HCF of 288 and 468 $= 2\times2\times3\times3$

$= 36$

Hence, the largest number is 36 that will divide both 288 and 468 without leaving any remained.

243. A pendulum strikes 2 times in 3s and another pendulum strikes 5 times in 7s. If both pendulum start striking at the same time, how many simultaneous strikes will take place in 1 min?

(a) 2 (b) 4
(c) 5 (d) 3

RRB NTPC 16.02.2021 (Shift-II) Stage Ist

Ans. (a) : According to question:

Pendulum on strikes 1 time = Difference of $\frac{3}{2}$ seconds

And other pendulum on strikes 1 time = Difference of $\frac{7}{5}$ seconds

If both Pendulum start striking at the same time, then they will strike together = LCM of $\frac{3}{2}$ and $\frac{7}{5}$ = Difference of 21 seconds

They strike together in 1 min (60 sec)

$= \frac{60}{21} = \frac{20}{7} = 2\frac{6}{7} = 2$ times (take only whole number)

244. Which of the following numbers is divisible by 7, 11 and 13?

(a) 1005001 (b) 1003001
(c) 1004001 (d) 1002001

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (d) : LCM of 7, 11 and $13 = 7 \times 11 \times 13$

$= 1001$

$\therefore (1001)^2 = 1002001$

Hence, 1002001 divisible by 7, 11 and 13.

245. The smallest natural number which is divisible by 8, 12, 28 and 36 is:

(a) 252 (b) 168
(c) 504 (d) 336

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (c) : Smallest natural number which is divisible by 8, 12, 28 and 36 $\Rightarrow$ LCM of 8, 12, 28 and 36

$\therefore$ LCM of 8, 12, 28 and 36 = 504

Hence, 504 is required answer.

246. The smallest four-digit number that is exactly divisible by each of 24, 40 and 56 is :

(a) 1080 (b) 1680
(c) 1260 (d) 1170

RRB Group-D 05/09/2022 (Shift-II)

Ans. (b) : Factorization of 24, 40 and 56

$24 = 2\times2\times2\times3$

$40 = 2\times2\times2\times5$

$56 = 2\times2\times2\times7$

LCM $= 2\times2\times2\times3\times5\times7 = 840$

Hence the smallest number of four digit $= 2\times840$

$= 1680$

02

Geometry

(Pythagoras Theorem, Similar and Congruence Triangles)

Geometry = Geo + Metron
Earth (पृथ्वी) Measurement (मापन)

☞ यूक्लिड को ज्यामिति का जनक कहा जाता है।
(Euclid is called the father of geometry).

Line and Angle

Point (•): A point has an exact location
• No size

Line :

Straight path, extends in both directions without end.
• Contains infinite points.

Plane :

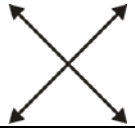
A two dimensional flat surface with zero thickness.

Collinear points :

Three or more point that lie on the same line.

Line Segment :

A line segment has a definite length.
A straight path between two points with a fixed length.

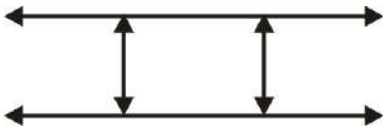
Intersecting Line : Two or more lines that cross each other and share a common point in a plane.


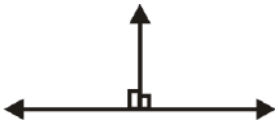
Non Collinear Points :

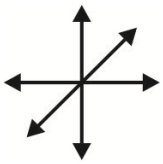
Three or more points that do not lie on the same line.

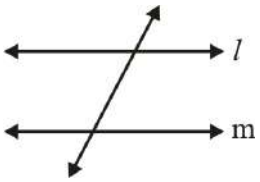
Rays :

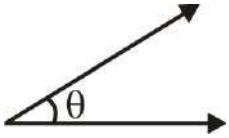
A line with uni-direction length.

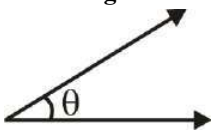
Parallel Lines :


Perpendicular Lines :


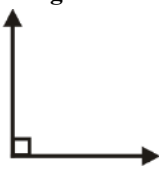
Concurrent Lines :


Transversal Line :


Angle : Inclination (tilt) between the two straight line.


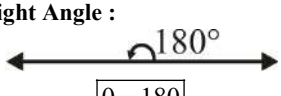
Acute Angle :


$0 < \theta < 90$

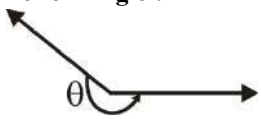
Right Angle :

$\angle\theta = 90$

Obtuse Angle :

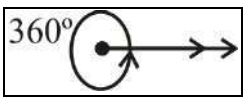

$90 < \theta < 180$

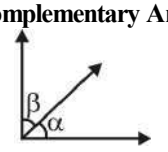
Straight Angle :


$\theta = 180$

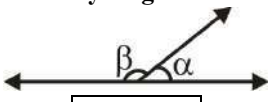
Reflex Angle :


$180° < \theta < 360°$

Whole/ Circle Angle :
$\theta = 360°$


Complementary Angle :


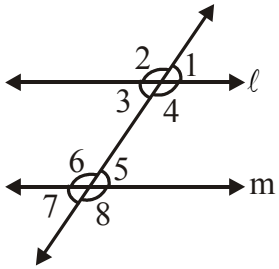
$\alpha + \beta = 90$
If $\alpha = x$ then $\beta = (90 - x)$

Supplementary Angle :


$\alpha + \beta = 180$
If $\alpha = x$ then $\beta = (180 - x)$

Angle Based on Transversal Line

If $\ell \parallel m$



Vertically opposite Angle :

$\angle 1 = \angle 3$ $\angle 2 = \angle 4$

$\angle 5 = \angle 7$ $\angle 6 = \angle 8$

Interior Alternative Angle :

$\angle 3 = \angle 5$ $\angle 4 = \angle 6$

Exterior Alternative Angle :

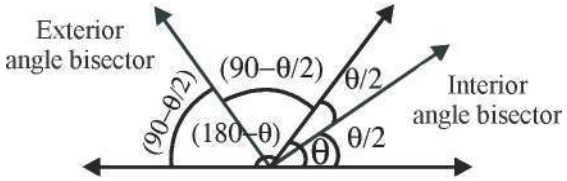
$\angle 1 = \angle 7$ $\angle 2 = \angle 8$

Corresponding Angle :

$\angle 1 = \angle 5$ $\angle 2 = \angle 6$

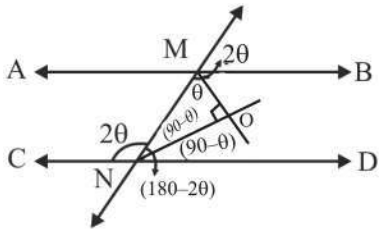
$\angle 3 = \angle 7$ $\angle 4 = \angle 8$

- The angle made by the bisector of the interior angle and exterior angle is 90°.

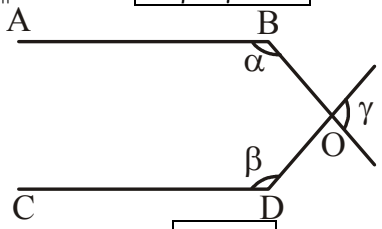


- If two parallel lines are intersected by a intersecting line then the angle formed by the bisector of the interior angles is 90°.

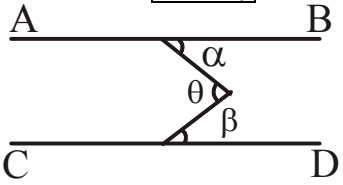
$\angle MON = 90°$



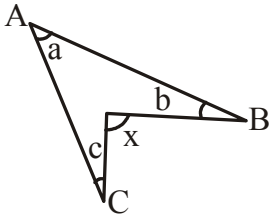
- If AB || CD then $\boxed{\alpha + \beta + \gamma = 360^\circ}$



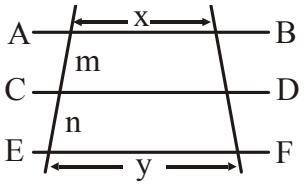
- If AB || CD then $\boxed{\theta = \alpha + \beta}$



- **Scissors' theorem :**



$\boxed{x = a + b + c}$

- 

$\boxed{\frac{AC}{CE} = \frac{BD}{DF} = \frac{m}{n}}$ $\boxed{CD = \frac{my + nx}{m + n}}$

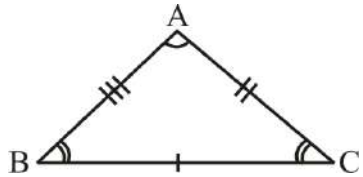
Triangle

Triangle = Tri + Angle

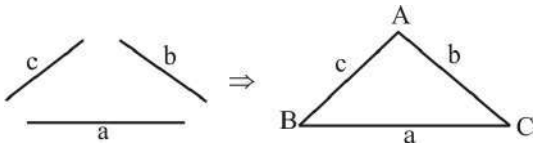
Three Angle

"A closed figure with three sides is called triangle"

☞ A triangle has three sides and three vertices.



Construction of triangle (Inequality of triangle)



(i) The sum of any two sides of the triangle must be greater than the third side-

$(a + b) > c$ $(b + c) > a$ $(c + a) > b$

(ii) The difference of any two sides of the triangle must be less than the third side.

$|a - b| < c$ $|b - c| < a$ $|c - a| < b$

Types of the triangles on the basis of sides :

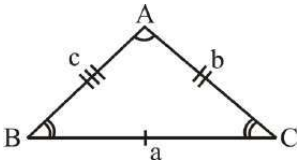
1. Scalene Triangle
2. Isosceles Triangle
3. Equilateral Triangle

Types of the triangles on the basis of angles :

1. Right Angle Triangle
2. Acute Angle Triangle
3. Obtuse Angle Triangle

The triangles on the basis of sides:

1. Scalene Triangle: "A scalene triangle is a triangle in which all three sides have different lengths."



$$AB \neq BC \neq CA$$
$$\angle C \neq \angle A \neq \angle B$$

Perimeter of triangle :

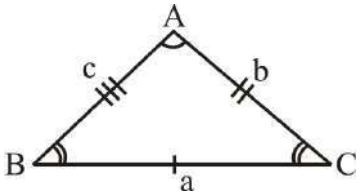
$$p = (a + b + c)$$

Semi-perimeter of triangle :

$$s = \frac{(a+b+c)}{2}$$

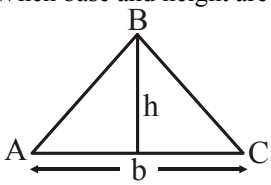
Area in scalene triangle :

(i) When three sides are given :



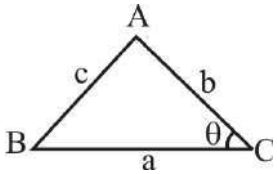
$$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$ ***(Heron's Formula)***

(ii) When base and height are given



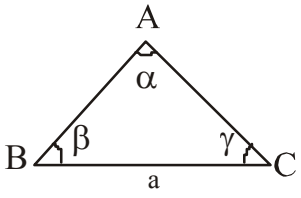
$$\Delta = \frac{1}{2} \times b \times h$$

(iii) When two sides and middle angle are given



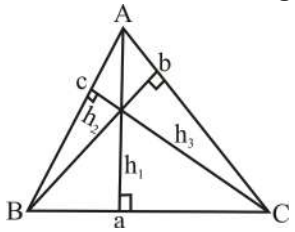
$$\Delta = \frac{1}{2} ab \sin\theta$$

(iv) When one side and three angles are given



$$\Delta = \frac{1}{2} \times a^2 \frac{\sin\beta \times \sin\gamma}{\sin\alpha}$$

Relation between sides and heights of triangle :



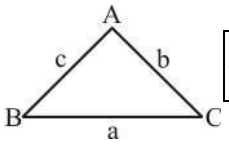
$\Rightarrow \quad \Delta = \frac{1}{2} a \times h_1, \quad \Delta = \frac{1}{2} b \times h_2, \quad \Delta = \frac{1}{2} c \times h_3$

$$\frac{1}{2} a \times h_1 = \frac{1}{2} b \times h_2 = \frac{1}{2} c \times h_3$$

$\therefore \; ah_1 = bh_2 = ch_3$

$$h_1 : h_2 : h_3 = \frac{1}{a} : \frac{1}{b} : \frac{1}{c}$$

Sine Rule :



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

$R \rightarrow$ Circum Radius

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = K$$ (K= Constant)

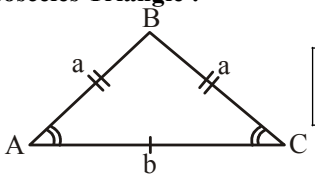
Cosine Rule :

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \Rightarrow a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos B = \frac{b^2 + c^2 - b^2}{2ac} \Rightarrow a^2 = b^2 + c^2 - 2bc \cos B$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab} \Rightarrow c^2 = a^2 + b^2 - 2ab \cos C$$

(2) Isosceles Triangle :



$$AB = BC \neq AC$$
$$\angle C = \angle A \neq \angle B$$

Perimeter of triangle :

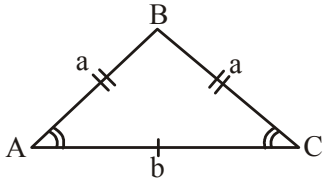
$$p = 2a + b$$

Semi-perimeter of triangle :

$$s = \frac{2a + b}{2}$$

Area in Isosceles Triangle :

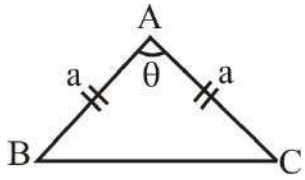
(i)



$$\Delta = \sqrt{s(s-a)(s-a)(s-b)}$$

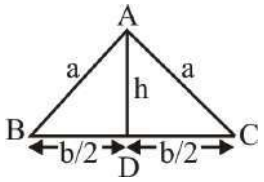
$$\Delta = (s\text{-}a)\sqrt{s(s-b)}$$

(ii)



$$\Delta = \frac{1}{2} a^2 \sin\theta$$

(iii)



By pythagoras theorem in Δ ABD,

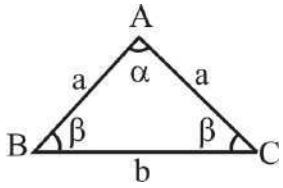
$$\boxed{h = \frac{1}{2}\sqrt{(4a^2 - b^2)}}$$

$\because \Delta = \frac{1}{2} \times b \times h$

$$\Delta = \frac{1}{2} \times b \times \frac{1}{2}\sqrt{4a^2 - b^2}$$

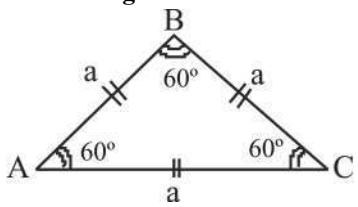
$$\boxed{\Delta = \frac{1}{4} b\sqrt{4a^2 - b^2}}$$

(iv)



$$\boxed{\Delta = \frac{1}{2}\frac{b\sin^2\beta}{\sin\alpha}}$$

Equilateral triangle :



AB = BC = CA = a

$\angle C = \angle A = \angle B = 60^\circ$

Perimeter in equilateral triangle :

$$\boxed{p = 3a}$$

Semi-perimeter in equilateral triangle :

$$\boxed{s = \frac{3a}{2}}$$

Height in equilateral triangle :

$$\boxed{h = \frac{\sqrt{3}}{2}a}$$

Area in equilateral triangle :

$$\boxed{\Delta = \frac{\sqrt{3}}{4}a^2}$$

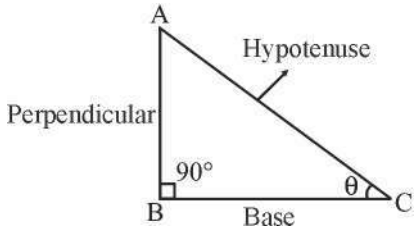
The triangle based on angles :

1. Right angled triangle : A right angled triangle is a triangle in which one angle is right angle.

Area :

$$\boxed{\Delta = \frac{1}{2} \times BC \times AB}$$

Pythagoras theorem : In right angled triangle, the square of the hypotenuse is equal to the sum of the square of the other two sides.



$$\boxed{AC^2 = AB^2 + BC^2}$$

Pythagoras triplets : A set of three integer number which satisfy Pythagoras theorem. **Ex.**: (3, 4, 5)

If (a, b, c) be a Pythagoras triplets, then (ak, bk, ck) or $\left(\frac{a}{k}, \frac{b}{k}, \frac{c}{k}\right)$ will also be the pythagoras triplet.

Following Pythagoras triplets are frequently used in the examination :

$\Rightarrow$ (3, 4, 5)$\rightarrow$(6, 8, 10), (9,12,15) (12,16,20) (15, 20, 25)

$\Rightarrow$ (5, 12, 13)$\rightarrow$(10, 24, 26) (15, 36, 39) (2.5, 6, 6.5)

$\Rightarrow$ (7, 24, 25)$\rightarrow$(14, 48, 50), (3.5, 12, 12.5) (21, 72, 75)

$\Rightarrow$ (9, 40, 41), (12, 35, 37), (20, 21, 29) , (13, 84, 85)

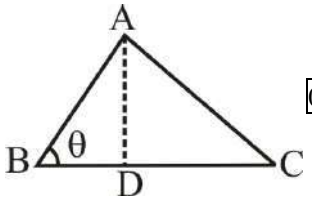
$\Rightarrow$ (8, 15, 17), (11, 60, 61), (20, 99, 101) (39, 80, 89)

$\Rightarrow$ (2ab, $a^2 - b^2$, $a^2 + b^2$) [2n, (n^2-1), (n^2+1)]

$\Rightarrow$ (1, 1, $\sqrt{2}$) (1, $\sqrt{3}$, 2)

2. Acute angled triangle :

In acute angled triangle is a triangle in which all the interior angles are acute angles (all the three angles are between 0° and 90°).



$$\boxed{0 < \theta < 90}$$

Identity :

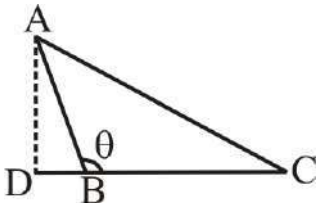
$$\boxed{AC^2 < AB^2 + BC^2}$$

Acute angled theorem :

$$\boxed{AC^2 = AB^2 + BC^2 - 2BC.BD}$$

3. Obtuse angled triangle :

An obtuse angle triangle is a triangle in which any one of the angles is an obtuse angles or more than 90°.



$$\boxed{90^\circ < \theta < 180^\circ}$$

Identity :

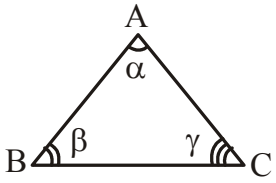
$$\boxed{AC^2 > AB^2 + BC^2}$$

Obtuse angled theorem :

$$\boxed{AC^2 = AB^2 + BC^2 + 2\ BD.BC}$$

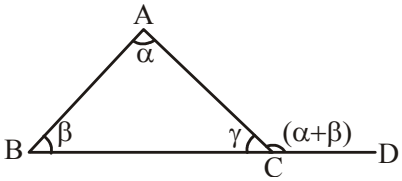
Properties of triangle:

1. The sum of all three angles of triangles is 180°.



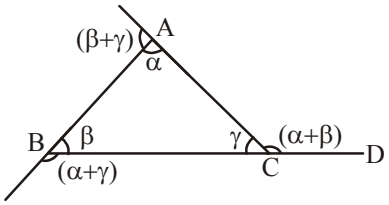
$\alpha + \beta + \gamma = 180^\circ$

2. (i) **External angled theorem :** If a side of a triangle is produced then the exterior angle so formed is equal to the sum of the two interior opposite angles.



$\angle ACD = \alpha + \beta$

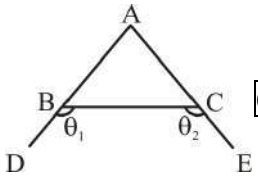
(ii) **The sum of external angles :**



Sum = $2(\alpha + \beta + \gamma)$

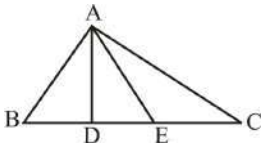
$= 2 \times 180^\circ \Rightarrow 360^\circ$

3.



$\theta_1 + \theta_2 = 180^\circ + A$

4.

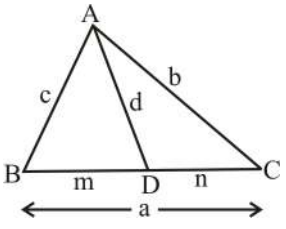


AD → Altitude

AE→ Angle Bisector of ∠A

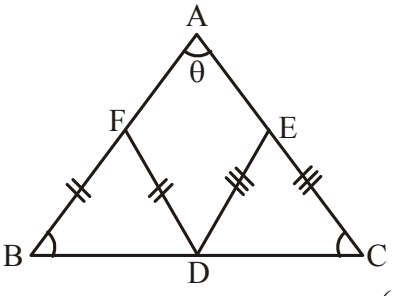
$DAE = \frac{\angle B - \angle C}{2}$

5. **Stewart theorem :**

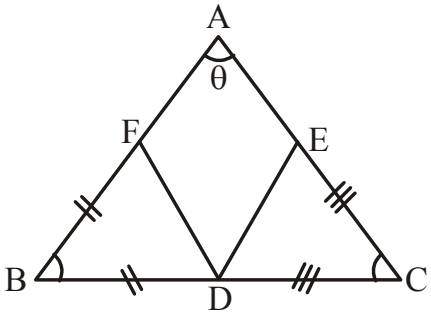


$b^2m + c^2n = a(d^2 + mn)$

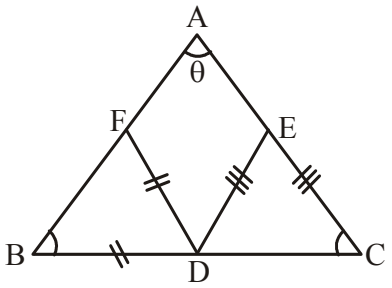
6. (i) If BF = DF & DE = CE then ∠FDE = θ



(ii) If BD = BF & CE = CD then $\angle FDE = \left(90 - \frac{\theta}{2}\right)$



(iii) If FD = DB & ED = DC then ∠FDE=(180 – 2θ)



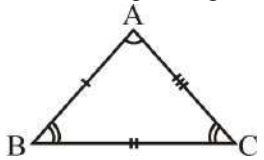
Congruency & Similarity of triangle

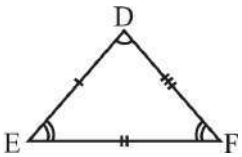
Congruency :

Two triangles are said to be Congruent-

(i) Their Corresponding angles are equal.

(ii) Their corresponding sides are also equal.





∠ A = ∠ D		AB = DE
∠ B = ∠ E	&	BC = EF
∠ C = ∠ F		AC = DF

$\Delta ABC \cong \Delta DEF$

{≅ is the sign of Congruency}

Conditions :

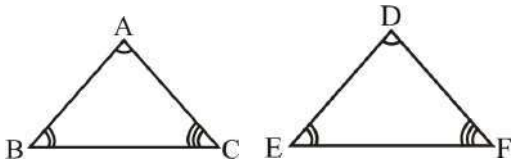
SSS (Side-Side-Side),
SAS (Side-Angle-Side),
AAS (Angle-Angle-Side) pair
ASA (Angle-Side -Angle)
RHS (Right Angle-Hypotenuse-Side

Note : In congruency, sides must be equal-

Similarity: Two triangles are said to be Similar :

(i) Their Corresponding angles are equal

(ii) Their corresponding sides are in the equal ratio



$\angle A = \angle D$

$\angle B = \angle E$ & $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

$\angle C = \angle F$

Hence $\boxed{\Delta ABC \sim \Delta DEF}$

{"~" is the sign of similarity}

Conditions :

SSS (Side-Side-Side)

SAS (Side-Angle-Side)

AA (Angle-Angle)

Note: In similar triangles, sides are in-equal ratio.

Properties :

1. In Similar triangles, ratio of each corresponding length is equal

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{h_1}{h_2} = \frac{r_1}{r_2} = \frac{R_1}{R_2} =$$

$$\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta DEF} = \frac{\text{Semi perimeter } \Delta ABC}{\text{Semiperimeter } \Delta DEF} =$$

$$\frac{\text{Median}_1}{\text{Median}_2} = \frac{\text{Angle Bisector}_1}{\text{Angle Bisector}_2}$$

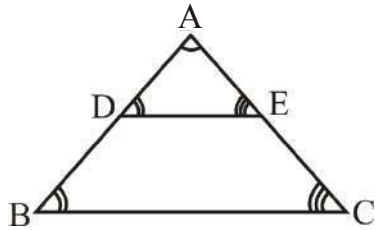
2. In similar triangles, ratio of the area of triangles is equal to the ratio of square of corresponding length.

$$\frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \left(\frac{AB}{DE}\right)^2 = \left(\frac{BC}{EF}\right)^2 = \left(\frac{AC}{DF}\right)^2 =$$

$$\left(\frac{h_1}{h_2}\right)^2 = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{R_1}{R_2}\right)^2 = \left(\frac{\text{Median}_1}{\text{Median}_2}\right)^2 = \left(\frac{\text{Angle Bisector}_1}{\text{Angle Bisector}_2}\right)^2$$

$$\left(\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta DEF}\right)^2 = \left(\frac{\text{Semi-perimeter } \Delta ABC}{\text{Semi-perimeter } \Delta DEF}\right)^2 =$$

3. Thales' Theorem :



$\Rightarrow$ If DE || BC

then $\boxed{\frac{AD}{DB} = \frac{AE}{EC}}$

$\Rightarrow$ If $\frac{AD}{DB} = \frac{AE}{EC}$

then $\boxed{DE \parallel BC}$

Important Results:

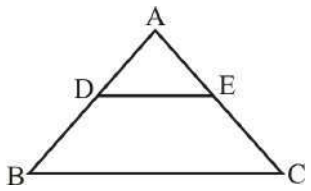
(i) $\frac{AD}{DB} = \frac{AE}{EC}$

(ii) $\Delta ADE \sim \Delta ABC$

(iii) $\frac{AD}{AB} = \frac{AE}{AC} = \frac{DE}{BC}$

(iv) $\frac{Ar(\Delta ADE)}{Ar(ABC)} = \left(\frac{AD}{AB}\right)^2 = \left(\frac{AE}{AC}\right)^2 = \left(\frac{DE}{BC}\right)^2$

4. **Mid Point Theorem :**



(i) If D and E are mid points of AB and AC respectively then,

$\boxed{DE \parallel BC}$ and $\boxed{DE = \frac{BC}{2}}$

(ii) If DE || BC and $DE = \frac{BC}{2}$, then D and E are the mid-points of AB and AC respectively in this case-

Important Results :

(i) $\frac{AD}{DB} = \frac{AE}{EC} = \frac{1}{1}$

(ii) $\Delta ADE \sim \Delta ABC$

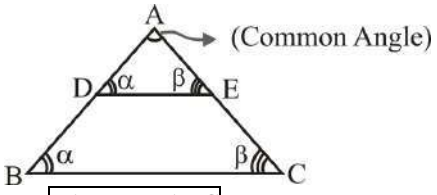
(iii) $\frac{AD}{AB} = \frac{AE}{AC} = \frac{DE}{BC} = \frac{1}{2}$

(iv) $\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \frac{1}{4}$

(v) $\frac{\text{Area of } \Delta ADE}{\text{Area of } \square DECB} = \frac{1}{3}$

Similar Figures

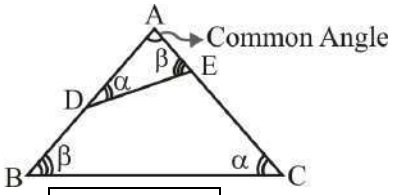
(i)



$\boxed{\Delta ADE \sim \Delta ABC}$

$\boxed{\frac{AD}{AB} = \frac{AE}{AC} = \frac{DE}{BC}}$

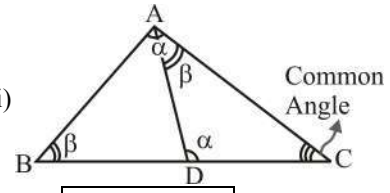
(ii)



$\boxed{\Delta ADE \sim \Delta ACB}$

$\boxed{\frac{AD}{AC} = \frac{AE}{AB} = \frac{DE}{BC}}$

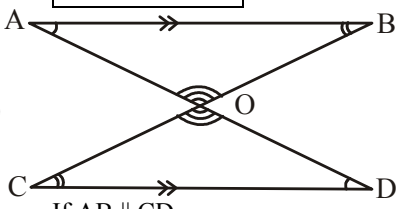
(iii)



$\Delta ABC \sim \Delta DAC$

$$\frac{AB}{AD} = \frac{BC}{AC} = \frac{AC}{CD}$$

(iv)

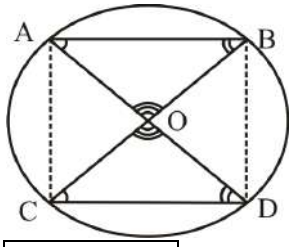


If AB || CD

$\Delta AOB \sim \Delta DOC$

then, $$\frac{AO}{DO} = \frac{BO}{CO} = \frac{AB}{CD}$$

(v)

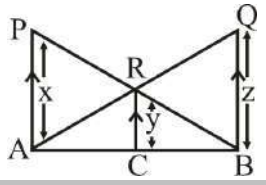


$\Delta ADB \sim \Delta COD$

$$\frac{AO}{OC} = \frac{BO}{OD} = \frac{AB}{CD}$$

"Angles of same segment are equals"

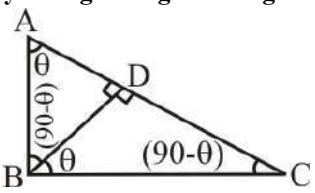
(vi)



$$\frac{1}{y} = \frac{1}{x} = \frac{1}{z} \qquad \frac{1}{y} = \frac{z+x}{xz}$$

$xz = xy + yz$

Similarity in Right Angle Triangle :



If BD ⊥ AC

$\Delta ABC \sim \Delta ADB \sim \Delta BDC$

From Similarity :

(i) From Point A : $AB^2 = AD \times AC$

(ii) From Point D : $DB^2 = DA \times DC$

(iii) From Point C : $CB^2 = CD \times CA$

(iv) From Area :

$$\Delta ABC \text{ Area} = \frac{1}{2} BC \times AB = \frac{1}{2} AC \times DB$$

$\therefore$ $BC \times AB = AC \times DB$

$$\Rightarrow \frac{1}{BD^2} = \frac{1}{AB^2} + \frac{1}{BC^2}$$

Relation between similarity and congruent

(i) If two triangles are congruent then they must be similar.

(ii) If two triangles are similar then it is not necessary that they are congruent.

(iii) If two triangles are congruent then their area are equal.

(iv) If areas of two triangles are equal then It is not necessary that they are Congruent.

(v) If areas of two similar triangles are equal then they are congruent.

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. In an isosceles triangle, the vertex angle measures 132º. What is the measure of each of the base angles?

(a) 24º and 24º

(b) 4º and 10°

(c) 11º and 8º

(d) 27° and 21º

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) : The sum of all angle in a triangle is 180º

The vertex angle = 132º

The base angle (x) of isosceles triangle is equal

According to question,

$x + x + 132° = 180°$

$2x = 180° - 132°$

$$x = \frac{48^0}{2}$$

$x = 24°$

Hence the value of each base angle (x) = 24° and 24°

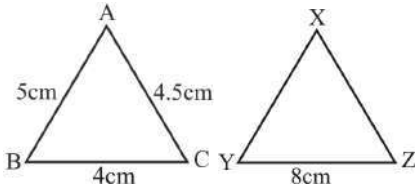
2. ΔABC is such that AB = 5 cm, BC = 4 cm and CA = 4.5 cm. ΔXYZ is similar to ΔABC. If YZ = 8 cm, then find the perimeter of ΔXYZ.

(a) 27 cm (b) 26 cm

(c) 28 cm (d) 25 cm

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a): According to question -



ΔABC and ΔXYZ by the rule of similarity-

$$\frac{AB}{BC} = \frac{XY}{YZ}$$

$$\frac{5}{4} = \frac{XY}{8}$$

$XY = 10cm$

and,

$$\frac{AC}{CB} = \frac{XZ}{ZY}$$

$$\frac{4.5}{4} = \frac{XZ}{8}$$

$XZ = 9cm$

Hence the perimeter of $\Delta XYZ = XY + YZ + ZX$

$= 10 + 8 + 9$

$= 27$ cm

3. In ΔPQR, $3\angle P = 4\angle Q = 6\angle R$, then find the value of $\left(\frac{2\angle P - \angle Q + 3\angle R}{5}\right)$.

(a) 30º (b) 65º

(c) 44º (d) 72º

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c) : Let,

$3 \angle P = 4 \angle Q = 6 \angle R = k$

$$\angle P = \frac{k}{3}, \angle Q = \frac{k}{4}, \angle R = \frac{k}{6}$$

$$\angle P : \angle Q : \angle R = \frac{k}{3} : \frac{k}{4} : \frac{k}{6}$$

$\angle P : \angle Q : \angle R = 4 : 3 : 2$

The sum of the three interior angles of the triangle is 180º

$\angle P + \angle Q + \angle R \Rightarrow (4x + 3x + 2x) = 180°$

$\Rightarrow 9x = 180°$

$x = 20°$

$\therefore \angle P = 4x = 4 \times 20 = 80°$

$\angle Q = 3x = 3 \times 20 = 60°$

$\angle R = 2x = 2 \times 20 = 40°$

Then,

$$\frac{2\angle P - \angle Q + 3\angle R}{5} = \frac{2 \times 80^0 - 60^0 + 3 \times 40^0}{5}$$

$$= \frac{160^0 - 60 + 120}{5}$$

$$= \frac{220}{5} = 44^0$$

4. In an isosceles triangle, the vertex angle measures 76º. What is the measure of each of the base angles?

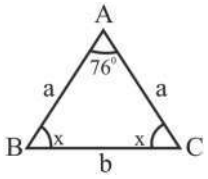
(a) 43º and 62º (b) 32º and 49º

(c) 52º and 52º (d) 55º and 49º

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c) : In isosceles triangle ABC,

Let each base angle be x



According to question,

$76° + x + x = 180°$

$2x = 180° - 76°$

$2x = 104°$

$x = 52°$

Hence, The measure of each base angle will be 52º.

5. The ratio of the lengths of two corresponding sides of two similar triangles is 6 : 2. The ratio of the areas of these two triangles, in the order mentioned, is :

(a) 6 : 2 (b) $6\sqrt{6} : 2$

(c) 37 : 5 (d) 36 : 4

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : Rule: In any two similar triangles the ratio of the areas of the triangles is equal to the ratio of the squares of their corresponding side.

Ratio of sides $= \ell_1 : \ell_2 = 6 : 2$

Ratio of Areas $(A_1 : A_2) = \ell_1^2 : \ell_2^2$

$= 6^2 : 2^2$

$= 36 : 4$

6. In an isosceles ΔABC, AC = BC, if each of the two equal angles of ΔABC is 9 degrees less than two– fifth of the third angle. Find the value of $\left(\frac{2\angle C - 3\angle A + \angle B}{2}\right)$.

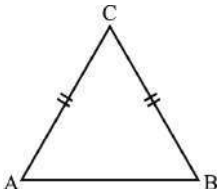
(a) 35º (b) 60º

(c) 45º (d) 75º

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : In Δ ABC

Let angle $\angle A = x$



$\because$ $AB = BC$, $\angle A = \angle B = x$

$\angle C = 180 - 2x$

According to the question,

$$x = (180 - 2x)\frac{2}{5} - 9$$

$$5x = 360 - 4x - 45$$

$$9x = 315$$

$$x = \frac{315}{9} = 35^\circ$$

$$\angle A = \angle B = 35^\circ,\ \angle C = 180 - 70 = 110^\circ$$

$$\frac{2\angle C - 3\angle A + \angle B}{2} = \frac{2\times 110^\circ - 3\times 35^\circ + 35^\circ}{2}$$

$$= \frac{220^\circ - 105^\circ + 35^\circ}{2} = \frac{255 - 105}{2} = 75^\circ$$

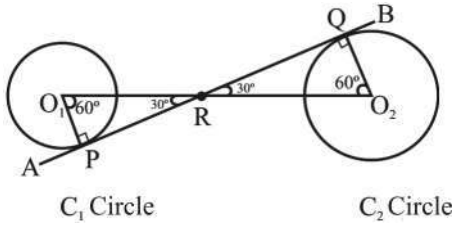
7. Let C_1 and C_2 be two circles which do not externally touch and intersect each other and O_1, and O_2 be the centers of the circles, respectively. Let AB be the common transverse tangent to the circles such that P, Q are the points of tangency respectively to C_1, C_2. Let R be the point of intersection of O_1 O_2 and AB. If $\angle PO_1R = 60°$, find $\angle QO_2R$ and $\angle QRO_2$, respectively.

(a) 20° and 70° (b) 40° and 50°

(c) 60° and 30° (d) 45° and 45°

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (c) :



C_1 Circle C_2 Circle

Given,

$$\angle PO_1R = 60^\circ$$

In ΔPO_1R -

$$\angle PRO_1 = 180^\circ - (90^\circ + 60^\circ) = 30^\circ$$

$$\angle QRO_2 = \angle O_1RP = 30^\circ \text{ (appearing angle)}$$

In ΔQO_2R –

$$\angle QO_2R = 180^\circ - (90^\circ + 30^\circ) = 60^\circ$$

So, $\angle QO_2R = 60^\circ,\ \angle QRO_2 = 30^\circ$

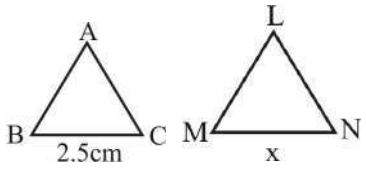
8. Two similar triangles are ΔABC and ΔLMN. If the area of $\Delta ABC = 25cm^2$, area of Δ LMN = $36cm^2$ and BC = 2.5cm, then the measure of MN (in cm) is :

(a) 2 (b) 1

(c) 3 (d) 4

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (c): According to question -



Both triangle ΔABC and ΔLMN are similar then

Theorem, $\frac{\text{Ar. } \Delta ABC}{\text{Ar. } \Delta LMN} = \frac{(BC)^2}{(MN)^2}$

$$\frac{25}{36} = \frac{(2.5)^2}{x^2}$$

$$\sqrt{\frac{25}{36}} = \frac{2.5}{x}$$

$$\frac{2.5}{x} = \frac{5}{6}$$

$$x = \frac{6\times 2.5}{5}$$

x = 3cm

9. In triangle ABC, if the angles are in the ratio 4 : 3 : 5, find the angles.

(a) 20°, 50°, 70° (b) 60°, 45°, 75°

(c) 20°, 15°, 25° (d) 40°, 30°, 50°

RRB Group-D 01/09/2022 (Shift-I)

Ans. (b) : According to the question,

Let A = 4x, B = 3x, C = 5x

In ΔABC $4x + 3x + 5x = 180°$

$12x = 180°$

$x = 15°$

$\angle A = 4 \times 15° = 60°,\ \angle B = 3 \times 15 = 45°$

$\angle C = 5 \times 15 = 75°$

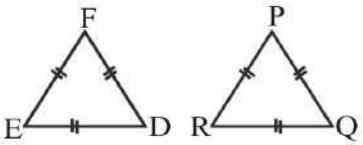
10. In two triangle ΔDEF and ΔPQR, IF DE = QR EF = PR and FD = PQ then :

(a) $\Delta FED \cong \Delta PRQ$ (b) $\Delta DEF \cong \Delta PQR$

(c) $\Delta EDF \cong \Delta RPQ$ (d) $\Delta PQR \cong \Delta EFD$

RRB Group-D 06/09/2022 (Shift-II)

Ans. (a) :



In ΔFED and ΔPRQ -

$\because$ DE = QR, EF = PR, FD = PQ

Hence, from the theorem side-side-side

$\therefore \Delta FED \cong \Delta PRQ$

11. In a triangle ABC, the lengths of its sides $\overline{AB}, \overline{AC}$ and $\overline{BC}$ and are 4 cm, 5 cm and 6 cm respectively. An angle bisector $\overline{AD}$ is drawn from A onto $\overline{BC}$, intersecting at D. Find $m(\overline{BD})$, correct to two places of decimal.

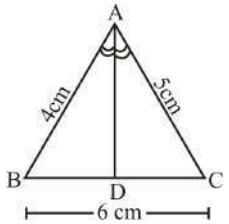
(a) 1.50 cm (b) 2.25 cm
(c) 3.00 cm (d) 2.67 cm

RRB GROUP-D – 30/09/2022 (Shift-I)

Ans. (d) : Given- $\overline{AB} = 4cm$, $\overline{AC} = 5cm$, $\overline{BC} = 6cm$

According to question,

From the theorem of angle bi-sector,



$$\frac{DC}{BD} = \frac{AC}{AB}$$

$$\frac{DC + BD}{BD} = \frac{AC + AB}{AB}$$

$$\frac{6}{BD} = \frac{5+4}{4}$$

$$BD = \frac{6 \times 4}{9}$$

$$BD = \frac{24}{9} = 2.666$$

$=2.67cm$

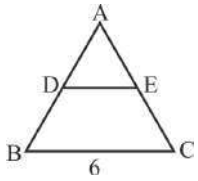
12. D and E are the mid point of sides AB and AC respectively and BC = 6 cm. If DE || BC the find the length of DE.

(a) 2.5 cm (b) 3 cm
(c) 5 cm (d) 6 cm

RRB Group-D 06/09/2022 (Shift-II)

Ans. (b) : According to the question,

In ΔABC,

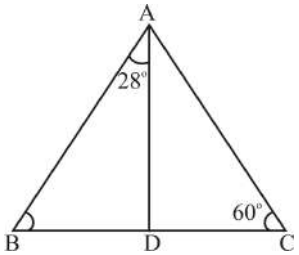


$DE \| BC$

$\therefore$ $DE = \frac{BC}{2}$ (From mid point theorem)

$DE = \frac{6}{2} = 3$ cm

13. If, $\frac{AB}{AC} = \frac{BD}{DC}$ then $\angle ABC$ is:



(a) 32^o (b) 74^o
(c) 92^o (d) 64^o

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (d) : In ΔABC,

By angle bisector theorem-

$\therefore \angle BAD = \angle DAC$

$\Rightarrow \angle DAC = 28°$

Now, in ΔABC,

$\angle ABC + \angle BAC + \angle ACB = 180°$

$\angle ABC + 56° + 60° = 180°$

$\angle ABC = 180° - 116°$

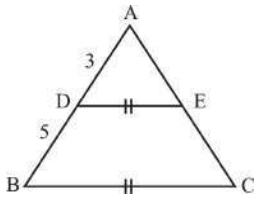
$\angle ABC = 64°$

14. In a triangle ABC. Point D and E are on the side AB and AC such that DE is parallel to BC and $\frac{AD}{BD} = \frac{3}{5}$. If AC = 4cm, then the value of AE is.

(a) 1.5 cm (b) 2 cm
(c) 1.8 cm (d) 2.4 cm

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (a) :



From Thales theorem,

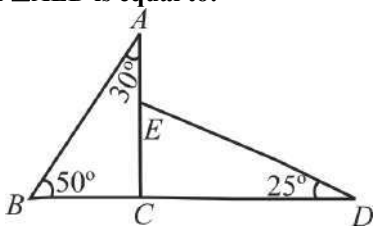
$\Delta ABC \sim \Delta ADE$

$$\frac{AD}{AB} = \frac{AE}{AC}$$

$$\frac{3}{8} = \frac{AE}{4}$$

$$AE = \frac{3}{2} = 1.5\,cm$$

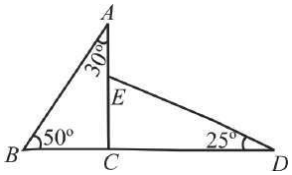
15. In the given diagram, if $\angle BAC = 30°$, $\angle ABC = 50°$ and $\angle CDE = 25°$, then $\angle AED$ is equal to:



(a) 75° (b) 95°
(c) 105° (d) 115°

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (c) :



In ΔABC

$\because \angle BCA = 180° - \angle BAC - \angle ABC$

$= 180° - 30° - 50°$

$= 100°$

$\therefore \angle ACD = 180° - 100°$

$\angle ACD = 80°$ [From linear pair property]

$\because$ Exterior angle is the sum of two interior angle of a triangle.

$\Rightarrow \angle AED = \angle ACD + \angle CDE$

$= 80^0 + 25^0$

$= 105°$

16. In ΔABC, if $\angle A = 3\ \angle B$ and $\angle C = 2\ \angle B$, then what are values of $\angle A$, $\angle B$ and $\angle C$?

(a) 90°, 60° and 30° (b) 60°, 30° and 90°

(c) 30°, 90° and 60° (d) 90°, 30° and 60°

RRB NTPC 26.07.2021 (Shift-I) Stage Ist

Ans. (d) : $\because \angle A = 3\angle B$ and $\angle C = 2\angle B$

$\therefore$ Let $\angle B = x^o$, $\angle A = 3x^o$ and $\angle C = 2x^o$

$\because$ Sum of angles of a triangle is 180º.

$\angle A + \angle B + \angle C = 180°$

$3x + x + 2x = 180°$

$6x = 180°$

$x = \frac{180°}{6} = 30°$

Hence, $\angle A = 3x = 3\times30 = 90°$

$\angle B = x = 30°$

$\angle C = 2x = 2\times30 = 60°$

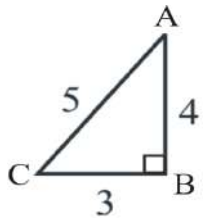
17. ABC is a right-angled triangle. If the lengths of two sides containing the right angle are 4 cm and 3 cm. What will be the radius of its in-circle.

(a) 1 cm (b) 2 cm

(c) 3 cm (d) 4 cm

RRB NTPC 15.02.2021 (Shift-I) Stage Ist

Ans. (a)



Hypotenuse $= \sqrt{4^2 + 3^2} = 5\,\text{cm}$

$\therefore$ Radius of in-circle

$= \frac{\text{Perpendicular} + \text{Base} - \text{Hypotenuse}}{2}$

$= \frac{4+3-5}{2} = \frac{2}{2} = 1\,\text{cm}$

18. In triangle ABC, $\angle A$ is 12º more than the measure of $\angle C$. The measure of $\angle B$ is 4 times as great as the measure of $\angle C$. What are the measures of the angles A, B and C respectively?

(a) 40º, 112º, 18º (b) 40º, 120º, 28º

(c) 35º, 92º, 23º (d) 40º, 112º, 28º

RRB NTPC 09.02.2021 (Shift-I) Stage Ist

Ans. (d) : $\angle A + \angle B + \angle C = 180°$ ..... (i)

According to the question,

$\angle A = \angle C + 12°$ ..... (ii)

$\angle B = 4 \times \angle C$ ..... (iii)

From equation (i), (ii) and (iii)

$\angle C + 12° + 4\angle C + \angle C = 180°$

$\angle C = 28°$

$\angle B = 112°$

$\angle A = 40°$

Hence, $\angle A$, $\angle B$ and $\angle C \Rightarrow$ 40º, 112º and 28º

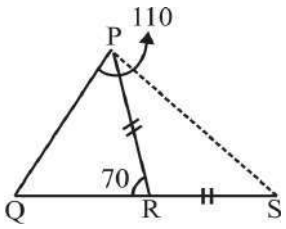
19. In ΔPQR, QR is extended up to S so that RS = RP. If $\angle PRQ = 70°$ and $\angle QPS = 110°$ then find the measure of $\angle PQS$.

(a) 55º (b) 50º

(c) 65º (d) 35º

RRB NTPC 17.01.2021 (Shift-I) Stage Ist

Ans. (d) :



$\because \angle PRQ + \angle PRS = 180°$ ..... (Linear pair)

$\therefore \angle PRS = 180° - 70° = 110°$

And in ΔPRS,

$\because$ PR = RS ..... (Given)

$\therefore \angle RSP = \angle RPS$ ..... (i)

(The angle opposite to equal side will be equal)

and $\angle PRS + \angle RSP + \angle RPS = 180°$ ..... (The sum of the three interior angles of a triangle is 180^0.)

$\because \angle RSP = \angle RPS$

So, $2\angle RSP = 180° - 110° = 70°$ ($\because \angle PRS = 110°$)

$\angle RSP = \frac{70°}{2} = 35° = \angle RPS$

Again in ΔPQS

$\angle PQS = 180° - (110° + 35°)$

$= 180° - 145° = 35°$

Hence, $\angle PQS = 35°$

20. In ΔXYZ, XY = 12 cm and YZ = 18, XW, the angle bisector of YXZ, meets YZ at W, such that YW : WZ is 4 : 5.

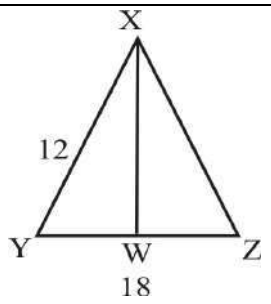
Find the length of the third side of the triangle.

(a) 18 cm (b) 14 cm

(c) 15 cm (d) 12 cm

RRB NTPC 17.01.2021 (Shift-I) Stage Ist

Ans. (c): According to the question –



∵ As per the angle bisector theorem, the angle bisector of a triangle bisect the opposite side in such a way that the ratio of the two line-segments is proportional to the ratio of the other two sides.

then, If XZ = x cm

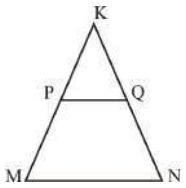
$$\frac{12}{x}=\frac{4}{5}$$

$4x = 60$

$x = 15$ cm.

So, XZ = 15cm.

21. In the given ΔKMN, PQ is parallel to MN. If $\frac{KP}{PM}=\frac{4}{13}$ and KN = 20.4 cm, find KQ



(a) 3.6 cm (b) 5.1 cm

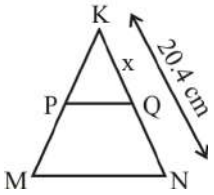
(c) 8.2 cm (d) 4.8 cm

RRB NTPC 16.01.2021 (Shift-I) Stage Ist

Ans. (d) : The parallel line divides the intersecting transversals passing through the parallel line in equal proportion.

∴ PQ || MN and KM and KN are transversal

then, $\frac{KP}{PM}=\frac{KQ}{QN}$



$$\frac{4}{13}=\frac{x}{(20.4-x)}$$

$4(20.4-x)=13x$

$81.6 - 4x = 13x$

$81.6 = 13x + 4x$

$81.6 = 17x$

$x = \frac{81.6}{17} = 4.8$

Hence, KQ = 4.8 cm

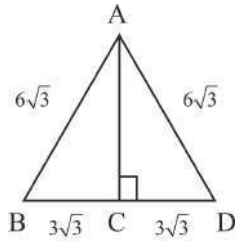
22. If one side of an equilateral triangle is $6\sqrt{3}$ cm, then what is its height?

(a) 9 cm (b) 6 cm

(c) 3 cm (d) $3\sqrt{3}$ cm

RRB RPF SI – 13/01/2019 (Shift-II)

Ans : (a) Side of equilateral triangle = $6\sqrt{3}$



In triangle ABC-

$(AC)^2 = (AB)^2 - (BC)^2$

$= \left(6\sqrt{3}\right)^2 - \left(3\sqrt{3}\right)^2 = 108 - 27$

$(AC)^2 = 81$

height = 9 cm

23. The midpoints of the sides of an equilateral triangle PQR are X, Y and Z. If the circumference of triangle PQR is 24 cm, then what will be the circumference of triangle XYZ?

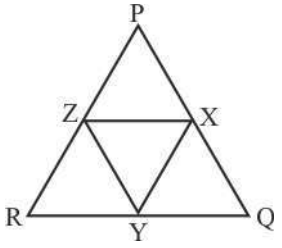
(a) 96 cm (b) 36 cm

(c) 12 cm (d) 48 cm

RRB RPF Constable – 22/01/2019 (Shift-II)

Ans : (c) According to the question-

PQ + QR + PR = 24 cm



In a triangle, the line joining the midpoints of two sides is parallel and half of the third side.

$ZX = \frac{1}{2}$ QR ..... (i)

$XY = \frac{1}{2}$ PR .....(ii)

$ZY = \frac{1}{2}$ PQ .....(iii)

Adding the equation (i), (ii) and (iii)

$ZX + XY + ZY = \frac{1}{2}$ (QR + PQ + PR)

$\frac{1}{2} \times 24 = 12$ cm

So circumference of ΔXYZ = 12 cm

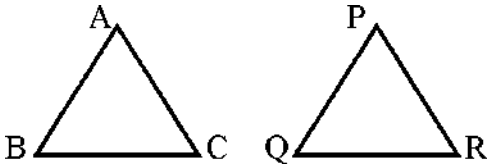
24. ΔABC, and ΔPQR are similar and their perimeters are 36 and 24 respectively. If PQ = 10 then find the value of AB.

(a) 15 (b) 16

(c) 20 (d) 18

RRB JE - 26/06/2019 (Shift-I)

Ans : (a)



$\because$ $\Delta ABC \sim \Delta PQR$

$\therefore$ $\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta PQR} = \frac{AB}{PQ}$

$\frac{36}{24} = \frac{AB}{10}$

$AB = \frac{360}{24} = 15$

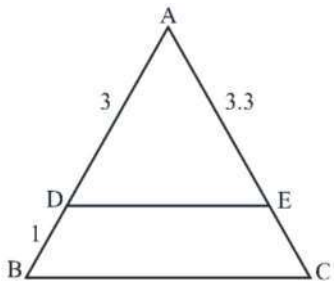
25. In ΔABC, the points D and E are on the sides AB and AC respectively such that DE ∥ BC and AD : DB = 3 : 1. If EA = 3.3 cm, find the value of AC.

(a) 5.5 cm (b) 4 cm

(c) 4.4 cm (d) 1.1 cm

RRB RPF Constable – 25/01/2019 (Shift-I)

Ans : (c)



According to the Thales theorem,

$\frac{AD}{DB} = \frac{AE}{EC}$

$\frac{3}{1} = \frac{3.3}{EC}$

$EC = 1.1$

$AC = AE + EC = 3.3 + 1.1 = 4.4$

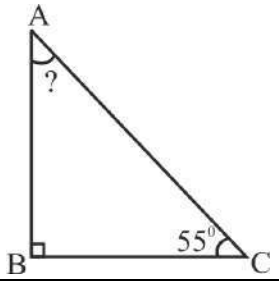
26. If one acute angle of a right angle triangle is 55º, then what will be the value of the other acute angle?

(a) 25º (b) 30º

(c) 40º (d) 35º

RRB Group-D – 12/10/2018 (Shift-III)

Ans: (d)



$\because$ the sum of the three interior angles of a triangle is 180°

$180^\circ = \angle A + \angle B + \angle C$

$180^\circ = \angle A + 90° + 55°$

$180^\circ - 145^\circ = \angle A$

$\angle A = 35^\circ$

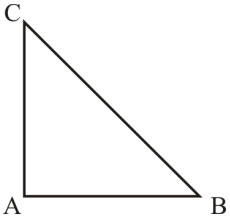
27. ABC is a right angle triangle whose angle A is right angle. Which side needs to bisect for the formation of two other right-angled triangles?

(a) AB (b) CA

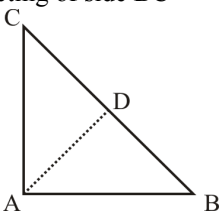
(c) at the center (d) BC

RRB Group-D – 20/09/2018 (Shift-I)

Ans. (d)



On bisecting of side BC–



Right angled triangle = Δ ADB, Δ ADC

ABC is a right angled triangle whose angle A is right angled, for the formation of two other right triangle, side BC will be bisected.

28. Which of the following are sides of a right angled triangle?

(a) 84 cm, 13 cm, 85 cm

(b) 84 cm, 63 cm, 115 cm

(c) 15 cm, 112 cm, 111 cm

(d) 76 cm, 100 cm, 57 cm

RRB Group-D – 25/09/2018 (Shift-III)

Ans. (a) : From Pythagoras theorem

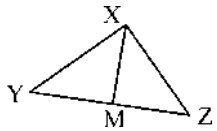
In right angle triangle, the square of hypotenuse is equal to the square of other two sides.

$\therefore (85)^2 = (13)^2 + (84)^2$

$7225 = 169 + 7056 = 7225$

Sides of right angle Δ will be 85, 84 and 13

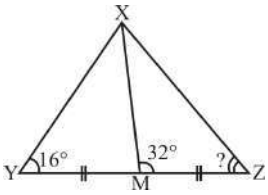
29. In the diagram M is the mid point of YZ, ∠XMZ = 32° and ∠XYZ = 16°. The value of ∠XZY is–



(a) 84° (b) 81°
(c) 74° (d) 68°

RRB Group-D – 27/09/2018 (Shift-I)

Ans. (c)



In the given triangle → M is the mid point of YZ,
Then, YM = ZM
∵ ∠XYM + ∠YXM = 32° (Exterior Angle)
∠YXM = (32° – 16°) = 16°
∴ YM = XM = ZM (Same Angle)
Now, In triangle XMZ,
side, XM = ZM ⇒ ∠MXZ = ∠MZX

then, $\angle XZM = \frac{180° - 32°}{2} = 74°$

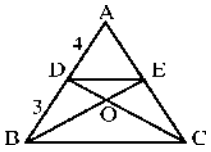
or ∠XZY = 74°

30. In triangle ABC, the points D and E lie on the sides AB and AC respectively. DE is parallel to the base BC. O is the intersection point of BE and CD. If AD : DB = 4:3, find the ratio of DO and DC.

(a) 4 : 11 (b) 3 : 7
(c) 5 : 12 (d) 5 : 7

RRB Paramedical Exam – 20/07/2018 (Shift-III)

Ans : (a)



DE || BC
∴ Δ ADE ~ Δ ABC

$\frac{AD}{AB} = \frac{DE}{BC}$

$\frac{4}{7} = \frac{DE}{BC}$ $(\because AB = AD + DB = 4 + 3 = 7)$

from ΔDOE and ΔBOC
∠ODE = ∠ OCB (Alternate interior angle)
∠OED = ∠OBC (Alternate interior angle)
∠DOE = ∠BOC (Vertically opposite angle)

∴ Δ DOE ~ Δ COB

So $\frac{DO}{CO} = \frac{DE}{CB}$

$\frac{DO}{CO} = \frac{4}{7}$

or $\frac{CO}{DO} + 1 = \frac{7}{4} + 1$

$\frac{DC}{DO} = \frac{11}{4}$

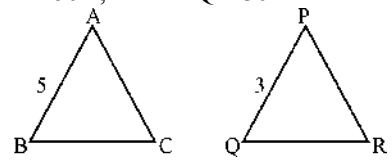
or DO : DC = 4 : 11

31. Triangle ABC is similar to triangle PQR. If AB = 5 cm and PQ = 3 cm, then find the value of $\frac{ar(\Delta ABC)}{ar(\Delta PQR)}$.

(a) $\frac{9}{25}$ (b) $\frac{3}{5}$
(c) $\frac{5}{3}$ (d) $\frac{25}{9}$

RRB Group-D – 19/09/2018 (Shift-III)

Ans. (d) : ΔABC ~ ΔPQR
AB = 5cm, PQ = 3cm



The ratio of area of two similar triangles is equal to the ratio of their corresponding sides square.

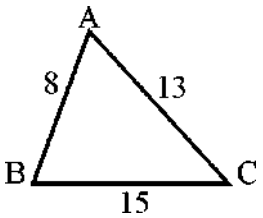
$\frac{area(\Delta ABC)}{area(\Delta PQR)} = \left(\frac{5}{3}\right)^2 = \frac{25}{9}$

32. The lengths of the three sides of a triangle are 8 cm, 13 cm and 15 cm respectively. What will be the ratio of their altitudes?

(a) 195 : 120 : 104 (b) 15 : 13 : 8
(c) 28 : 23 : 21 (d) 104 : 195 : 120

RRB Group-D – 22/10/2018 (Shift-III)

Ans : (a)



Ratio of altitudes

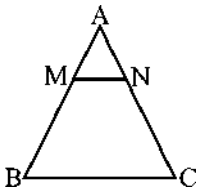
$= \frac{1}{8} : \frac{1}{13} : \frac{1}{15}$
$= 15 \times 13 : 8 \times 15 : 13 \times 8$
$= 195 : 120 : 104$

33. In triangle ABC, point M is on side AB and point N is on side AC such that BMNC becomes a trapezium. The ratio of side MN and side BC is 7:9. Find the ratio of the area of triangle AMN and the area of trapezium BMNC.

(a) 7 : 9 (b) 32 : 49
(c) 49 : 32 (d) 49 : 81

RRB Group-D – 11/12/2018 (Shift-II)

Ans: (c)



$\because$ BMNC is a trapezium

$\therefore$ MN || BC

$\therefore$ $\Delta AMN \sim \Delta ABC$

So, $\frac{\text{Area of } \Delta AMN}{\text{Area of } \Delta ABC} = \left(\frac{MN}{BC}\right)^2 = \left(\frac{7}{9}\right)^2 = \frac{49}{81}$

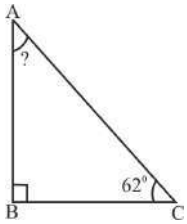
$\therefore \frac{\text{Area of } \Delta AMN}{\text{Area of } \square BMNC} = \frac{49}{81-49} = \frac{49}{32} \Rightarrow 49 : 32$

34. The acute angle of a right angled triangle is 62°. Find the value of the second acute angle.

(a) 38° (b) 28°
(c) 45° (d) 36°

RRB Group-D – 15/10/2018 (Shift-III)

Ans. (b) : Given right angle triangle



$\angle B = 90°$ $\angle C = 62°$ $\angle A = ?$

Sum of interior angles of triangle is 180°

$\angle A = 180° - (90° + 62°) = 180° - 152° = 28°$

35. If 8, p and 17 are Pythagoras triplet, then the value of p will be–

(a) 15 (b) 9
(c) 14 (d) 13

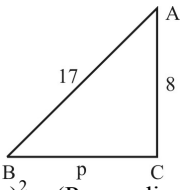
RRB Group-D – 01/10/2018 (Shift-I)

Ans. (a) : According to the question,

8, p and 17 is Pythagoras triplet

then p = ?

From the figure,



$(\text{hypotenuse})^2 = (\text{Perpendicular})^2 + (\text{base})^2$

$(17)^2 = (8)^2 + (p)^2$

$289 = 64 + (p)^2$

$289 - 64 = (p)^2$

$225 = p^2$

$\boxed{p = 15}$

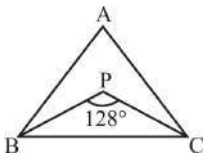
36. In Δ ABD, the bisectors of ∠B and ∠C intersect at P inside the triangle. If ∠BPC = 128°, then what is the measure of ∠A?

(a) 82° (b) 76°
(c) 78° (d) 52°

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (b) : Given,

$\angle BPC = 128°$



$\because \angle BPC = 90° + \frac{\angle A}{2}$

$\Rightarrow 128° = 90° + \frac{\angle A}{2}$

$\Rightarrow \frac{\angle A}{2} = 38°$

$\Rightarrow \angle A = 76°$

37. The bisector of ∠QPR of ΔPQR meets the side QR at S. If PQ = 12 cm, PR = 15 cm and QR = 18 cm, then the length of SR is

(a) 8 cm (b) 13 cm
(c) 10 cm (d) 12 cm

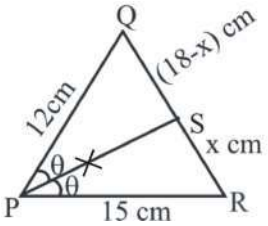
RRB NTPC (Stage-II) –14/06/2022 (Shift-II)

Ans. (c) : Given,

PQ = 12 cm

PR = 15 cm

QR = 18 cm



Let SR = x cm

Then,

From Angle Bisector Theorem–

$\frac{PQ}{PR} = \frac{QS}{SR}$

$\frac{12}{15} = \frac{18-x}{x}$

$9x = 90$

$x = \frac{90}{9}$

$x = 10$

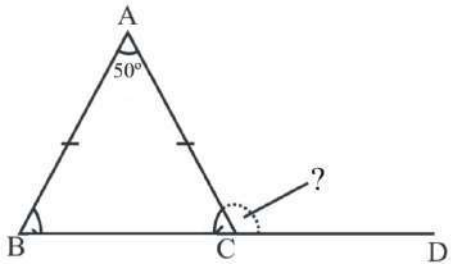
Hence, SR = 10 cm

38. ABC is an isosceles triangle in which AB = AC and ∠BAC = 50° .Side BC is extended to D. Find the measure of ∠ACD.

(a) 115° (b) 110°
(c) 100° (d) 130°

RRB NTPC (Stage-II) 17/06/2022 (Shift-I)

Ans. (a):



Let ∠ABC = ∠ACB = K
∠BAC +∠ABC + ∠ACB = 180°
50° + K + K =180°
2K = 130°
K = 65°
So, ∠ACD + ∠ACB = 180°
∠ACD + 65° = 180°
∠ACD = 180° – 65°
∠ACD = 115°

39. If two angles of a triangle measure 60º and 80º respectively, then the measure of the third angle of this triangle is:

(a) 50º (b) 70º
(c) 60º (d) 40º

RRB Group-D 22/08/2022 (Shift-I)

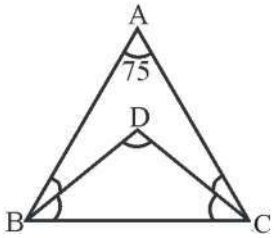
Ans. (d) : Sum of all three angles of a triangle be 180°.
According to the question,
Third angle of a triangle = 180º – (80º + 60º)
= 180º – 140º
= 40º

40. The internal bisectors of ∠B and ∠C of ΔABC meet at D. If ∠A = 75º, the ∠BDC is:

(a) 102.5º (b) 105.5º
(c) 112.5º (d) 127.5º

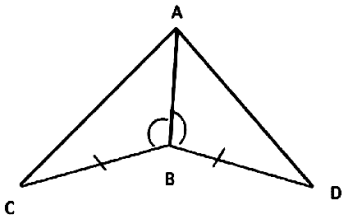
RRB Group-D 29/08/2022 (Shift-I)

Ans. (d) :



∠BDC = 90 + A/2
= 90 + 75/2
= 127.5º

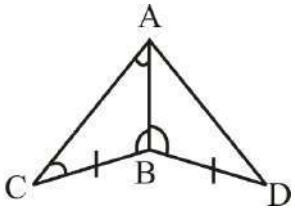
41. In the given figure ∠ABC = ∠ABD, BC = BD then Δ CAB = Δ.....



(a) ABD (b) DAB
(c) DBA (d) ADB

RRB GROUP-D – 17/08/2022 (Shift-III)

Ans. (b) :



In ΔACB and ΔABD
BC = BD -------- (given)
AB = AB ------- (Common)
∠ABC = ∠ABD
Hence, from the theorem side-side-angle
Δ CAB = Δ DAB

42. The area (in cm^2) of an equilateral triangle of side 3 cm is:

(a) $\frac{\sqrt{243}}{6}$ (b) $\frac{\sqrt{243}}{3}$
(c) $\frac{\sqrt{243}}{4}$ (d) $\frac{\sqrt{243}}{2}$

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (c) : Given :– Side of a triangle = 3cm

$\because$ Area of equilateral $\Delta = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow \frac{\sqrt{3}}{4} \times 3^2 \Rightarrow \frac{9\sqrt{3}}{4} = \frac{\sqrt{243}}{4}$

43. The larger of two supplementary angles is 36º more than the smaller. The smaller angle is:

(a) 72° (b) 108°
(c) 63° (d) 27°

RRB GROUP-D – 15/09/2022 (Shift-III)

Ans. (a) :
Let smaller angle of two supplementary angle be = x^0
$\therefore$ largest angle = $x^0 + 36^0$
According to the question,
$x^0 + x^0 + 36^0 = 180^0$
$2x^0 = 180^0 - 36^0$

$x^0 = \frac{144^0}{2} = 72^0$

Hence, smaller angle will be 72°.

44. Two angles are complementary. The larger angle is 6º less than thrice the measure of the smaller angle. What is the measure of the larger angle?

(a) 63º (b) 57º
(c) 66º (d) 54º

RRB Group-D 18/08/2022 (Shift-II)

Ans. (c) : Let larger angle be x and smaller angle be y
x + y = 90º ..... (i)
According to the question,
3y – 6 = x
x – 3y = –6 .....(ii)
Equation (ii) – equation (i)

$x = 66^\circ$
$y = 24^\circ$
Hence, larger angle is 66°.

45. Two adjacent angles form an angle of 100º. The larger angle is 20º less than five times the smaller angle. The larger angle is:

(a) 75º (b) 90º
(c) 70º (d) 80º

RRB NTPC 11.02.2021 (Shift-I) Stage Ist

Ans. (d) : Let the small angle = x
then the large angle = 5x – 20º
According to the question,

$x + 5x - 20^\circ = 100^\circ$
$6x = 120^\circ$
$\boxed{x = 20^\circ}$

Hence the larger angle = $5 \times 20^\circ - 20^\circ$
$= 100^\circ - 20^\circ$
$= 80^\circ$

46. What is the sum of the angle complementary to 15º and the angle supplementary to 125º?

(a) 135º (b) 120º
(c) 130º (d) 150º

RRB NTPC 09.02.2021 (Shift-I) Stage Ist

Ans. (c) : Two angle is called complementary when their measures add to 90 degrees.

$\angle A + \angle B = 90^\circ$

Supplementary angles are two angles whose measures add up to 180º

$\angle A + \angle B = 180^\circ$

According to the question,

Complementary angle $= \angle A + \angle B = 90^\circ$
$= \angle 15^\circ + \angle B = 90^\circ$
$\angle B = 75^\circ$

Supplementary angle $= \angle A + \angle B = 180^\circ$
$= 125 + \angle B = 180^\circ$
$\angle B = 55^\circ$

Sum of Angle $= 75^\circ + 55^\circ = 130^\circ$

47. If two complementary angles are in the ratio of 11:7, then find the smaller angle.

(a) 35° (b) 55°
(c) 45° (d) 25°

RRB RPF SI – 11/01/2019 (Shift-II)

Ans : (a) Because sum of two complementary angle is 90°

Small angle $= \frac{7}{11+7} \times 90 = \frac{7}{18} \times 90 = 35^\circ$

48. The supplement of an angle is 15° more than three times its complementary. What will be the value of the angle?

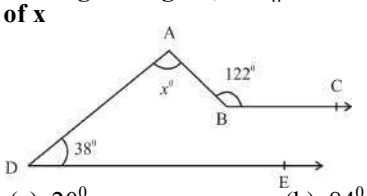
(a) 57.5° (b) 72.5°
(c) 52.5° (d) 65°

RRB Group-D – 16/10/2018 (Shift-III)

Ans : (c) Suppose an angle = x°
According to the question

$180° - x° = 3(90° - x°) + 15°$
$2x° = 270° + 15° - 180°$
$2x° = 105°$
$\boxed{x = 52.5°}$

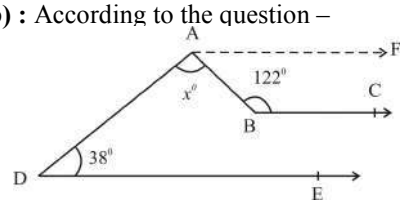
49. In the given figure, BC || DE then find the value of x



(a) 20^0 (b) 84^0
(c) 142^0 (d) 38^0

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (b) : According to the question –



BC || DE || AF
$\angle FAB + \angle ABC = 180^0$ (Interior angle)
$\angle FAB = 180^0 - 122^0 = 58^0$
$\angle FAD + \angle ADE = 180^0$ (Interior angle)
$\angle FAB + \angle BAD + 38^0 = 180^0$
$58^0 + x^0 + 38^0 = 180^0$
$x^0 = 180^0 - 96^0$
$x = 84^0$

50. The sum of two angles is 155° and their difference is $\frac{\pi}{2}$. The value of the greater angle (in radians) is:

(a) $\frac{53\pi}{72}$ (b) $\frac{47\pi}{72}$
(c) $\frac{49\pi}{72}$ (d) $\frac{51\pi}{72}$

RRB NTPC 09.02.2021 (Shift-II) Stage Ist

Ans. (c) : Let two angles are $\angle A$ and $\angle B$ respectively
According to the question,

$\angle A + \angle B = 155^\circ$ .....(i)

$\angle A - \angle B = \frac{\pi}{2} = 90^\circ$ .....(ii)

$2\angle A = 245^\circ$

$\angle A = \frac{245^\circ}{2}$

On putting the value of $\angle A$ in equation (i)-

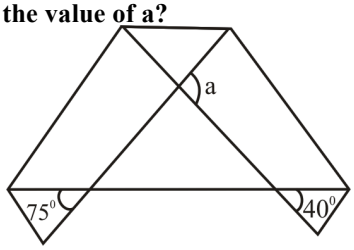
$\angle A + \angle B = 155°$

$\angle B = 155^\circ - \frac{245^\circ}{2} = \frac{65^\circ}{2}$

∴ Value of greater angle in radian

$= \frac{245^\circ}{2} \times \frac{\pi}{180} = \frac{49\pi}{72}$

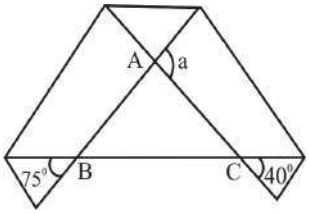
51. What is the value of a?



(a) 65° (b) 75°
(c) 105° (d) 115°

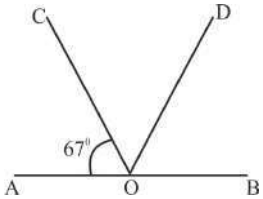
RRB NTPC 29.03.2016 Shift : 3

Ans : (d)



∠ABC = 75° (opposite angle)
∠ACB = 40° (opposite angle)
∴ ∠BAC = 180° – (75° + 40°)
= 180° – 115° = 65°
but ∠BAC + a = 180° (angle of Linear pair)
a = 180° – 65° = 115°

52. In the given figure, AOB is a straight line, ∠AOC = 67^0 and the bisector of ∠BOC is OD. What is the value of ∠BOD in degrees?



(a) 56° (b) 55.5°
(c) 55° (d) 56.5°

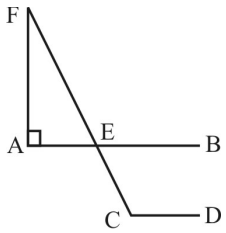
RRB Group-D – 20/09/2018 (Shift-III)

Ans : (d) ∠AOC = 67°
∴ ∠BOC = 180° – 67° = 113°
Bisector of ∠BOC is OD

$$\text{So, } \angle BOD = \frac{\angle BOC}{2}$$

$$\angle BOD = \frac{113^\circ}{2} = 56.5^\circ$$

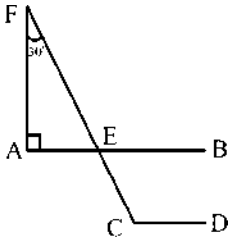
53. In the figure, AB || CD and ∠AFE = 30° then ∠FCD is:



(a) 60° (b) 120°
(c) 90° (d) 45°

RRB Group-D – 05/11/2018 (Shift-III)

Ans. (b) :



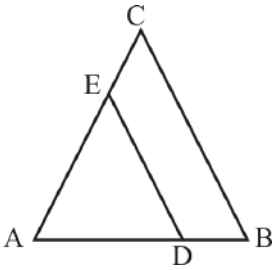
Given,
AB || CD
∠AFE = 30° ∠FCD = ?
From ΔAEF
∠AFE = 30° (given)
∠FAE = 90°
∵ Sum of all three angles of Δ is 180°
∴ 90° + 30° + ∠AEF = 180°
∴ ∠AEF = 180°–120° = 60°
∠BEC = 60° (Vertically opposite angle)
∠FEB + ∠BEC = 180° (Alternate angle)
∠FEB + 60° = 180°
∠FEB = 120°
∵ ∠FEB = ∠FCD (Corresponding angle)
∴ ∠FCD = 120°

54. Horizontal lines are on the same line.
(a) Equal in length
(b) Parallel to each other
(c) Intersecting each other
(d) Form triangle

RRB NTPC 29.04.2016 Shift : 1

Ans : (b) Horizontal line on one line is parallel of each other.

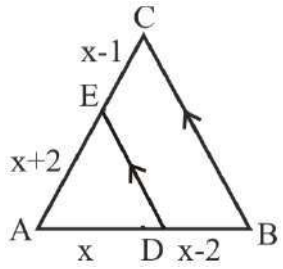
55. In the given figure, DE||BC. If AD = x, DB = x - 2, AE = x + 2 and EC = x– 1, then find the value of x.



(a) 5 (b) 3
(c) 4 (d) 2

RRB NTPC 13.01.2021 (Shift-II) Stage Ist

Ans. (c) :



DE || BC
⇒ If a line is drawn parallel to one side of a triangle it divides the other two sides in equal proportion.

$$\Rightarrow \quad \frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{x}{x-2} = \frac{x+2}{x-1}$$

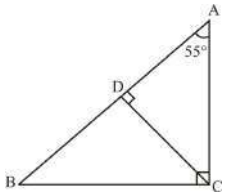
$$(x + 2)(x - 2) = x(x - 1)$$
$$x^2 - 4 = x^2 - x$$
$$x = 4$$

56. If ΔABC is right angled at C $CD \perp AB, \angle A = 55^0$ then, $\angle ACD$ = ?

(a) 60^0 (b) 45^0
(c) 35^0 (d) 55^0

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (c) :



Given–

$CD \perp AB, \angle A = 55^0$

In right angle ΔADC,

$\angle DAC + \angle CDA + \angle ACD = 180°$

$55° + 90° + \angle ACD = 180°$

$\angle ACD = 180° - 145°$

$\angle ACD = 35°$

57. The perimeters of two similar triangles, ΔPQR and ΔXYZ are 48 cm and 24 cm respectively. If XY = 12 cm, then PQ is:

(a) 12 cm (b) 8 cm
(c) 24 cm (d) 18 cm

RRB NTPC 04.01.2021 (Shift-I) Stage Ist

Ans. (c) : $\because$ $\Delta PQR \sim \Delta XYZ$

$\therefore \frac{48}{24} = \frac{PQ}{12}$

PQ = 48/2 = 24 cm.

58. The area of a triangle ABC is 63 square unit. Two parallel lines DE, FG are drawn such that it divides AB and AC into three equal parts. What is the area of quadrilateral DEFG?

(a) 28 Square unit (b) 35 Square unit
(c) 21 Square unit (d) 48 Square unit

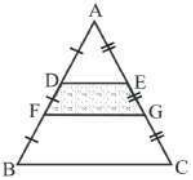
RRB NTPC 02.04.2016 Shift : 2

Ans : (c) In similar Δ ADE and ΔABC–

$$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \left(\frac{AD}{AB}\right)^2$$

$$\frac{\text{Area of } \Delta ADE}{63} = \left(\frac{AD}{3AD}\right)^2$$

Area of Δ ADE = 7 square unit



$\Rightarrow$ $\Delta AFG \sim \Delta ABC$

$$\therefore \quad \frac{\text{Area of } \Delta AFG}{\text{Area of } \Delta ABC} = \left(\frac{AF}{AB}\right)^2$$

$$\Rightarrow \quad \frac{\text{Area of } \Delta AFG}{63} = \left(\frac{2AD}{3AD}\right)^2$$

$\Rightarrow$ Area of $\Delta AFG = \frac{4}{9} \times 63 = 28$ Square unit

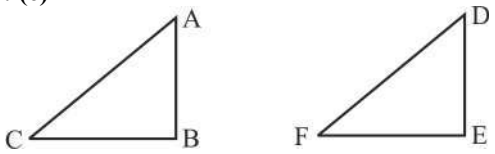
$\therefore$ Area of □DEFG = ΔAFG – Δ ADE
= 28 – 7 = 21 Square unit

59. If ΔABC and ΔDEF are similar triangles, in which BC = 4 cm, EF = 7 cm and the area of ΔABC is 144 square cm, then find the area of ΔDEF.

(a) 252 Square cm (b) 504 Square cm
(c) 441 Square cm (d) 324 Square cm

RRB NTPC 02.04.2016 Shift : 1

Ans : (c)



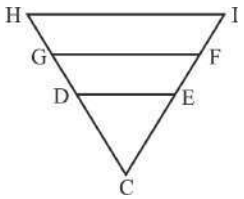
$\because$ $\Delta ABC \sim \Delta DEF$

$$\therefore \quad \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \left(\frac{BC}{EF}\right)^2$$

$$\frac{144}{\text{Area of } \Delta DEF} = \left(\frac{4}{7}\right)^2$$

$$\text{Area of } \Delta DEF = \frac{144 \times 49}{16} = 441 \text{ Square cm}$$

60.

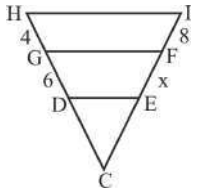


HI, GF and DE are parallel lines, If DG = 6, GH = 4 and FI = 8, then EF = ?

(a) 8 (b) 9
(c) 12 (d) 16

RRB NTPC 31.03.2016 Shift : 1

Ans : (c)



From the Thales theorem

In ΔCGF,

Let EF = x

$$\frac{CD}{GD} = \frac{CE}{EF}$$

or $$\frac{CD}{CE} = \frac{GD}{EF} \text{.....(1)}$$

Again in ΔCHI,

$$\frac{CD}{DH} = \frac{CE}{EI}$$

$$\frac{CD}{CE} = \frac{DH}{EI} \text{.....(2)}$$

∴ From equation (1) and (2)

$$\frac{GD}{EF}=\frac{DH}{EI}$$

$$\frac{6}{x}=\frac{6+4}{x+8}$$

$10x = 6x + 48$

$4x = 48$

$x = 12$

$EF = 12$

61. If the ratio of the angles of a triangle is 1:2:3, find the value of the largest angle?

(a) 30° (b) 60°

(c) 90° (d) 120°

RRB NTPC 19.04.2016 Shift : 1

Ans : (c) If the angles of triangle are x, 2x and 3x respectively.

Then $x + 2x + 3x = 180°$

$6x = 180°$

$x = 30°$

∴ Largest angle = $3x = 3\times30 = 90°$

62. If ΔABC ≅ ΔXYZ and ∠BAC = 55°, then ∠ZXY = ?

(a) 65° (b) 135°

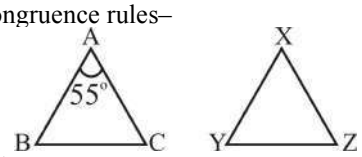
(c) 55° (d) 67.5°

RRB ALP & Tec. (31-08-18 Shift-I)

Ans : (c) Given– ∠BAC = 55°

ΔABC ≅ ΔXYZ

So from congruence rules–



∠A = ∠X

or ∠BAC = ∠ZXY

55^{o} = ∠ZXY

63. In ΔABC, AB = 10 cm. BD = 6 cm and DC = 7.5 cm. ∠A is bisected internally to intersect BC at D. What is the length of CA?

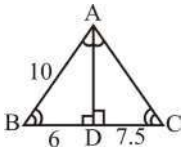
(a) 12 cm (b) 10 cm

(c) 10.5 cm (d) 12.5 cm

RRB ALP & Tec. (30-08-18 Shift-III)

Ans : (d) According to the question

In ΔABC,



By angle bisector theorem,

$$\frac{AB}{DB}=\frac{AC}{DC}$$

$$\frac{10}{6}=\frac{AC}{7.5},\qquad AC=\frac{10\times7.5}{6}$$

AC = 12.5 cm

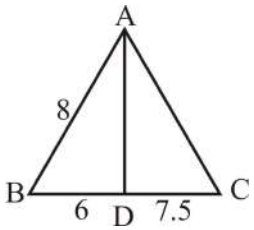
64. In ΔABC, AB = 8 cm. The bisector of ∠A is internally meets on BC at D and BD = 6 cm and DC = 7.5 cm. What will be the value of CA?

(a) 10.5 cm (b) 12.5 cm

(c) 12 cm (d) 10 cm

RRB ALP & Tec. (10-08-18 Shift-III)

Ans : (d)



From the interior angle Bisector theorem–

$$\frac{AB}{BD}=\frac{AC}{CD}$$

$$\frac{8}{6}=\frac{AC}{7.5}$$

$$AC=\frac{8\times7.5}{6}$$

AC = 10 cm

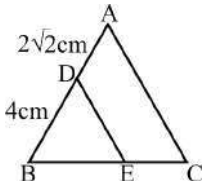
65. In Δ ABC, DE || AC, where D and E are the points on side AB and BC, respectively. If BD = 4 cm and AD = $2\sqrt{2}$ cm, then what is the ratio of the area of Δ BDE to the trapezium ADEC?

(a) $2:\left(1+\sqrt{2}\right)$ (b) $2:\left(1+3\sqrt{2}\right)$

(c) $2:\left(1+2\sqrt{2}\right)$ (d) $1:\left(1+2\sqrt{2}\right)$

RRB Group-D 01/09/2022 (Shift-III)

Ans. (c) :



$$\frac{\text{area of }\Delta BDE}{\text{area of }\square ADEC}=\frac{BD^2}{(AB)^2-(BD)^2}$$

$$=\frac{(4)^2}{(4+2\sqrt{2})^2-(4)^2}=\frac{16}{24+16\sqrt{2}-16}$$

$$=\frac{16}{8+16\sqrt{2}}=2:\left(1+2\sqrt{2}\right)$$

66. The circumradius of a triangle is 9 cm while the inradius of it is 4 cm. What is the distance between the circumcentre and the incentre of the triangle?

(a) 3 cm (b) 2 cm

(c) 4 cm (d) 5 cm

RRB NTPC 27.03.2021 (Shift-II) Stage Ist

Ans. (a) Circumradius of triangle (R) = 9 cm

Inradius of triangle (r) · 4 cm

Distance between circumradius and inradius of triangle

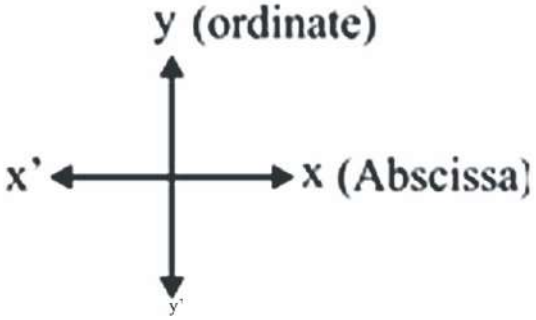
$= \sqrt{R^2-2rR}$

$= \sqrt{(9)^2-2\times4\times9}=\sqrt{81-72}=\sqrt{9}$

D = 3 cm

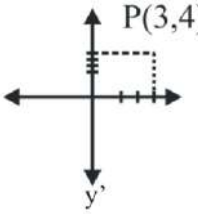
03 Co-ordinate Geometry

1. Cartesian Co-ordinate system :



Co-ordinate = Abscissa, ordinate

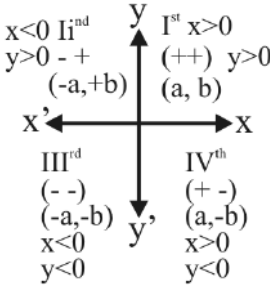
Ex.: P(3, 4)



P(3, 4)

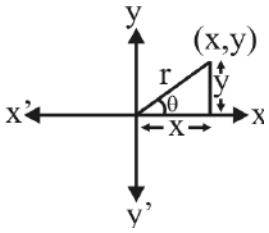
x Axis y axis
(Abscissa) ordinate

2. Quadrant :



Note: Any point which is lines on x-axis or y-axis is not in any quadrant.

3. Polar form :



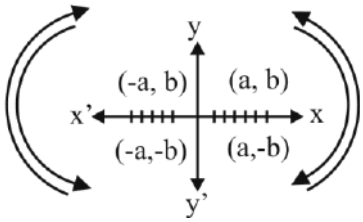
$\sin = \frac{y}{r}$ $\quad y = r \sin$

$\cos = \frac{x}{r}$ $\quad x = r \cos$

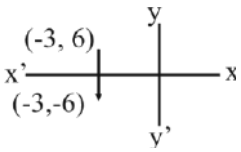
$\tan = \frac{y}{x}$ $\quad y = x \tan$

4. Reflection :

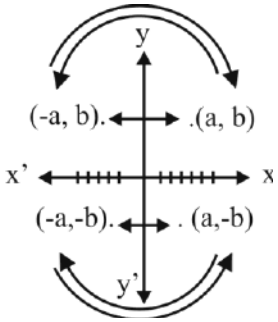
(i) Reflection on the x-axis (water Image)



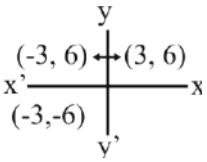
Ex.: What is the Reflection of (-3, 6) on x-axis.



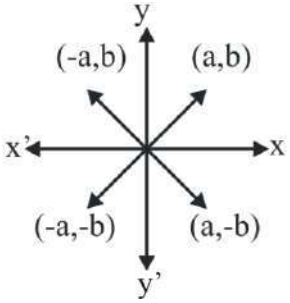
(ii) Reflection on y axis (Mirror Image) :



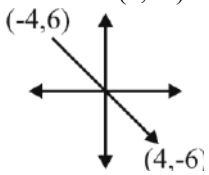
Ex.: What is Reflection of (-3, 6) on y axis.



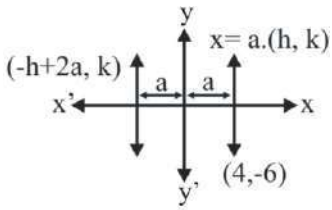
(iii) Reflection of origin :



Ex.: What is the reflection of (4, -6) on origin :



(iv) In line x =a, the reflection of (h, k):



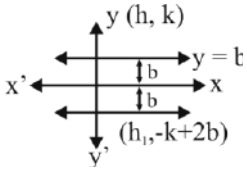
Hence, In x = a, the reflection of (h, k)
= (-h + 2a, k)

$\frac{h + x_2}{2} = a$ Content

$x_2 = 2a - h$ $\boxed{y = k}$

$\boxed{x_2 = -h + 2a}$

(v) In line y = b, the reflection of (h, k) :



$\frac{k + y_2}{2} = b$

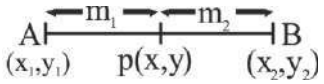
Conltant $y_2 = 2b - k$

$\boxed{x = h}$ $\boxed{y = -k + 2b}$

Hence, In the y = b the reflection of (h, k)
(h,-k+2b)

5. Section Formula :

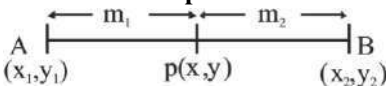
(i) Internal Section :



If AP : BP = $m_1 : m_2$

then $x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$, $y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$

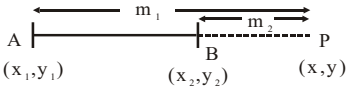
(ii) Co-Ordinate of midpoint :



If AP : BP = $m_1 : m_2 : 1 : 1$

then $x = \frac{x_1 + x_2}{2}$, $y = \frac{y_1 + y_2}{2}$

(iii) External section :



If AP : BP = $m_1 : m_2$

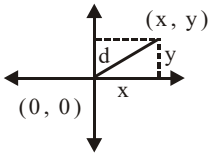
$x = \frac{m_1 x_2 - m_2 x_1}{m_1 - m_2}$, $y = \frac{m_1 y_2 - m_2 y_1}{m_1 - m_2}$

6. Distance:

(i) The distance between two points (x_1, y_1) and (x_2, y_2):

$d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$

(ii)

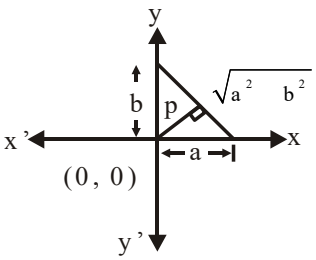


Distance from x axis y,

Distance from y axis x

The distance from origin $\sqrt{x^2 + y^2}$

(iii) Find the length of perpendicular drawn from the origin on any given line:



$\boxed{P = \frac{ab}{\sqrt{a^2 + b^2}}}$

(iv) The length of perpendicular drawn from origin on the line

$\boxed{P = \frac{c}{\sqrt{a^2 + b^2}}}$

ax + by + c = 0

(v) The distance from point (x_1, y_1) to line ax + by + c = 0 in:

$\boxed{d = \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}}$

ax + by + c = 0

(vi) Distance between two parallel lines ax + by + c = 0 and ax + by + d = 0 :

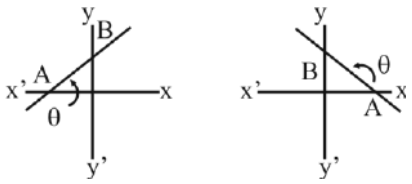
Distance $= \frac{|c - d|}{\sqrt{a^2 + b^2}}$

(vii) Length of perpendicular drawn from point (x_1, y_1) to straight line x cos + y sin = p

$d = \frac{x_1 \cos + y_1 \sin - p}{\sqrt{\cos^2 + \sin^2}}$

$\boxed{d = x_1 \cos + y_1 \sin - p}$

7. Slop or gradient of a line:



(i) $m = \tan$

$$\tan = \frac{y_2 - y_1}{x_2 - x_1}$$

(ii) $$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

(iii) Slope of a line parallel to x axis: $= 0$ $m = 0$

(iv) Slope of a line parallel to y axis: $= 90$ $m =$

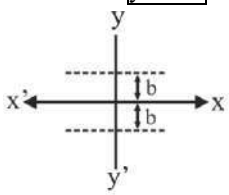
8. Straight Line :

(i) Interior intersect form equation $= \frac{x}{a} \quad \frac{y}{b} = 1$

(ii) Gradient/slope form equation : $y = mx + c$

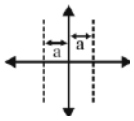
(iii) Standard equation : $Ax+By+c=0$

(iv) Equation of a straight line parallel to x axis at a distance "b" from it. $y = b$

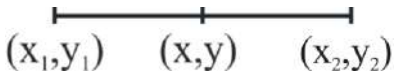


(v) Equation of a straight line parallel to y axis at a distance "a" from it.

$x = a$



9. Point form equation of line :



(i) When two points are given : $y \quad y_1 = \frac{y_2 - y_1}{x_2 - x_1}$

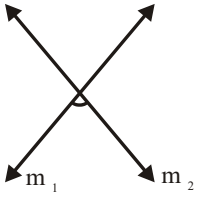
$(x \quad x_1)$

(ii) When given slope and a point :

$y \quad y_1 = m(x \quad x_1)$

(iii) Equation of line through origin : $y = mx$

10. Angle between two given lines :



$$\tan = \frac{m_1 \quad m_2}{1 \quad m_1 m_2}$$

(i) If both lines are perpendicular to each other $= 90^o$ $m_1 m_2 = 1$

(ii) If both lines are parallel to each other $= 0$ $m_1 = m_2$

(iii) If two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are given :

$$\tan = \frac{a_2 b_1 \quad a_1 b_2}{b_1 b_2 \quad a_1 a_2}$$

(iv) To be perpendicular : $= 90^o$ $a_1a_2 + b_1b_2 = 0$

(v) To be parallel : $= 0$ $a_1b_2 = a_2b_1$

11. Type of lines :

For the system of equation $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

$\frac{a_1}{a_2} \quad \frac{b_1}{b_2}$	Unique solution	consistent (independent)	Intersecting lines	
$\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$	Infinitely many solution	consistent (dependent)	Coincident lines	
$\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$	No solution	Inconsistent	Parallel lines	

12. The Parallel line Equation of a line ax + by + c = 0

$ax + by =$ (is constant)

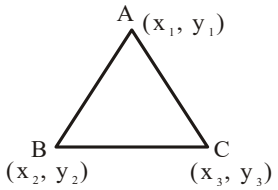
Note: To find the value of , put the value of point on the given line in place of (x, y) in the parallel line equation.

(ii) Equation of a line perpendicular to line $ax + by + c = 0$

$ay \quad bx =$ where is a constant

Note: To find the value of , put the value of point on the given line in place of (x, y) in the perpendicular line equation.

13.(i) Area of triangle when all three points are given:



Area of ABC =

$$\frac{1}{2} | x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_3) |$$

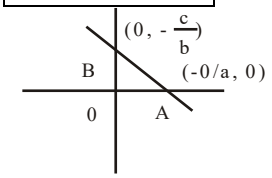
(ii) If Area of $= 0$

then all three points are collinear.

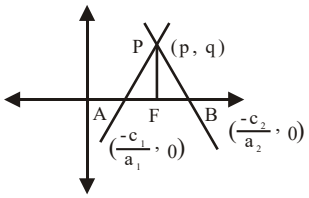
(iii) To find the area made from the line equation

ax+by+c = 0, a 0, b 0 c 0

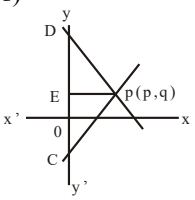
$$\text{Area of } = \left|\frac{1}{2}\frac{C^2}{ab}\right|$$



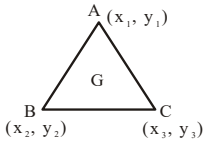
(iv) Area of triangle formed by two straight lines with x-axis = $\frac{1}{2}$ (difference of x-intercept of the two lines) × y coordinate of point of intersection of two lines.



(v) Area of triangle formed by two straight lines with y-axis $\frac{1}{2}$ (difference of y-intercept of two lines) x (x coordinate of point of interaction of two lines)



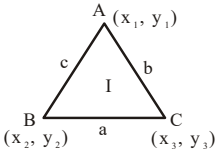
14.(i) Coordinate of centroid of triangle:



Coordinate of centroid

$$= \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$$

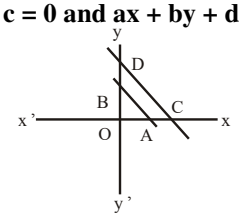
(ii) Coordinate of In centre of Triangle



$$I(x, y) = \left(\frac{ax_1 + bx_2 + cx_3}{a + b + c}, \frac{ay_1 + by_2 + cy_3}{a + b + c}\right)$$

Note: Find the Co-ordinate circumcentre & ortho centre, to get perpendicular form equation and solve them.]

15. Area of Trapezium between two parallel lines ax + by + c = 0 and ax + by + d = 0



(Trapezium) ABDC Ar = Ar of OCD Ar of OAB

$$= \frac{1}{2}\left|\frac{d^2}{ab}\right| \left|\frac{c^2}{ab}\right|$$

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. The distance between the points (0, 3) and (–3, 0) is :

(a) 3 units (b) $2\sqrt{3}$ units

(c) $3\sqrt{2}$ units (d) 6 units

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (c) :

Point A x_1, y_1 0, 3

Point B x_2, y_2 3, 0

The distance between the points

$$AB = \sqrt{x_2 - x_1^{\ 2} + y_2 - y_1^{\ 2}}$$

$$= \sqrt{-3 - 0^{\ 2} + 0 - 3^{\ 2}}$$

$$\sqrt{9 \quad 9}$$

$3\sqrt{2}$ Units

2. The points (–5, 1), (1, k) and (4, –2) are collinear if the value of k is.

(a) 1 (b) 3

(c) 2 (d) –1

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Ans. (d) : When three points (–5, 1), (1, k) and (4, –2) are collinear −

Where, $x_1 = -5, x_2 = 1, x_3 = 4, y_1 = 1, y_2 = k, y_3 = -2$

$$\frac{1}{2}[x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3(y_1 - y_2)] = 0$$

$$-5 (k+2)+1 (-2-1) +4 (1-k) = 0$$

$$-5k - 10 - 3 + 4 - 4k = 0$$

$$-9k - 9 = 0$$

$$-9k = 9$$

$$k = -1$$

3. The distance of the point P(2, 3) from the x-axis is.

(a) 3 (b) 1

(c) 5 (d) 2

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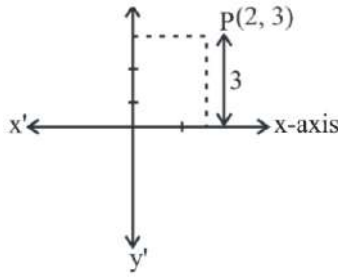
Ans. (a) : According to the question,



Hence, the distance of point P from the X-axis is 3.

4. The coordinates of the centroid of the triangle ABC whose vertices are A(–5, 7), B(–4, –5) and C(4, 5) is

(a) $\frac{4}{3}, \frac{7}{3}$ (b) $\frac{5}{3}, \frac{7}{3}$

(c) $\frac{7}{3}, \frac{5}{3}$ (d) $\frac{5}{3}, \frac{7}{3}$

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Ans. (b) : Let, $x_1 = -5, \quad x_2 = -4, \quad x_3 = 4$

$y_1 = 7, \quad y_2 = -5 \quad y_3 = 5$

Coordinates of the centroid of the triangle

$$= \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$

$$= \left(\frac{-5 + -4 + 4}{3}, \frac{7 + -5 + 5}{3} \right)$$

$$= \frac{5}{3}, \frac{7}{3}$$

5. If the points A (1, 2), B(4, 3), C(1, 0) and D(k, –1) are the vertices of a parallelogram then, the value of k is :

(a) –1 (b) –2

(c) 2 (d) 1

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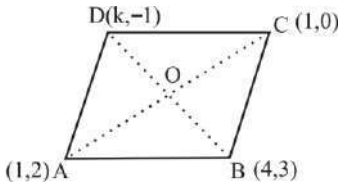
Ans. (b) :



The diagonals of a parallelogram divide each other equally and meet at a single point.

Midpoint of diagonal AC = Midpoint of diagonal BD

$$\left(\frac{1+1}{2}, \frac{2+0}{2} \right) \quad \left(\frac{k+4}{2}, \frac{3-1}{2} \right)$$

$$\frac{1}{2} \quad \frac{1}{2} \quad \frac{k}{2} \quad \frac{4}{2}$$

$$1 = \frac{k}{2} \quad \frac{4}{2}$$

$$2 = k + 4$$

$$k = 2 - 4$$

$$k = -2$$

6. The point (9, 0), (9, 6), (–9, 6) and (–9, 0) are the vertices of a _____.

(a) trapezium (b) rhombus

(c) square (d) rectangle

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Ans. (d) : Let A (9, 0), B (9, 6), C (–9, 6) and D (–9, 0)-

Side AB $= \sqrt{9-9^2 + 0-6^2} = \sqrt{6^2} = 6$ Unit

Side BC $= \sqrt{9--9^2 + 6-6^2} = \sqrt{18^2} = 18$ Unit

Side CD $= \sqrt{-9+9^2 + 6-0^2} = \sqrt{6^2} = 6$ Unit

Side DA $= \sqrt{-9-9^2 + 0-0^2} = \sqrt{-18^2} = 18$ Unit

Diagonal BD $= \sqrt{9+9^2 + 6-0} = \sqrt{324+36} = \sqrt{360}$

Diagonal AC $= \sqrt{9+9^2 + 0-6^2} = \sqrt{324+36} = \sqrt{360}$

If facing sides are equal and diagonals is also equal then that parallelogram will be a rectangle.

7. The area of the triangle ABC with the vertices A(–5, 7), B(–4, –5) and C(4, 5) is

(a) 35 sq. units (b) 53 sq. units

(c) 63 sq. units (d) 36 sq. units

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Ans. (b) : Given that,

A $(-5, 7)$ (x_1, y_1)

B $(-4, -5)$ (x_2, y_2)

C $(4, 5)$ (x_3, y_3)

Area of triangle,

$$= \frac{1}{2}\left[x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2) \right]$$

$$= \frac{1}{2}\left[-5(-5-5) + -4(5-7) + 4(7--5) \right]$$

$$= \frac{1}{2} -5 \times -10 + -4 \times -2 + 4 \times 12$$

$$\frac{1}{2} 50 \quad 8 \quad 48$$

$$\frac{1}{2} 106$$

$$53 \text{ sq.units}$$

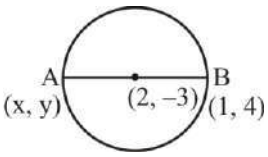
8. The coordinates of a point A, where AB is the diameter of a circle whose centre is (2, – 3) and B is (1, 4) is:

(a) (3, -10) (b) (-3, 10)

(c) (-2, 10) (d) (2,-10)

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (a) : According to question,



$\because$ The midpoint of point A and point B is (2, -3)-

$\because \frac{x \quad 1}{2} \quad 2 , \frac{y \quad 4}{2} \quad 3$

$x = 3, y = -10$

So, coordinate of A= (3, –10)

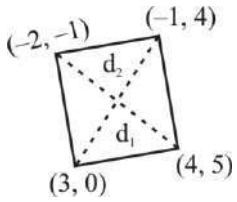
9. The area of a quadrilateral whose vertices are (3, 0), (4, 5), (-1, 4) and (-2,-1) taken in order, is :

(a) 30 sq.units (b) 24 sq.units

(c) 12 sq.units (d) 48 sq.units

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (b) : According to the question,



Distance between point (3, 0) and (–1, 4)-

$$d_1 = \sqrt{3+1^2 + 0-4^2}$$

$$= \sqrt{4^2 \quad 4^2} = \sqrt{32}$$

$$= 4\sqrt{2} \text{ Unit}$$

Distance between point (–2, –1) and (4, 5)

$$d_2 = \sqrt{-2-4^2 + -1-5^2} = \sqrt{6^2 \quad 6^2}$$

$$= \sqrt{36 \quad 36} \quad \sqrt{72} = 6\sqrt{2} \text{ Unit}$$

$$\text{Area} = \frac{1}{2} d_1 d_2$$

$$= \frac{1}{2} \quad 4\sqrt{2} \quad 6\sqrt{2} = 24 \text{ Square units.}$$

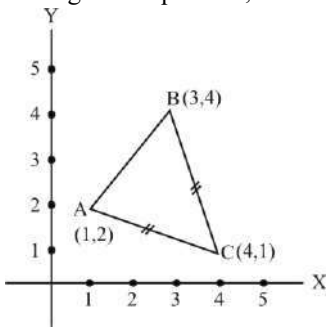
10. The points A (1, 2), B (3, 4) and C (4, 1) are the vertices of a triangle which is :

(a) Isosceles (b) Right-angled

(c) Equilateral (d) Scalene

RRB NTPC 01.02.2021 (Shift-I) Stage Ist

Ans. (a): According to the question,



$$AB = \sqrt{3-1^2 + 4-2^2} = \sqrt{4+4} = \sqrt{8}$$

$$BC = \sqrt{4-3^2 + 1-4^2} = \sqrt{1+9} = \sqrt{10}$$

$$CA = \sqrt{1-4^2 + 2-1^2} = \sqrt{9+1} = \sqrt{10}$$

Thus side, BC = CA AB

Hence, the triangle is a isosceles triangle.

12. The intercepts made by the plane $3x - 4y - 2z = 6$ with the coordinate axis are:

(a) $2, \frac{3}{2}, 3$ (b) $2, \frac{3}{2}, \quad 3$

(c) $2, \quad \frac{3}{2}, 3$ (d) $2, \quad \frac{3}{2}, \quad 3$

RRB NTPC 13.03.2021 (Shift-II) Stage Ist

Ans. (d) : Standard equation of intercepts

$$\frac{x}{a} \quad \frac{y}{b} \quad \frac{z}{c} \quad 1 \text{ ..... (i)}$$

Plane $3x \quad 4y \quad 2z \quad 6$ ..... (Given)

Dividing both side by 6

$$\frac{3x}{6} \quad \frac{4y}{6} \quad \frac{2z}{6} \quad \frac{6}{6}$$

$$\frac{x}{2} \quad \frac{2y}{3} \quad \frac{z}{3} \quad 1$$

$$\frac{x}{2} + \frac{y}{-\frac{3}{2}} + \frac{z}{-3} = 1$$

Comparing with Intercepts equation

$a = 2$

$b = -\frac{3}{2}$

$c = -3$

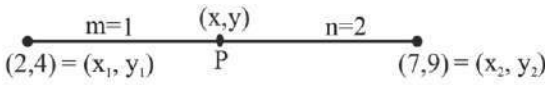
13. Find the coordinates of the point which will divide the line joining the point (2, 4) and (7, 9) internally in the ratio 1 : 2 :

(a) $\frac{3}{8}, \frac{3}{11}$ (b) $\frac{5}{3}, \frac{1}{3}$

(c) $\frac{11}{3}, \frac{17}{3}$ (d) $\frac{8}{3}, \frac{11}{3}$

RRB NTPC 05.02.2021 (Shift-I) Stage Ist

Ans. (c):



We know that

$$x = \frac{nx_1 + mx_2}{m+n}, \quad y = \frac{ny_1 + my_2}{m+n}$$

$$x = \frac{2 \quad 2 \quad 1 \quad 7}{1 \quad 2} \quad \frac{4 \quad 7}{3} \quad \frac{11}{3}$$

$$y = \frac{2 \quad 4 \quad 1 \quad 9}{1 \quad 2} \quad \frac{8 \quad 9}{3} \quad \frac{17}{3}$$

So, the point = $\frac{11}{3}, \frac{17}{3}$

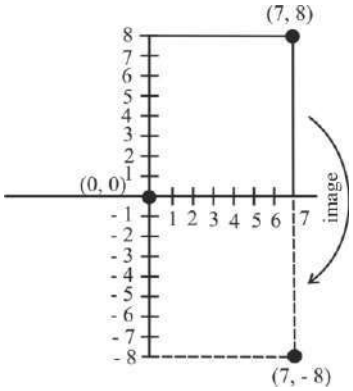
14. The image of the point (7, 8) when reflected along the x - axis is :

(a) (8, 7) (b) (–7, –8)

(c) (–7, 8) (d) (7, –8)

RRB NTPC 22.02.2021 (Shift-I) Stage Ist

Ans. (d) : The reflected image of the point (7, 8) with respect to the x-axis will be as follows–



Hence, (7, – 8) is reflected image.

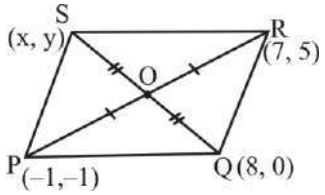
15. In a parallelogram PQRS, P = (–1,–1), Q = (8,0) and R = (7, 5) find the coordinates of 'S' ?

(a) (–2, 4) (b) $-2, \frac{7}{2}$

(c) $-\frac{3}{2}, 4$ (d) (–1,4)

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (a) : Let the coordinates of the point (S) = (x, y)



Coordinates of midpoint = $\left(\frac{x_1 \quad x_2}{2}, \frac{y_1 \quad y_2}{2} \right)$

Coordinates of the midpoint of point P (-1, -1) and point R (7, 5)-

$\frac{-1 \quad 7}{2}, \frac{-1 \quad 5}{2}$

= (3, 2).....(i)

Coordinates of the midpoint of point Q (8,0) and point S (x, y) -

$\frac{8 \quad x}{2}, \frac{y \quad 0}{2}$

$\frac{8 \quad x}{2}, \frac{y}{2}$

On comparing with equation (i),

$(3, 2) = \frac{8 \quad x}{2}, \frac{y}{2}$

$3 = \frac{8 \quad x}{2} \qquad 2 = \frac{y}{2}$

$x \quad -2 \qquad y \quad 4$

$x, y \qquad -2, 4$

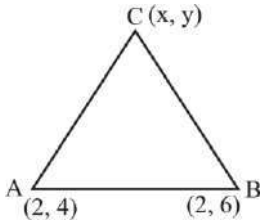
16. Find the third vertex of an equilateral triangle whose two vertices are (2, 4) and (2, 6).

(a) (2, 5) (b) $(\sqrt{3}, 5)$

(c) $(2 \quad \sqrt{3}, 5)$ (d) $(2\sqrt{3}, 5)$

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (c) : Let the third vertex of an equilateral triangle is (x, y).



In equilateral triangle, all sides have equal length.

AB = BC = AC

Here, AB $= \sqrt{2 - 2^{\ 2} + 6 - 4^{\ 2}}$

$\sqrt{2^{\ 2}} = 2 \ = 2$ units

And AC $= \sqrt{2 - x^{\ 2} + 4 - y^{\ 2}} = 2$ units _____(i)

BC $= \sqrt{2 - x^{\ 2} + 6 - y^{\ 2}} = 2$ units _____(ii)

On comparing the equation (i) and (ii)

$\Rightarrow \sqrt{2 \quad x^{\ 2} \ 4 \quad y^{\ 2}} = \sqrt{2 \quad x^{\ 2} \ 6 \quad y^{\ 2}}$

On squaring both sides–

$(2–x)^2 + (4 – y)^2 = (2 – x)^2 + (6 – y)^2$

$16 + y^2–8y = 36 + y^2 – 12y \qquad 4y = 20$

$y = 5$ _____(iv)

Now, putting $y = 5$ in eq^n (i),

$\sqrt{2 \quad x^{\ 2} \quad 1 \quad 2}$

On squaring both sides–

$(2 – x)^2 + 1 = 4 \qquad (2 – x)^2 = 3 \quad 2 \quad x \quad \sqrt{3}$

$x \quad 2 \quad \sqrt{3}$

So, $x, y \qquad 2 \quad \sqrt{3}, 5 \qquad 2 \quad \sqrt{3}, 5$

17. Find the co-ordinates of the point, which internally divides the line segment joining the point (–4, 4) and (4, 0) in the ratio of 3 : 1.

(a) (0, 4) (b) (2, 1)
(c) (–3, 4) (d) (1, 3)

RRB RPF SI – 05/01/2019 (Shift-II)

Ans. (b) : We know that-

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}$$

$$\frac{3 \times 4 + 1 \times (-4)}{3 + 1}$$

$$\frac{12 - 4}{4}$$

$$\frac{8}{4}$$

$$x = 2$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$\frac{3 \times 0 + 1 \times 4}{3 + 1} = \frac{4}{4}$$

$y = 1$

Hence, the co-ordinates of required points = (2, 1)

18. The co-ordinates of a point, which internally divides the line segment joining the point (-1, 9) and (11, 1) in the ratio of 3:1 are as follows.

(a) (5, 5) (b) $\frac{13}{2}, 4$
(c) (2, 7) (d) (8, 3)

RRB Group-D – 28/09/2018 (Shift-III)
RRB RPF Constable – 20/01/2019 (Shift-III)

Ans : (d) If the coordinate of the interior point of the line segment joining the two points (x_1, y_1) and (x_2, y_2) are (x, y), which is divided this line segment in the ratio of $m_1 : m_2$

(x_1, y_1) (x_2, y_2)
$(-1, 9)$ $(11, 1)$
m_1 (x, y) m_2

$m_1 = 3, m_2 = 1$

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$x = \frac{3 \times 11 + 1 \times (-1)}{3 + 1}, \quad y = \frac{3 \times 1 + 1 \times 9}{3 + 1}$$

$$x = \frac{33 - 1}{4}, \quad y = \frac{3 + 9}{4}$$

$x = 8, y = 3$,

Hence, the co-ordinate of required point is (8, 3).

19. Find the ratio in which the line 4x + y = 13 divide the segment which is joining to the point (1, 6) and (6, 1).

(a) 1:3 (b) 2:5
(c) 2:3 (d) 1:4

RRB RPF Constable – 17/01/2019 (Shift-I)

Ans. (d) :

Equation of a line passing through two points $(x_1\ y_1)$ and (x_2, y_2)

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

Equation of a line passing through the points (1, 6) (6, 1)

$$y - 6 = \frac{1 - 6}{6 - 1}(x - 1)$$

$y - 6 = -x + 1$

or $x + y = 7$ .....(i)

Again equation of a given lines $4x + y = 13$ .....(ii)

From the equation (i) and (ii)–

The co-ordinate of the intersection point of both the lines (x, y) = (2, 5)

Let the point (1, 6) and (6, 1) is divided in the ratio of m:n by the point (2, 5).

$$x = \frac{mx_2 + nx_1}{m + n}$$

$$2 = \frac{m \times 6 + n \times 1}{m + n}$$

$2m + 2n = 6m + n$

$4m - n = 0$

$4m = n$

$$\frac{m}{n} = \frac{1}{4} \quad 1 : 4$$

20. The line segment joined by the points (-1, 0) and (2, 6). What will be the co-ordinate of points who divides the line in the ratio of 2:1?

(a) (0, 4) (b) (1, 3)
(c) (1, 4) (d) (0, 5)

RRB Group-D – 23/09/2018 (Shift-I)

Ans : (c)

(-1,0) (x, y) (2, 6)
m_1 (2) m_2 (1)

Let the co-ordinates of interior point is (x, y) -

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$x = \frac{2 \times 2 + 1 \times (-1)}{2 + 1}, \quad y = \frac{2 \times 6 + 1 \times 0}{2 + 1}$$

$$x = \frac{4 - 1}{3}, \quad y = \frac{12}{3}$$

$x = 1, y = 4$

Hence, interior point (x, y) · (1, 4)

21. At which point, the line segment associated with points (4, 5) and (7, 11) divided internally in the ratio of 2 : 1.

(a) (6, 8) (b) (5, 10)
(c) (5, 9) (d) (6, 9)

RRB Group-D – 15/11/2018 (Shift-III)

Ans : (d) The coordinate of the points P(x, y) internally dividing the line segment joining the two points A (x_1,y_1) and B (x_2,y_2) in the ratio of m:n.

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2} \qquad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$x_1 = 4, y_1 = 5, m_1 = 2$

$x_2 = 7, y_2 = 11, m_2 = 1$

$$x = \frac{2 \times 7 + 1 \times 4}{2 + 1}, \quad y = \frac{2 \times 11 + 1 \times 5}{2 + 1}$$

$$x = \frac{14 + 4}{3}, \quad y = \frac{22 + 5}{3}$$

$$x \quad \frac{18}{3}, \quad y \quad \frac{27}{3}$$

$x = 6 \qquad y = 9$

So required point will be (6, 9).

22. The coordinates of the points that divides the line segment joining the points (–7, 6) and (5, 0) internally in the ratio of 1 : 3

(a) (–3, 4) (b) (–4, 4.5)
(c) (3, 1) (d) (1, 3)

RRB Group-D – 05/11/2018 (Shift-III)

Ans. (b) : Given, $x_1 = -7, x_2 = 5 \quad m_1 = 1$

$y_1 = 6, y_2 = 0 \quad m_2 = 3$

The point divides the line segment internally, then the coordinate of the point is

$$x, y \quad \left(\frac{m_2x_1 + m_1x_2}{m_1 + m_2}, \frac{m_2y_1 + m_1y_2}{m_1 + m_2}\right)$$

$$\left(\frac{3 \quad 7 \quad 1 \quad 5}{1+3}, \frac{3 \quad 6 \quad 1 \quad 0}{1+3}\right)$$

$$\left(\frac{21 \quad 5}{4}, \frac{18}{4}\right) \qquad \frac{16}{4}, \frac{18}{4}$$

Hence, the co-ordinate of required point

(x,y) = (–4, 4.5)

23. Find the coordinate of the point, which internally divides the line segment joining the point (-3, 7) and (9, -1) in the ratio of 3:1.

(a) (0, 5) (b) (6, 1)
(c) (3, 3) (d) $\frac{9}{2}, 2$

RRB Paramedical Exam – 21/07/2018 (Shift-III)

Ans. (b) Formula of internal division

$$x = \frac{m_1x_2 \quad m_2x_1}{m_1 \quad m_2} \qquad y = \frac{m_1y_2 \quad m_2y_1}{m_1 \quad m_2}$$

according to the question,

The ratio of the line joining the internal division of the points (–3, 7) and (9, –1) is 3:1

Where, $x_1 = -3, x_2 = 9, y_1 = 7, y_2 = -1, m_1 = 3, m_2 = 1$

Then, $x = \frac{3 \quad 9 \quad 1(\ 3)}{3 \quad 1}$

$$x = \frac{27 \quad 3}{4}$$

$$x = \frac{24}{4} = 6$$

$$y = \frac{3 \quad (\ 1) \quad 1 \quad 7}{3 \quad 1}$$

$$y = \frac{4}{4} = 1$$

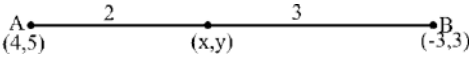
Hence, co-ordinates of internal division will be (6, 1).

24. The coordinates of a point, which internally divides the line segment joining the point (4, 5) and (-3, 3) in the ratio of 2 : 3 is–

(a) 11/5, 17/5 (b) 13/5, 17/5
(c) 12/5, 13/5 (d) 6/5, 21/5

RRB Group-D – 24/10/2018 (Shift-III)

Ans. (d) :



$m_1 = 2 \qquad m_2 = 3$

As per the question,

$$x - \frac{m_1x_2 \quad m_2x_1}{m_1 + m_2} - \frac{2 \quad (\ 3) \quad 3 \quad 4}{2 + 3}$$

$$x \quad \frac{6}{5}$$

$$y = \frac{m_1y_2 \quad m_2y_1}{m_1 \quad m_2} = \frac{2 \quad 3 \quad 3 \quad 5}{2 \times 3}$$

Hence, $x, y \quad \frac{6}{5}, \frac{21}{5}$

25. The coordinates of the point that internally divides the line segment joining the points (5, 5) and (7, 3) internally in the ratio of 3 : 1 are given by:

(a) (2, 3) (b) (4, 1)
(c) $\frac{5}{2}, 0$ (d) (1, 1)

RRB ALP & Tec. (29-08-18 Shift-I)

Ans : (b) Let the coordinate of required points (x, y)

$$x, y \quad \frac{mx_2 \quad nx_1}{m \quad n}, \frac{my_2 \quad ny_1}{m \quad n}$$

$x_1 = -5 \qquad x_2 = 7 \qquad x = ?$

$y_1 = 5 \qquad y_2 = -3 \qquad y = ?$

$$(x, y) = \left(\frac{3 \times 7 + 1 \times \ -5}{3+1}, \frac{3 \times \ -3 \ + 1 \times 5}{3+1}\right)$$

$$\left(\frac{21 \quad 5}{4}, \frac{9 \quad 5}{4}\right) \qquad \frac{16}{4}, \frac{4}{4} = (4, -1)$$

Hence, coordinate of required points is (4,–1).

26. The area (in square units) of the triangle formed by the vertices (0, 2), (2, 3) and (3, 1) is:

(a) 3.5 (b) 5.5

(c) 2.5 (d) 4.4

RRB Group-D 18/08/2022 (Shift-II)

Ans. (c) : Vertices = $\underset{x_1, y_1}{0, 2} \quad \underset{x_2, y_2}{2, 3} \quad \underset{x_3, y_3}{3, 1}$

Area of Triangle,

$= \frac{1}{2} | x_1 \ y_2 - y_3 \ + x_2 \ y_3 - y_1 \ + x_3 \ y_1 - y_2 \ |$

$= \frac{1}{2} | 0 \ 3 - 1 \ + 2 \ 1 - 2 \ + 3 \ 2 - 3 \ |$

$\frac{1}{2} | 0 \quad 2 \quad 3 |$

$\frac{1}{2} | \quad 5 | \quad \frac{1}{2} \quad 5 = 2.5$

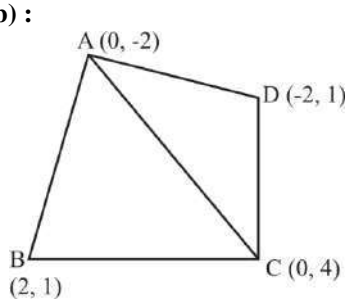
27. The area (in square units) of the quadrilateral ABCD, formed by the vertices A (0, –2), B (2, 1) C (0, 4), and D (–2, 1) is:

(a) 13 (b) 12

(c) 15 (d) 14

RRB Group-D 18/08/2022 (Shift-I)

Ans. (b) :



Area of triangle -

$= \frac{1}{2} | x_1 \ y_2 - y_3 \ + x_2 \ y_3 - y_1 \ + x_3 \ y_1 - y_2 \ |$

Area of □ABCD = Area of ΔABC + Area of ΔADC

$= \frac{1}{2} | 0 \ 1 - 4 \ - 2 \ 4 + 2 \ + 0 \ - 2 - 1 \ | + \frac{1}{2} | 0 \ 4 - 1 \ - 0 \ 1 - 2 \ - 2 \ - 2 - 4 \ |$

$\frac{1}{2} \quad 12 \quad \frac{1}{2} \quad 12 = 6 + 6$

= 12 square unit

28. The area of a triangle with vertices (3, –2), (2, –3) and (p, –4) is 8 square units. Find the value of p.

(a) 17 (b) –16

(c) 15 (d) –15

RRB Group-D 30/08/2022 (Shift-II)

Ans. (a) : Area of triangle =

$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

$8 = \frac{1}{2} \ 3(-3 - (-4)) + 2(-4 - (-2)) + P(-2 - (-3))$

$2 \times 8 = 3(-3 + 4) + 2(-4 + 2) + P(-2 + 3)]$

$16 = 3 \times 1 + 2 (-2) + P$

$16 = 3 - 4 + P$

$16 = -1 + P$

$P = 16 + 1 = 17$

29. ABC is a triangle whose vertices are A(0, 0), B(a, 5) and C(–5, 5). If the triangle is right-angled at A, then find the value of a.

(a) 3 (b) 5

(c) 6 (d) 2

RRB NTPC 26.07.2021 (Shift-I) Stage Ist

Ans. (b) **:** By applying Pythagoras theorem in ABC

$BC^2 \quad AC^2 \quad AB^2$

$a + 5^2 - 5 - 5^2 = -5 - 0^2 + 5 - 0^2 + a - 0^2 + 5 - 0^2$

$a + 5^2 + 0 = 25 + 25 + a^2 + 25$

$a^2 + 25 + 10a \quad 75 + a^2$

$10a \quad 75 \quad 25 \quad 50$

$a \quad \frac{50}{10} \quad 5$

$\boxed{a \quad 5}$

30. Find the area of a triangle whose vertices are (a, b + c), (a, b – c) and (– a, c).

(a) 2 bc (b) 2 ac

(c) 2 b (a + c) (d) c (a – b)

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (b) **:** Solve at–

$x_1 = a, x_2 = a, x_3 = -a$

$y_1 = b + c, y_2 = b - c, y_3 = c$

From the formula of

Area of

$= \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

$= \frac{1}{2}[a(b - c - c) + a(c - b - c) + (-a)(b + c - b + c)]$

$= \frac{1}{2}[a(b - 2c) + a(-b) + (-a)(2c)]$

$= \frac{1}{2}[ab - 2ac - ab - 2ac] = \frac{1}{2} \quad - 4ac = - 2ac = 2ac$

∵ The area of a triangle can't be negative.

31. The area in square units of a triangle formed by the coordinate axis and the straight line 5x + 7y = 35 is:

(a) 35 (b) $\frac{35}{2}$

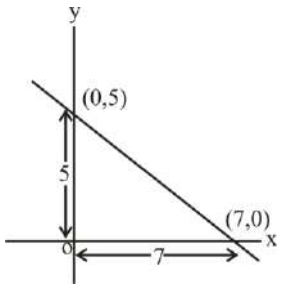
(c) $\frac{2}{35}$ (d) $\frac{25}{2}$

RRB NTPC 05.02.2021 (Shift-I) Stage Ist

Ans. (b): Given, $5x + 7y = 35$

On dividing both side by 35.

$$\frac{x}{7} \quad \frac{y}{5} \quad 1$$



Area of triangle $= \frac{1}{2} \quad 7 \quad 5 \quad \frac{35}{2}$

32. Find the area of a triangle formed by (1, 0), (–1, 0), (0, 1).

(a) 1.5 sq. units (b) 0 sq. units

(c) 1 sq. units (d) 2 sq. units

RRB NTPC 29.01.2021 (Shift-I) Stage Ist

Ans. (c) : Given point (1,0), (–1,0) and (0,1)

$x_1=1$ $x_2=-1$ $x_3=0$

$y_1=0$ $y_2=0$ $y_3=1$

Area of $= \frac{1}{2} x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)$

$= \frac{1}{2}\left[1(0-1) - 1 \quad 1-0 \quad + 0 \quad 0-0 \right]$

$\frac{1}{2}(\quad 1 \quad 1) = -\frac{2}{2}$

1 sq. units

Note- The area of a triangle can't be negative.

33. Find the area of a triangle whose vertices are (1, 2), (-4, -3) and (4, 1)

(a) 7 square units (b) 10 square units

(c) 14 square units (d) 20 square units

RRB Group-D – 17/09/2018 (Shift-I)

Ans : (b) Area of triangle

$= \frac{1}{2}\left[x_1 \quad y_2 - y_3 \quad + x_2 \quad y_3 - y_1 \quad + x_3 \quad y_1 - y_2 \right]$

$= \frac{1}{2}\left[1 \quad -3-1 \quad + \quad -4 \quad 1-2 \quad + 4 \quad 2- \quad -3 \right]$

$\frac{1}{2} \quad 4 \quad 4 \quad 20 \quad \frac{20}{2} = 10$ square units

34. The vertex point of a triangle are (a, b + c), (b, c + a) and (c, a + b) then find the area of triangle.

(a) ab + bc + ca (b) 0

(c) a–b–c (d) a + b + c

RRB Group-D – 12/10/2018 (Shift-III)

Ans: (b) Area of triangle

$= \frac{1}{2}\left[x_1 \quad y_2 - y_3 \quad + x_2 \quad y_3 - y_1 \quad + x_3 \quad y_1 - y_2 \right]$

$- \frac{1}{2}\left[a \quad c-a \quad - \quad a+b \quad + b \quad a+b \quad - \quad b+c \quad + c \quad b+c \quad - \quad c+a \right]$

$= \frac{1}{2}\left[a \quad c+a \quad - a \quad - b \quad + b \quad a+b \quad - b \quad - c \quad + c \quad b+c \quad - c \quad - a \right]$

$= \frac{1}{2} \quad ac - ab + ab - bc + bc - ac$

$\frac{1}{2} \quad 0 \quad 0$

35. The coordinate points of the vertex of a triangle are given (3, 5), (-2, 0) and (6, 4) then find the area of triangle.

(a) 20 sq. units (b) 7 sq. units

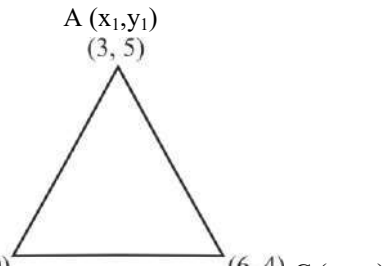
(c) 10 sq. units (d) 14 sq. units

RRB Group-D – 11/10/2018 (Shift-II)

Ans : (c) Given that vertex of triangle (3, 5), (–2, 0) and (6, 4)

Formula — Area of $=$

$$\frac{1}{2}\left[x_1 \quad y_2 - y_3 \quad + x_2 \quad y_3 - y_1 \quad + x_3 \quad y_1 - y_2 \right]$$



$= \frac{1}{2}\left[3 \quad 0-4 \quad + \quad -2 \quad 4-5 \quad + 6 \quad 5-0 \right]$

$= \frac{1}{2}\left[3 \quad -4 \quad + \quad -2 \quad -1 \quad + 6 \quad 5 \right] \quad \frac{1}{2} \quad 12 \quad 2 \quad 30$

$\frac{1}{2} \quad 20$

= 10 square units

36. If A = (1, 1), B = (-2, 7) and C = (3, -3), then $\frac{1}{AB} + \frac{1}{BC} + \frac{1}{CA} = ?$

(a) $\frac{31\sqrt{5}}{150}$ (b) $\frac{31}{60}\sqrt{5}$

(c) $\frac{150}{31}$ (d) $\frac{31}{150}$

RRB Group-D – 27/09/2018 (Shift-III)

Ans : (a) A = (1, 1), B = (-2, 7) and C = (3, -3)

Distance between the two points $= \sqrt{x_2-x_1^{\ 2} \quad y_2-y_1^{\ 2}}$

Distance between points A and B $= \sqrt{-2-1^{\ 2} + 7-1^{\ 2}}$

$= \sqrt{-3^2 + 6^2}$

$= \sqrt{9+36}$

$= \sqrt{45} \quad 3\sqrt{5}$

Similarly,

Distance between points B and C $= \sqrt{3+2^2 + -3-7^2}$

$= \sqrt{5^2 + -10^2}$

$= \sqrt{25+100}$

$= \sqrt{125} = 5\sqrt{5}$

And,

Distance between points C and A $- \sqrt{3-1^2 + -3-1^2}$

$\sqrt{2^2 \quad 4^2}$

$\sqrt{4 \quad 16}$

$\sqrt{20} \quad 2\sqrt{5}$

$\Rightarrow \frac{1}{AB} + \frac{1}{BC} + \frac{1}{CA} = \frac{1}{3\sqrt{5}} + \frac{1}{5\sqrt{5}} + \frac{1}{2\sqrt{5}}$

$\frac{1}{\sqrt{5}}\left(\frac{1}{3} \quad \frac{1}{5} \quad \frac{1}{2}\right) \quad \frac{1}{\sqrt{5}}\left(\frac{10 \quad 6 \quad 15}{30}\right)$

$\frac{1}{\sqrt{5}} \quad \frac{31}{30} \quad \frac{31}{30\sqrt{5}} = \frac{31}{30\sqrt{5}} \quad \frac{\sqrt{5}}{\sqrt{5}} \quad \frac{31\sqrt{5}}{150}$

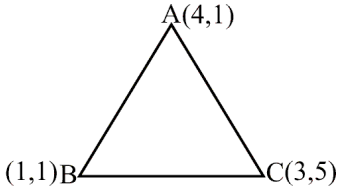
37. If the points of vertex of a given triangle are (4, 1), (1, 1) and (3, 5) then triangle is–

(a) Isosceles but not right angled
(b) Right angled but not isosceles.
(c) Both right angled and isosceles
(d) Asymmetrical triangle

RRB Group-D – 19/09/2018 (Shift-I)

Ans : (d)

If two points are (x_1,y_1) and (x_2,y_2) then distance between them $= \sqrt{(x_2 - x_1)^2 \quad (y_2 - y_1)^2}$



$AB = \sqrt{(1-4)^2 + (1-1)^2} = \sqrt{-3^2} = 3$

$AC = \sqrt{(3-4)^2 + (5-1)^2} = \sqrt{1+16} = \sqrt{17}$

$BC = \sqrt{(3-1)^2 + (5-1)^2} = \sqrt{4+16} = 2\sqrt{5}$

Because three sides of the triangle is different, so the triangle will be Asymmetrical triangle.

38. If two straight line x -5y = 2 and x + 2y = 9 cut each other at a point A, further it is cut x-axis at the point B and C respectively then find the area of triangle ABC.

(a) 3.2 square units (b) 3.5 square units
(c) 3.7 square units (d) 3.1 square units

RRB Group-D – 25/10/2018 (Shift-II)

Ans : (b) ∵ Point B and C are located on the x-axis.

The coordinate of point B and C on substituting y = 0 in the given equation x-5y = 2 and x + 2y = 9 will be (2,0) and (9,0) respectively.

Again lines x –5y = 2 and x + 2y = 9 intersect each other on point A.

$x - 5y = 2$ ------(i)

$x + 2y = 9$ ------(ii)

On solving equation (i) and (ii)

$x = 7, y = 1$

So coordinate of point A = (7, 1)

$x_1 = 2, x_2 = 9, x_3 = 7$

$y_1 = 0, y_2 = 0, y_3 = 1$

Hence area of triangle ABC

$= \frac{1}{2} x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)$

$= \frac{1}{2} 2(0-1) + 9(1-0) + 7(0-0)$

$= \frac{1}{2} \quad 2 \quad 9 \quad = \frac{7}{2} \quad 3.5$ square units.

39. The area of the triangle whose vertices are given by (2,4), (–3,–1) and (5,3) is:

(a) 7 sq. units (b) 14 sq. units
(c) 20 sq. units (d) 10 sq. units

RRB ALP & Tec. (17-08-18 Shift-I)

Ans : (d) ∵ Area of triangle

$= \frac{1}{2}\left[x_1 \quad y_2 - y_3 \quad + x_2 \quad y_3 - y_1 \quad + x_3 \quad y_1 - y_2 \quad\right]$

$x_1 = 2, y_1 = 4, x_2 = -3, y_2 = -1, x_3 = 5, y_3 = 3$

$= \frac{1}{2}\left[2 \quad -1-3 \quad + \quad -3 \quad 3-4 \quad + 5 \quad 4+1 \quad\right]$

$\frac{1}{2} \quad 8 \quad 3 \quad 25 \quad \frac{1}{2} \quad 20 = 10$ square units

40. The graphs of the equations 3x – 2y – 11 = 0 and x + y = 7 intersect at P (, β). What is the value of (3 + 5β)?

(a) 13 (b) 23
(c) 25 (d) 11

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (c) : Given,

$3x - 2y - 11 = 0$

$3x - 2y = 11$ …. (i)

$x + y = 7$ …. (ii)

On multiplying by 2 in equation (ii) and adding them,

$3x - 2y = 11$

$\underline{2x + 2y = 14}$

$5x = 25$

$x \quad \frac{25}{5}$

$\boxed{x \quad 5}$

On putting the value of x in equation (i),

$3 \times 5 - 2y = 11$

$-2y = -4$

$y = 2$

P (,) = (5, 2)

Then, According to the question,

$3 + 5$

$= (3 \times 5 + 5 \times 2)$

$= 25$

41. The straight line kx – 3y = 6 passes through the point (3,2). What is the value of k ?

(a) 4 (b) 3

(c) 6 (d) 2

RRB NTPC (Stage-II) 16/06/2022 (Shift-III)

Ans. (a) : Straight line kx – 3y = 6 passes through the point (3,2)

$k \times 3 - 3 \times 2 = 6$

$k \times 3 = 12$

$k = 4$

42. If the centre of a circle is (-2,3) and its radius is 4, then find the equation of the circle.

(a) $x^2 + y^2 + 4x + 6y - 3 = 0$

(b) $x^2 + y^2 + 4x - 6y - 3 = 0$

(c) $x^2 + y^2 - 4x + 6y + 3 = 0$

(d) $x^2 + y^2 - 4x + 6y - 3 = 0$

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (b) : Given, co-ordinate of centre = (–2, 3)

Radius (r) = 4

Equation of circle,

$(x+2)^2 + (y-3)^2 = (4)^2$ [$\because$ Formula, $(x - \ )^2 + (y - \ )^2 = r^2$

Where, (,) co-ordinate of centre and r = radius]

$x^2 + 4x + 4 + y^2 + 9 - 6y = 16$

$x^2 + y^2 + 4x - 6y - 3 = 0$

43. Find the equation of the tangents to the circle $x^2 + y^2 = 9$ at x = 2.

(a) $2x + \sqrt{5}y = 9$

$2x - \sqrt{5}y = 9$

(b) $2x - \sqrt{5}y = 9$

$2x - \sqrt{5}y = 9$

(c) $2x - \sqrt{5}y = 9$

$2x - \sqrt{5}y = 9$

(d) $2x - \sqrt{5}y = 9$

$2x - \sqrt{5}y = 9$

RRB NTPC 19.01.2021 (Shift-I) Stage Ist

Ans. (a) : Given-

$x^2 + y^2 = 9$ ...(i)

At, x = 2 $4 + y^2 = 9$

$y^2 = 5$

$y = \sqrt{5}$

On differentiating equation (i),

$\frac{dy}{dx} \quad \frac{x}{y}$

$\left(\frac{dy}{dx}\right)_{2,\sqrt{5}} \quad m_1 \quad \frac{2}{\sqrt{5}}$

$\left(\frac{dy}{dx}\right)_{2,-\sqrt{5}} \quad m_2 \quad \frac{2}{\sqrt{5}}$

Equation of tangent-

$y - y_1 = m(x - x_1)$

$y - \sqrt{5} = \frac{2}{\sqrt{5}} \ x \quad 2 \qquad (\because$ on putting $m = m_1)$

$2x + \sqrt{5}y = 9$

Again $y + \sqrt{5} = \frac{2}{\sqrt{5}} \ x - 2 \qquad \{\because$ on putting $m = m_2 \}$

$2x \quad \sqrt{5}y \quad 9$

Hence, option (a) is correct.

44. The equation of a straight line passing through (–2, 5) and (1, 3) is:

(a) 2x–3y–19 = 0 (b) 2x+2y+19 = 0

(c) 3x–2y–11 = 0 (d) 2x+3y–11 = 0

RRB NTPC 13.03.2021 (Shift-II) Stage Ist

Ans. (d) : The equation of straight line passing through two points $(x_1\ y_1)$ and $(x_2\ y_2)$.

$y - y_1 = \frac{y_2 \quad y_1}{x_2 \quad x_1}(x - x_1)$

As per question, the required equation is

$y \quad 5 \quad \frac{3 \quad 5}{1 \quad 2}(x \quad 2)$

$3y \quad 15 \quad 2x \quad 4$

$2x \quad 3y - 11 \quad 0$

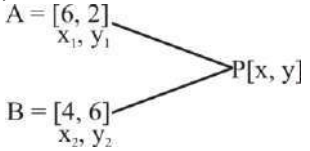
45. Find the relation between x and y such that the point (x, y) is equidistant from (6, 2) and (4, 6).

(a) 2x – y = 3 (b) 2x + y = –3

(c) x + 2y = 3 (b) x – 2y = –3

RRB NTPC 31.01.2021 (Shift-II) Stage Ist

Ans. (d) : Given,



$d_{AP} = d_{BP}$

From formula–

$\sqrt{x - x_1^{\ 2} + y - y_1^{\ 2}} = \sqrt{x - x_2^{\ 2} + y - y_2^{\ 2}}$

$= x - 6^{\ 2} + y - 2^{\ 2} = x - 4^{\ 2} + y - 6^{\ 2}$

$= x^2 + 36 - 12x + y^2 + 4 - 4y = x^2 + 16 - 8x + y^2 + 36 - 12y$

$= -12x + 8x - 4y + 12y + 40 - 52 = 0$

$4x \quad 8y \quad 12 \quad 0$

$\boxed{x - 2y \quad -3}$

46. Equation of the line, passing through (2, 3) and perpendicular to the line joining to (–5, 6) and (–6, 5) is:

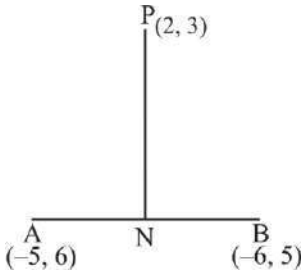
(a) $x + y - 5 = 0$ (b) $x - y + 5 = 0$

(c) $x - y - 5 = 0$ (d) $x + y + 5 = 0$

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (a) : Let, the slope of the PN line = m

And, the slope of the AB line = n



$n = \frac{y_2 - y_1}{x_2 - x_1} \quad \frac{5 - 6}{-6 - 5}$

$n = 1$

According to the question, If both the lines are perpendicular then.

$n \quad m = -1$

$1 \quad m = -1$

$m = -1$

Hence, the equation of the line which slop m = –1 and passing through (2, 3)-

$y - y_1 = m(x - x_1)$

$y - 3 = -1(x - 2)$

$y - 3 = -x + 2$

$x + y - 5 = 0$

47. Find the equation of line which slope is -4 and bisect the y axis at y = 2

(a) $2x \quad \frac{y}{4} \quad 1$ (b) $2x \quad \frac{y}{2} \quad 1$

(c) $2x \quad \frac{y}{3} \quad 1$ (d) $2x + y = 1$

RRB Group-D – 16/10/2018 (Shift-III)

Ans : (b) Intersection of y = 2

Hence coordinates = (0, 2) = (x_1, y_1)

Gradient (m) = –4

Equation of line passing through a point (x_1, y_1) which slope has m.

Equation of line $y - y_1 = m(x - x_1)$

$y - 2 = -4(x - 0)$

$y - 2 = -4x$

$4x + y = 2$

$2x \quad \frac{y}{2} \quad 1$

48. Find the number of points on the x-axis that are at a distance of 'c' units (c<3) from the point (2, 3)

(a) 0 (b) 2

(c) 3 (d) 1

RRB NTPC 26.07.2021 (Shift-I) Stage Ist

Ans. (a): Distance of 'c' units from the point (2, 3) let the other points on X-axis be (x, 0)

Therefore, the number of required point will be equal to the number of possible value of x

By distance formula – $\sqrt{x - 2^{\ 2} + 0 - 3^{\ 2}}^{\ 2} = c^2$

$(x-2)^2 + 9 = c^2 \quad (x-2)^2 = c^2 - 9$

$(x-2)^2 < 0 \quad (\because c < 3)$

$(x-2)^2 \quad 0 \quad (\because a^2 \quad 0)$

It is a contradiction, that there is no point exists. Hence the number of points on the x-axis at a distance of c unit is 0.

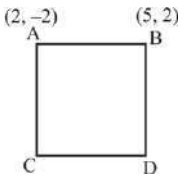
49. If (2, – 2) and (5, 2) are two consecutive vertices of a square, then the length of each side of the square will be:

(a) $\sqrt{5}$ units (b) $\frac{5}{\sqrt{2}}$ units

(c) $5\sqrt{2}$ units (d) 5 units

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (d) :



Length of side of Square = $\sqrt{x_2 \quad x_1^{\ 2} \quad y_2 \quad y_1^{\ 2}}$

$= \sqrt{5 \quad 2^{\ 2} \quad 2 \quad 2^{\ 2}} = \sqrt{3^{\ 2} \quad 4^{\ 2}} = \sqrt{9 \quad 16} = \sqrt{25}$

= 5 units

50. If the distance between two points (x, 7) and (1, 15) is 10 units, then the possible values of x = ?

(a) 4, 5 (b) 3, 7

(c) 5, -7 (d) 7, -5

RRB NTPC 08.03.2021 (Shift-II) Stage Ist

Ans. (d) : Distance between points (x, 7) and (1, 15)

$x_1 = 1, x_2 = x \quad y_1 = 15, y_2 = 7$

$d = \sqrt{x_2 - x_1^{\ 2} + y_2 - y_1^{\ 2}}$

$\sqrt{(x-1)^2 + (7-15)^2} = 10$

On squaring both sides,

$(x-1)^2 + (7-15)^2 = 100$

$(x-1)^2 + 64 = 100$

$(x-1)^2 = 100 - 64 = 36$

$x \quad 1 \quad 6$

$x = (+6 + 1)$ and $(-6 + 1)$

$x = 7, -5$

Hence value of x is 7 and –5.

51. The distance from the origin to the line 4x + 3y = 6 is:

(a) $\frac{7}{5}$ (b) $\frac{3}{5}$

(c) $\frac{4}{5}$ (d) $\frac{6}{5}$

RRB NTPC 04.03.2021 (Shift-I) Stage Ist

Ans. (d) : Distance of the line ax + by + c = 0 from point (x, y)

$$d = \left[\frac{ax + by + c}{\sqrt{a^2 + b^2}}\right]$$

So, distance of $4x + 3y + 6 = 0$ From origin (0, 0) is

$$d = \frac{4(0) + 3(0) + 6}{\sqrt{16 + 9}}$$

$$d = \frac{6}{\sqrt{25}} \quad \boxed{d = \frac{6}{5}}$$

52. Find the value of the angle subtended between the graph of linear equation 35X–35Y+15=0 and X-axis.

(a) 35º (b) 50º

(c) 45º (d) 55 º

RRB NTPC 05.04.2021 (Shift-II) Stage Ist

Ans. (c) : 35X–35Y+15=0

$$\Rightarrow 35Y = 35X + 15$$

$$Y = \frac{35X}{35} + \frac{15}{35}$$

$$Y = X + \frac{15}{35}$$

Comparing with $y = mx + c$, $m = \tan\theta = 1$ $\boxed{\theta = 45}$

53. Find the length of the tangent drawn from the point (2, 3) to the circle $x^2 + y^2 = 4$.

(a) 2 (b) 3

(c) 1 (d) 4

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (b) : The equation of the given circle is

$x^2 + y^2 = 4$

$x^2 + y^2 - 4 = 0$

On comparing with the general equation of the circle

$x_1^2 + y_1^2 + 2gx_1 + 2hy_1 + k = 0$

For the length of the tangent drawn from the point (2, 3) to the given circle,

$x_1 = 2$, $y_1 = 3$, $g = 0$, $h = 0$, $k = -4$

Length of the tangent = $\sqrt{x_1^2 + y_1^2 + 2gx_1 + 2hy_1 + k}$

$\sqrt{2^2 + 3^2 - 4}$

$\sqrt{4 + 9 - 4}$

$\sqrt{9}$

3

54. If the length of the tangent from (2, 5) to $x^2 + y^2 - 5x + 4y + k = 0$ is $\sqrt{37}$ units, then the value of k is:

(a) –2 (b) –1

(c) 2 (d) 1

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (a) : On comparing $x^2 + y^2 - 5x + 4y + k = 0$ with $x^2 + y^2 + 2gx + 2fy + c = 0$,

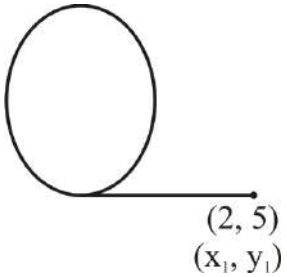
$2g = -5$

$g = -5/2$

and $2f = 4$

$f = 2$

$c = k$



Length of the tangent = $\sqrt{x_1^2 + y_1^2 + 2gx_1 + 2fy_1 + k}$

$$\sqrt{37} = \sqrt{2^2 + 5^2 + 2\left(-\frac{5}{2}\right)(2) + 2(2)(5) + k}$$

On squaring both sides-

$37 = 4 + 25 - 10 + 20 + k$

$37 = 49 - 10 + k$

$k = 37 - 39$

$k = -2$

55. The position of the point (1, 2) with respect to the circle $x^2 + y^2 - 3x - 4y + 1 = 0$

(a) Lies on the circle

(b) Cannot be decided

(c) Lies outside the circle

(d) Lies inside the circle

RRB NTPC 22.02.2021 (Shift-I) Stage Ist

Ans. (d) : $x^2 + y^2 - 3x - 4y + 1 = 0$

Equation of the circle, $x^2 + y^2 + 2gx + 2fy + c = 0$

$S = x^2 + y^2 - 3x - 4y + 1$……..(Given)

On putting the value of the point (1, 2) in the equation of given circle,

$S = 1 + 4 - 3 - 8 + 1$

$S = -5$ (– ve) The point (1, 2) will be inside the circle.

Note-

(i) When $S > 0$, then the point will be outside the circle.

(ii) When $S < 0$, then the point will be inside the circle.

(iii) When $S = 0$, then the point will be on the circumference of the circle.

56. The position of the point (3, 4) with respect to the circle $x^2 + y^2 - 3x - 4y + 1 = 0$

(a) Lies on it
(b) Lies outside of it
(c) Lies inside it
(d) Cannot be decided

RRB NTPC 05.02.2021 (Shift-I) Stage Ist

Ans. (b) : Given,

$S = x^2 + y^2 - 3x - 4y + 1 = 0$ _____ (i)

We know that for any point (x,y),

$S > 0$ then the point (x, y) will be outside the circle.

$S < 0$, then the point (x, y) will be inside the circle.

$S = 0$ then the point (x, y) will lie on the circle.

On putting the value of (x, y) = (3, 4) in eq^n (i),

$S = 9+16-9-16+1 = 1$

$S > 0$, Hence (3, 4) will be outside the circle.

57. Find the radius of the circle $x^2 + y^2 + 7x + 4y + 9 = 0$

(a) $\frac{\sqrt{13}}{2}$
(b) $\frac{\sqrt{19}}{2}$
(c) $\frac{\sqrt{29}}{2}$
(d) $\frac{\sqrt{23}}{2}$

RRB NTPC 04.03.2021 (Shift-I) Stage Ist

Ans. (c) : Comparing $x^2 + y^2 + 7x + 4y + 9 = 0$ with $x^2 + y^2 + 2gx + 2fy + c = 0$

$2g = 7$ $\quad 2f = 4$ and $\quad c = 9$

$g = 7/2$ $\quad f = 2$

So radius $\sqrt{g^2 \quad f^2 \quad c}$

$\sqrt{\frac{7}{2}^2 \quad 4 \quad 9}$

$\sqrt{\frac{49}{4} \quad 4 \quad 9}$

$\sqrt{\frac{49 \quad 16 \quad 36}{4}} \quad \sqrt{\frac{29}{4}} \quad \boxed{\frac{\sqrt{29}}{2}}$

58. The angle between two circles $x^2 + y^2 - 12x - 6y + 41 = 0$ and $x^2 + y^2 + kx + 6y - 59 = 0$ is 45°. Find the value of k.

(a) 3 $\quad$ (b) -4
(c) 4 $\quad$ (d) 4

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (d) : Comparing the equation of circle $x^2 + y^2 - 12x - 6y + 41 = 0$ and $x^2 + y^2 + kx + 6y - 59 = 0$ with equation $x^2+y^2+2gx+2fy+c = 0$,

$g_1 = -6, f_1 = -3, c_1 = 41$

$g_2 = k/2, f_2 = 3, c_2 = -59$

We know that,

$$\cos \quad \frac{c_1 \quad c_2 \quad 2g_1.g_2 \quad 2f_1.f_2}{2\sqrt{g_1^2 + f_1^2 - c_1}\sqrt{g_2^2 + f_2^2 - c_2}}$$

$$\cos 45^\circ \quad \frac{41 - 59 - 2(-6)\frac{k}{2} - 2(-3)3}{2\sqrt{36 + 9 - 41}\sqrt{\frac{k^2}{4} + 9 + 59}}$$

$$\frac{1}{\sqrt{2}} \quad \frac{18 \quad 6k \quad 18}{2 \quad 2\sqrt{\frac{k^2}{4} \quad 68}}$$

$$\frac{1}{\sqrt{2}} \quad \frac{6k}{4\sqrt{\frac{k^2}{4} \quad 68}}$$

On squaring both sides–

$$\frac{1}{2} \quad \frac{36k^2}{16 \quad \frac{k^2}{4} \quad 68}$$

$$4 \quad \frac{k^2}{4} \quad 68 \quad 18k^2$$

$$4 \quad \frac{k^2 \quad 272}{4} \quad 18k^2$$

$k^2 + 272 = 18k^2$

$17k^2 = 272$

$k^2 = 16$

$K = 4$

59. Which type of line represented by the line $6x - 3y + 10 = 0$ and $2x - y + 9 = 0$

(a) Concurrent
(b) Parallel
(c) Intersection
(d) None of these

RRB RPF SI – 16/01/2019 (Shift-III)

Ans : (b) Given equation-

$6x - 3y + 10 = 0$

Let slope = m_1

$$\therefore \ m_1 = -\left(\frac{\text{Cofficient of x}}{\text{Cofficient of y}}\right) \quad - \quad \frac{6}{-3} \quad 2$$

Equation

$2x - y + 9 = 0$

Let slope = m_2

$$m_2 = -\left(\frac{\text{Cofficient of x}}{\text{Cofficient of y}}\right) \quad - \quad \frac{2}{-1} \quad 2$$

$\because \ m_1 = m_2 = 2$

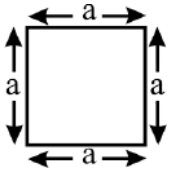
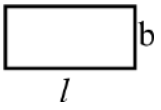
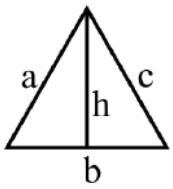
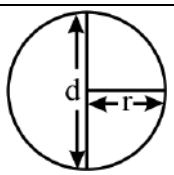
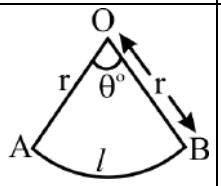
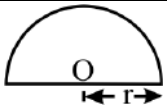
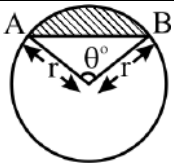
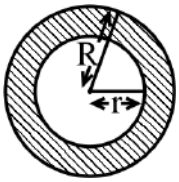
So the lines will be parallel.

04

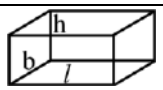
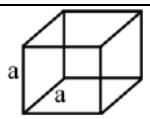
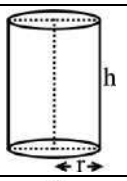
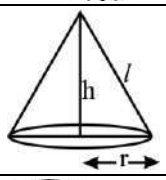
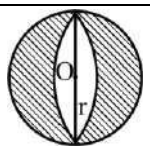
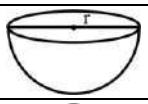
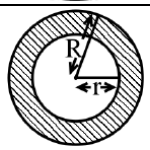
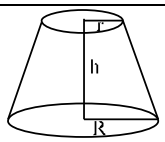
Mensuration

(Surface area and Volume)

Two Dimensional Figure

S. N.	Name of figure	Area	Figure	Perimeter	Nomination
1.	Square	a^2 diagonal $a\sqrt{2}$		4a	a = side of square
2.	Rectangle	l b diagonal $= \sqrt{l^2 \quad b^2}$		2(l+b)	l = length b = breadth
3.	Triangle	$\frac{1}{2}$b h $\sqrt{S\ S-a\ \ S-b\ \ S-c}$ Where, S $\frac{a\ \ b\ \ c}{2}$		P= a+b+c	a,b,c = sides of triangle, h = height
4.	Circle	r^2		2 r or d	r = radius d = diameter
5.	Radius sector of circle	$\frac{}{360}$ r^2 or $\frac{1}{2}lr$		$\frac{}{360}$2 r 2r or l 2r	= angle of sector r = radius of sector l = length of arc
6.	Semicircle	$\frac{1}{2}$ r^2		r 2r	r = radius
7.	Circle sector/ Darken dividend	$\left[\frac{}{360}\pi r^2 - \frac{1}{2}r^2 \sin\theta\right]$		$\left[\frac{\theta}{360}2\ r \quad 2r\sin\frac{\theta}{2}\right]$	r = radius = angle of sector
8.	Ring/Shaded area	$R^2 \quad r^2$			R = circum-radius r = in-radius

Three Dimensional Figure

S. N.	Name of figure	Lateral surface area	Total surface area	Volume	Figure	Nomination
1.	Cuboid	$2h\ l\ b$	$2\ lb\ \ bh\ \ hl$	lbh		l = length b = breadth h = height
2.	Cube	$4a^2$	$6a^2$	a^3		a = side
3.	Cylinder	$2\ rh$	$2\ r\ r\ \ h$	r^2h		r = radius h = height
4.	Cone	rl	$r\ \ l\ \ r$	$\frac{1}{3}\ r^2h$		h = height r = radius l = slant height
5.	Sphere	–	$4\ r^2$	$\frac{4}{3}\ r^3$		r = radius
6.	Semi sphere	$2\ r^2$	$3\ r^2$	$\frac{2}{3}\ r^3$		r = radius
7.	Spherical shell	–	$4\ \ R^2\ \ r^2$	$\frac{4}{3}\ \ R^3\ \ r^3$		R = circum-radius r = in-radius
8.	Cone frustum	$(R\ \ r)\ell$	$(R\ \ r)\ell$ $(R^2\ \ r^2)$	$\frac{1}{3}\ \ R^2\ \ r^2\ \ Rr\ h$		r = upper radius R= base radius h= height

Prism

- If any polygon (triangle, quadrilateral, pentagon, hexagon) is taken as its base and rectangular faces are vertically placed on its sides and the lid of the polygon congruent to its base is placed, then the solid formed from it is called a prism.

or

A prism is a solid that has two faces that are parallel and congruent and their faces (Polygon) join by vertex to vertex. A prism has a polygon as its base and vertical side perpendicular to the base.

Lateral surface area = Perimeter of base × Height
L.S.A. = Perimeter of Base × h

T.S.A. = L.S.A. + 2× Area of Base

Volume = Area of base × height

$$V = \frac{na^2}{4}\cot\frac{}{n}\ \ h$$

Pyramid

- If any polygon (triangle, quadrilateral Pentagon, hexagon etc.) is made its base and triangular faces are erected on its sides in such a way that the vertices of all the faces meet at one point, then the shape (figure) thus formed is called a pyramid.

Lateral surface area = $\frac{1}{2}\times$ Perimeter of base × Slant height

T.S.A. = L.S.A + Area of Base

$V = \frac{1}{3}\times$Area of Base × height

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. If the heights of two cones are in the ratio 11 : 9 and their diameters are in the ratio 6 : 11, what is the ratio of their volumes?

(a) 11 : 4 (b) 4 : 11
(c) 3 : 11 (d) 11 : 3

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (b) : Let,

Height of first cone $(h_1) = 11x$

Height of second cone $(h_2) = 9x$

Radius of first cone $(r_1) = \frac{6}{2}y$

Radius of second cone $(r_2) = \frac{11}{2}y$

According to the question,

Volume of first cone : Volume of second cone

$$= \frac{1}{3}\pi r_1^2 h_1 : \frac{1}{3}\pi r_2^2 h_2$$

$$= \frac{6}{2}y \times \frac{6}{2}y \times 11x : \frac{11}{2}y \times \frac{11}{2}y \times 9x = 4 : 11$$

Hence, required ratio = 4 : 11

2. An open water drum is in the form of a cylinder. The height of the drum is 79 m and its internal diameter is 78 m. Find the area (in m^2, rounded off to one decimal place) that needs to be painted if one wants to paint the inside of the drum. Take $= \frac{22}{7}$

(a) 24130.8 (b) 24155.7
(c) 24146.6 (d) 24126.7

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (c) : Given that,

Height of drum (h) = 79 m

Radius of drum $(r) = \frac{78}{2} = 39$ m

Surface area inside the drum

$$= r\,2h + r$$

$$= \frac{22}{7} \times 39 \times 2 \times 79 + 39 = \frac{22}{7} \times 39 \times 197$$

$= 24,146.5714 \approx 24,146.6\ m^2$

3. 64 identical small spheres are cast from a sphere of radius 12 cm, with the total volume of the small spheres being equal to the volume of the larger sphere. The diameter (in cm) of each of the small spheres is :

(a) 11 (b) 6
(c) 3 (d) 5

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (b) : Given,

Radius of large sphere $(r_1) = 12$cm

Let Radius of small sphere = r_2

According to the question,

$$\frac{4}{3}\pi r_1^3 = \frac{4}{3}\pi r_2^3 \times 64$$

$$12^3 = r_2^3 \times 64$$

$$12 \times 12 \times 12 = r_2^3 \times 64$$

$$r_2 = \sqrt[3]{\frac{12 \times 12 \times 12}{64}}$$

$$= \frac{12}{4}$$

$= 3$cm

Hence, Diameter of small sphere $(2r_2) = 2 \times 3 = 6$ cm

4. A car manufacturing company is sponsoring a basketball match by painting its logo on the basketball at the rate of ₹3/cm^2. There are two identical basketballs of diameter 14 cm which are to be painted. What will be the total cost (in ₹) of painting the balls for the company?

(a) 1848 (b) 4928
(c) 3696 (d) 3586

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c) : Total surface area of both basketballs

$$= 4r^2 + 4r^2$$

$$= 8r^2$$

$$= 8 \times \frac{22}{7} \times 7 \times 7$$

$$= 8 \times 22 \times 7$$

$= 176 \times 7\ cm^2$

Total cost of painting the balls $= 3 \times 176 \times 7$

$= ₹\ 3696$

5. The areas of three adjacent faces of a solid cuboid are 260 cm^2, 104 cm^2 and 10 cm^2. What is the volume (in cm^3) of the cuboid?

(a) 782 (b) 524
(c) 520 (d) 627

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (c) : Given, $\ell b = 260\ cm^2$

$bh = 104\ cm^2$

$h\ell = 10\ cm^2$

Volume of cuboid $= \sqrt{\ell b \times bh \times h\ell}$

$$= \sqrt{260 \times 104 \times 10}$$

$$= \sqrt{13 \times 2 \times 10 \times 13 \times 8 \times 10}$$

$$= \sqrt{13 \times 13 \times 4 \times 4 \times 10 \times 10}$$

$= 13 \times 4 \times 10$

$= 520\ cm^3$

6. The radius of a right circular cone is 2.1 cm and its height is 2.8 cm. The total surface area of the cone is : (Take = 22/7)

(a) 46.2 cm^2 (b) 36.96 cm^2
(c) 18.48 cm^2 (d) 23.1 cm^2

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (b) : Given that,

Radius (r) = 2.1 cm
Height (h) = 2.8 cm

Slant height (ℓ) $\sqrt{r^2 \quad h^2}$

$\sqrt{2.1^2 \quad 2.8^2}$

$\sqrt{4.41 \quad 7.84}$

$\sqrt{12.25} \quad 3.5$

The total surface area of the cone, $r^2 \quad r\ell$

$r(\quad \ell)$

$= \frac{22}{7} \times 2.1 \times (2.1 + 3.5)$

$\frac{22}{7} \quad 2.1 \quad 5.6$

$36.96 \ cm^2$

7. The area of the four walls of a room is 780m^2 and its length is twice its breadth. If the height of the room is 13m, then the area of its floor is equal to :

(a) 150m^2 (b) 315 m^2
(c) 295 m^2 (d) 200 m^2

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (d) : Let the length and breadth of the room be 2x, x meter respectively.

Given- Height = 13 meter

Area of four walls of the room = 2(l+b) h

According to the question = 2(2x+ x) 13 = 780

x = 10

So, Area of the floor = 2x × x

$= 2x^2$

$= 2 \times 10^2$

$= 200 \ meter^2$

8. A solid metallic sphere of radius 4 cm is melted and recast into 64 identical spheres. What is the ratio of the surface area of the original sphere to the total surface area of 5 smaller spheres so formed?

(a) 16:15 (b) 32:3
(c) 16:5 (d) 14:5

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (c) : Let the radius of the smaller sphere be 'r'

$\frac{4}{3}\pi \quad 4^3 = 64 \times \frac{4}{3}\pi r^3$

$4^3 \quad 64r^3 \quad r^3 \quad \frac{64}{64} \quad 1$

r = 1cm

$$\frac{\text{Surface are of larger sphere}}{\text{Total surface area of the 5 smaller sphere}}$$

$= \frac{16}{5}$

9. The altitude of an equilateral triangle is 12 cm. What is the perimeter of the triangle?

(a) $18\sqrt{3}$ cm (b) 42 cm
(c) $24\sqrt{3}$ cm (d) $30\sqrt{3}$ cm

RRB NTPC (Stage-II) –16/06/2022 (Shift-I)

Ans. (c) : Given,

Length of altitude of an equilateral triangle = 12 cm

$\frac{\sqrt{3}}{2} \times$ Side = 12

Side = $8\sqrt{3}$ cm

Perimeter of the triangle = 3 × side

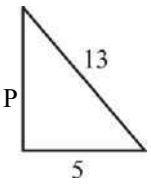
$= 3 \times 8\sqrt{3} = 24\sqrt{3}$ cm

10. The length of the hypotenuse of a right-angled triangle is 13 cm and the length of one of the other two sides is 5 cm. What is the area (in cm^2) of the triangle?

(a) 28 (b) 29.5
(c) 30 (d) 32.5

RRB NTPC (Stage-II) 17/06/2022 (Shift-I)

Ans. (c) :



From Pythagoras Theorem-

Perpendicular (P) = $\sqrt{(Hypotenuse)^2 \quad (Base)^2}$

$= \sqrt{(13)^2 \quad (5)^2}$

$= \sqrt{169 \quad 25}$

$= \sqrt{144}$

$= 12$ cm

$Area \ of \ right\text{-}angled \ triangle = \frac{1}{2} \times Perpendicular \times Base$

$= \frac{1}{2} \times 12 \times 5$

$= 30 cm^2$

11. The length of the three sides of a triangle are 12 cm, 15 cm and 21 cm, respectively, Find the area (in cm^2) of the triangle.

(a) $36\sqrt{6}$ (b) $30\sqrt{6}$
(c) $72\sqrt{6}$ (d) $48\sqrt{6}$

RRB NTPC (Stage-II) 17/06/2022 (Shift-I)

Ans. (a) : Given,

Length of the three sides of a triangle

a = 12 cm, b = 15 cm, c = 21 cm

Semi-perimeter(s) = $\frac{a \quad b \quad c}{2}$

$= \frac{12 \quad 15 \quad 21}{2}$

$= 24$ cm

Area of triangle ( ) = $\sqrt{s\ s-a\ \ s-b\ \ s-c}$

$= \sqrt{24\ \ 24-12\ \ 24-15\ \ 24-21}$

$= \sqrt{24\ \ 12\ \ 9\ \ 3}$

$= 36\sqrt{6}\ cm^2$

12. A triangle has sides of length 5 cm, 7 cm and 10 cm. Find the area of the triangle (in cm^2).

(a) 25 (b) $2\sqrt{66}$

(c) $7\sqrt{10}$ (d) 350

RRB Group-D 22/08/2022 (Shift-I)

Ans. (b) : According to the question,

$s = \frac{5\ \ 7\ \ 10}{2} = \frac{22}{2} = 11$

Area of the triangle = $\sqrt{s\ s-a\ \ s-b\ \ s-c}$

$= \sqrt{11\ 11-5\ \ 11-7\ \ 11-10}$

$\sqrt{11\ \ 6\ \ 4\ \ 1}\ \ 2\sqrt{66}\ cm^2$

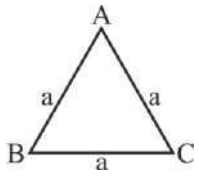
13. If the area of an equilateral triangle is 25 3 cm^2, then the length of each side of the triangle is:

(a) 12 cm (b) 5 cm

(c) 8 cm (d) 10 cm

RRB Group-D 23-08-2022 (Shift-II)

Ans. (d) : Given,



The area of An equilateral triangle is $25\sqrt{3}\ cm^2$

So, $\frac{\sqrt{3}}{4}a^2 \quad 25\sqrt{3}$

$a^2 = 100$

$a = 10$

Hence, the length of each side of the triangle is 10 cm

14. The sides of a triangle are 15 cm, 28 cm, and 41 cm. What is the length of its altitude corresponding to the side with a length of 28 cm?

(a) 14 cm (b) 10 cm

(c) 12 cm (d) 9 cm

RRB Group-D 01/09/2022 (Shift-III)

Ans. (d) : Sides of triangle = 15 cm, 28 cm and 41 cm

$s \quad \frac{a\ \ b\ \ c}{2}$

$s = \frac{15\ \ 28\ \ 41}{2} = \frac{84}{2} = 42$ cm

Area of triangle = $\sqrt{42(42-15)(42-28)(42-41)}$

$= \sqrt{42 \times 27 \times 14 \times 1} = 126\ cm^2$

length of altitude will be 28 cm then

Area $\frac{1}{2}$ Base Height

$126 \quad \frac{1}{2} \quad 28$ altitude

Thus, altitude = 9 cm

15. The ratio of the lengths of two corresponding sides of two similar triangles is 2 : 1. The ratio of the areas of these two triangles, in the order mentioned, is:

(a) 3 : 1 (b) $2\sqrt{2}:1$

(c) 4 : 1 (d) 2 : 1

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (c) : Given: Ratio of length of two corresponding sides of two similar triangle is 2 : 1.

∵ We know that

Ratio of Area of similar triangle = (Ratio of corresponding side)

Ratio of areas = $2^2 : 1^2$

= 4 : 1

16. In any triangle ABC, a + b + c = 2s with usual notation, then the value of $\sin\frac{A}{2}$ is

(a) $\sqrt{\frac{(s\ \ b)(s\ \ c)}{s(s\ \ a)}}$ (b) $\sqrt{\frac{(s\ \ c)(s\ \ a)}{ac}}$

(c) $\sqrt{\frac{(s\ \ b)(s\ \ c)}{bc}}$ (d) $\sqrt{\frac{s(s\ \ a)}{bc}}$

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (c) : Given-

$a + b + c = 2s$ ...(i)

Area of triangle = $\frac{1}{2}bc\sin A$

By formula:-

Area of triangle = $\sqrt{s\ s-a\ \ s-b\ \ s-c}$

$\frac{1}{2}bc\sin A \quad \sqrt{s\ s-a\ \ s-b\ \ s-c}$

$\sin A \quad \frac{2\sqrt{s\ s-a\ \ s-b\ \ s-c}}{bc}$ $\left\{\begin{array}{l}\text{formula}\\ \sin x = 2\sin\frac{x}{2}\cos\frac{x}{2}\end{array}\right\}$

$\sin\frac{A}{2}\cos\frac{A}{2} \quad \frac{\sqrt{s\ s-a\ \ s-b\ \ s-c}}{bc}$ ... (ii)

We know that-

$\cos A \quad \frac{b^2\ \ c^2-a^2}{2bc}$

$2\cos^2\frac{A}{2}-1 \quad \frac{b^2\ \ c^2-a^2}{2bc}$ $\left\{\begin{array}{l}\text{Formula - } \cos 2A = 2\cos^2 A - 1\\ \cos A \quad 2\cos^2\frac{A}{2}-1\end{array}\right\}$

$$2\cos^2\frac{A}{2} \quad \frac{b^2 \quad c^2 - a^2 \quad 2bc}{2bc}$$

$$\cos^2\frac{A}{2} \quad \frac{b + c - a \quad b + c + a}{4bc}$$

$$\cos^2\frac{A}{2} \quad \frac{2s - a - a \quad 2s}{4bc} \qquad \text{[From equ}^{n}\text{(i)]}$$

$$\cos^2\frac{A}{2} \quad \frac{2s - 2a \quad 2s}{4bc}$$

$$\cos^2\frac{A}{2} \quad \frac{s \quad s - a}{bc}$$

$$\cos\frac{A}{2} \quad \sqrt{\frac{s \quad s - a}{bc}}$$

Putting the value of $\cos\frac{A}{2}$ in equation (ii)-

$$\sin\frac{A}{2}\sqrt{\frac{s \quad s - a}{bc}} \quad \frac{\sqrt{s \quad s - a \quad s - b \quad s - c}}{bc}$$

$$\sin\frac{A}{2} \quad \sqrt{\frac{s - b \quad s - c}{bc}}$$

17. The ratio of the area of an equilateral triangle of side x to the area of a square of side x is:

(a) $\sqrt{3} : 4$ (b) $\sqrt{3} : 8$

(c) $\sqrt{3} : 2$ (d) $\sqrt{3} : 1$

RRB NTPC 25.01.2021 (Shift-II) Stage Ist

Ans. (a) : Area of equilateral triangle : Area of square

$$= \frac{\sqrt{3}}{4}x^2 : x^2 = \sqrt{3} : 4$$

18. The base of a right-angled triangle is 12 cm and the difference between the other two sides is 6 cm. What will be the perimeter of the triangle?

(a) 30 cm (b) 54 cm

(c) 36 cm (d) 18 cm

RRB NTPC 09.01.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question,

b = 12 cm c – a = 6 cm

c = a + 6

$\because$ $a^2 + b^2 = c^2$

$b^2 = c^2 - a^2 = (c + a)(c - a)$

144 = (c + a) 6

144 = 6c + 6a

144 = 6(6 + a) + 6a

144 = 36 + 12a

a = 9 cm

c – a = 6 c – 9 = 6 c = 15 cm

Hence the perimeter of the triangle = a + b + c

= 9 + 12 + 15 = 36 cm

19. If the hypotenuse of a right angled isosceles is 8 cm, then the area of the triangle is:

(a) $16\ cm^2$ (b) $2\sqrt{32}\ cm^2$

(c) $\sqrt{32}\ cm^2$ (d) $8\ cm^2$

RRB NTPC 01.03.2021 (Shift-I) Stage Ist

Ans. (a):

$\because$ Area of right angled isosceles triangle

$$= \frac{\text{Hypotenuse}^2}{4} = \frac{8 \quad 8}{4} = 16\ cm^2$$

20. The lengths of the two shorter sides of a right triangle 24 cm & 7 cm. Find the radius of circumcircle of the triangle.

(a) 12.5 cm (b) 12 cm

(c) 16 cm (d) 15.5 cm

RRB NTPC 26.07.2021 (Shift-II) Stage Ist

Ans. (a) : Given-

The lengths of the two shorter sides of a right angle triangle are 7 cm and 24 cm respectively.

$\because$ The hypotenuse is the longest side of a right angled triangle.

$$\text{Hypotenuse} = \sqrt{24^2 \quad 7^2} \quad \sqrt{576 \quad 49} \quad \sqrt{625}$$

Hypotenuse = 25 cm

$\because$ Radius of the circumcircle of right angled triangle

$$\frac{\text{Hypotenuse}}{2} \quad \frac{25}{2} \quad 12.5\ cm$$

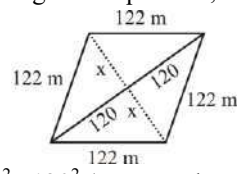
21. A field is in the shape of a rhombus whose side is 122 m. The length of one of its diagonal's is 240 m. What is the area (in m^2) of the field?

(a) 1320 (b) 3080

(c) 5280 (d) 1760

RRB NTPC (Stage-II) –16/06/2022 (Shift-I)

Ans. (c) : According to the question,



$x^2 = 122^2 - 120^2$ (From Pythagoras theorem)

$= 14884 - 14400 = 484$

x = 22 meter

Second diagonal (d_2) = 2x

= 2×22 = 44 meter

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 240 \times 44 = 5280\ m^2$$

22. Find the area of a rhombus whose diagonals are 48m and 64m long.

(a) 1636 sq.m (b) 1536 sq.m

(c) 1436 sq.m (d) 1736 sq.m

RRB NTPC (Stage-II) 17/06/2022 (Shift-III)

Ans. (b) :

$$\text{Area of rhombus} = \frac{1}{2} \quad \text{product of diagonal}$$

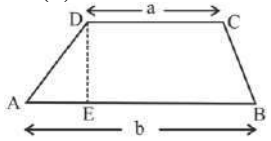
$$= \frac{1}{2} \quad 48 \quad 64 = 1536 \text{ square meter.}$$

23. The area of a trapezium is 1792 cm^2 and the perpendicular distance between its parallel sides is 28 cm. If the length of one of the parallel sides is 72 cm, then find the length of the other side.

(a) 64 cm (b) 56 cm
(c) 84 cm (d) 48 cm

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (b) : Given,
Area of trapezium = 1792 cm^2
Distance between its parallel sides. (h) = 28 cm
Length of one side (b) = ?



Now,

$$\text{Area of trapezium} = \frac{1}{2}(a + b) \times h$$

$$1792 = \frac{1}{2}(72 + b) \times 28$$

$256 = (72 + b) \times 2$
$128 = 72 + b$
$b = 128 - 72$
Length of second side (b) = 56 cm

24. The area of a rhombus is 440 cm^2. If the length of one of its diagonals is 20 cm, then what is the length of its other diagonal?

(a) 22 cm (b) 11 cm
(c) 44 cm (d) 88 cm

RRB NTPC (Stage-II) 16/06/2022 (Shift-III)

Ans. (c) : Area of rhombus $= \frac{1}{2} d_1 d_2$

$$\frac{1}{2} \times 20 \times d_2 = 440 \text{ cm}^2$$

$d_2 = 44$ cm

25. Find the area a trapezium (in sq. with parallel sides of length 3 unit and 5 unit and the shortest distance between its parallel sides is 6 units.

(a) 24 (b) 15
(c) 48 (d) 12

RRB Group-D 01/09/2022 (Shift-III)

Ans. (a) : Area of trapezium $\frac{1}{2} \times$(Sum of parallel sides) × minimum distance between them

$$= \frac{1}{2} \times (3 + 5) \times 6$$

= 24 square unit

26. The parallel sides of a trapezium and its height are in an arithmetic progression with a common difference of 4. If the height is the highest term and the area of the trapezium is 160 sq. units, find the ratio of length of greatest parallel side to that of the smallest parallel side.

(a) 5 : 1 (b) 2 : 3
(c) 3 : 2 (d) 1 : 5

RRB Group-D 18/08/2022 (Shift-III)

Ans. (c) : Smallest side of parallelogram = x
other sides of arithmetic progression = x + 4 and x + 8
and longest side converted in height
According to the question,

Area of trapezium = $\frac{1}{2} \times$ (Sum of parallel sides) × height

$$160 = \frac{1}{2}(x + x + 4)(x + 8)$$

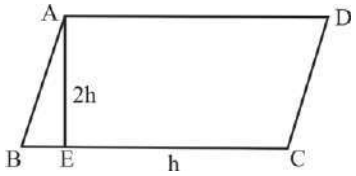
$320 = (2x + 4)(x + 8)$
$320 = 2x^2 + 20x + 32$
$x^2 + 10x + 16 = 160$
$x^2 + 10x - 144 = 0$
$x^2 + 18x - 8x - 144 = 0$
$x(x + 18) - 8(x + 18) = 0$
Hence, $(x + 18)(x - 8) = 0$
$x = 8$
The ratio of length of longest side of parallel side and smallest sides of parallel sides = 12 : 8
= 3 : 2

27. In a parallelogram, the altitude is twice the corresponding base, and the area of the parallelogram is 288 m^2. The altitude of the parallelogram is:

(a) 12 m (b) 18 m
(c) 36 m (d) 24 m

RRB NTPC 01.03.2021 (Shift-I) Stage Ist

Ans. (d) : Given:–
Area of Parallelogram = 288 m^2
Let length of base = h m
Altitude = 2h m



$$\text{Altitude of parallelogram} = \frac{\text{Area}}{\text{Base}}$$

$$2h = \frac{288}{h} \text{ m}$$

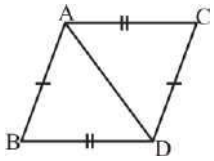
$h^2 = 144$ m
$h = 12$ m
Altitude = $2h = 2 \times 12 = 24$ m

28. If a triangle and a parallelogram are on the same base and between the same parallel lines, then the area of the triangle is equal to :

(a) One- third of the area of the parallelogram
(b) Half of the area of the parallelogram
(c) Three-fourth of the area of the parallelogram
(d) The area of the parallelogram

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (b)



From figure,

Area of ABD $\frac{1}{2}$ area of parallelogram ABCD

Hence, it is clear from the above that a parallelogram and a triangle are created on same base and same parallel lines. Hence the area of triangle will be half of the area of the parallelogram.

29. Find the area of a rhombus whose perimeter is 164 cm and one diagonal is of length 80 cm.

(a) 700 cm^2 (b) 720 cm^2

(c) 705 cm^2 (d) 710 cm^2

RRB NTPC 28.01.2021 (Shift-I) Stage Ist

Ans. (b) : Given,

Diagonal of rhombus (AB) (d_1) = 80 cm

Perimeter of rhombus = 164 cm

Side of rhombus = $\frac{164}{4}$ 41 cm

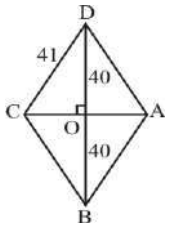
From Pythagoras theorem,

$OC^2 = (41)^2 - (40)^2$

$(OC)^2 = 1681 - 1600 = 81$

$OC = \sqrt{81}$

OC = 9 cm



$d_2 = 2 \times OC = 2 \times 9 = 18$ cm

Hence, area of rhombus $= \frac{1}{2} d_1 \quad d_2 \quad \frac{1}{2} \quad 80 \quad 18$

$= 80 \times 9 = 720 \text{ cm}^2$

30. What will be the area of a parallelogram with base 44 cm and height 22 cm?

(a) 978 cm^2 (b) 958 cm^2

(c) 988 cm^2 (d) 968 cm^2

RRB NTPC 18.01.2021 (Shift-II) Stage Ist

Ans. (d) : Base = 44 cm.

Height = 22 cm

Area of parallelogram = Base × Height

$= 44 \times 22 = 968 \text{ cm}^2$

31. A rectangle of sides 34 cm and 18 cm is reconstructed to form a rhombus whose perimeter is equal to that of the rectangle and one of its angle is 120º. Find the area of the rhombus in cm^2.

(a) $\frac{169\sqrt{3}}{3}$ (b) $169\sqrt{3}$

(c) $338\sqrt{3}$ (d) $\frac{338\sqrt{3}}{3}$

RRB NTPC 31.01.2021 (Shift-I) Stage Ist

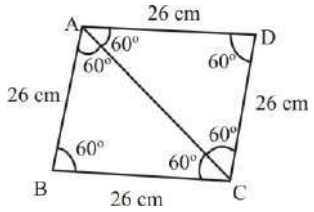
Ans. (c): Let the side of rhombus be a cm.

According to the question,

Perimeter of rhombus = Perimeter of rectangle

4a = 2 (34 +18)

a = 26



Area of rhombus ABCD = 2 × Area of equilateral triangle ABC

Area $= 2 \times \frac{\sqrt{3}}{4} \times \text{side}^2 = 2 \times \frac{\sqrt{3}}{4} \times 26 \times 26 \text{ cm}^2$

$= 26 \times 13 \times \sqrt{3} \text{ cm}^2$

$= 338\sqrt{3} \text{ cm}^2$

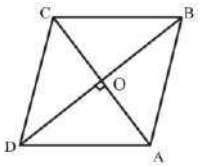
32. What is the area of a rhombus, whose sides are 25 cm and one of the diagonals is 14 cm?

(a) 336 cm^2 (b) 310 cm^2

(c) 330 cm^2 (d) 300 cm^2

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (a) :



ABCD is a rhombus in which,

AB = BC = CD = DA = 25 cm

∵ Diagonals of a rhombus bisect each other at right angle.

∴ AB = 25 cm, OA = $\frac{14}{2}$ =7 cm

In AOB,

AOB = 90°

Now, $OB^2 = (AB^2 - OA^2)$

$= (25^2 - 7^2) = (625 - 49)$

$OB^2 = 576$

$\Rightarrow OB = \sqrt{576}$

OB = 24 cm

BD = (2×OB)

BD = 2×24 = 48 cm

∴ Area of rhombus = $\frac{1}{2}$ AC BD

$= \frac{1}{2} \quad 14 \quad 48 = 7 \times 48 = 336 \text{ cm}^2$

33. Find the area of a rhombus whose side is 10 cm and the longest diagonal is 16 cm.

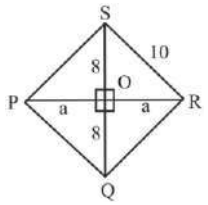
(a) 86 cm^2 (b) 88 cm^2

(c) 96 cm^2 (d) 94 cm^2

RRB NTPC 08.01.2021 (Shift-II) Stage Ist

Ans. (c): In rhombus PQRS diagonal (SQ) = 16 cm

Suppose second diagonal (RP) = 2a cm



In SOR,

$a^2 \quad 8^2 \quad 10^2$

$a^2 \quad 64 \quad 100$

$a \quad \sqrt{100 \quad 64} \quad \sqrt{36}$

$a \quad 6$ cm

Second diagonal = 2a = 2×6 = 12

Area of rhombus $= \frac{1}{2} d_1 d_2 = \frac{1}{2} \times 16 \times 12 = 96$ cm^2

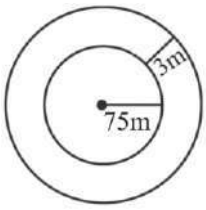
34. What is the area (in m^2) of a circular path having a uniform width of 3m surrounding a circular field of diameter 150m?

(a) 453 (b) 447

(c) 456 (d) 459

RRB NTPC (Stage-II) –16/06/2022 (Shift-I)

Ans. (d) : According to the question,



Area of circle = r^2

Area of circular field

= (Area of field with circular path) – (Area of the field)

= $(75 + 3)^2 - (75)^2$

= $78 \times 78 - \times 75 \times 75$

= 459 m^2

35. If diameter of a circle is 16m, then what is the area of the circle?

(a) 256 m^2 (b) 96 m^2

(c) 64 m^2 (d) 128 m^2

RRB NTPC (Stage-II) 15/06/2022 (Shift-II)

Ans. (c) : $2R = 16$ m

$R = 8$ m $\quad \left[\text{Radius } R \quad \frac{\text{Diameter } D}{2} \right]$

Area of the circle = R^2

= $\times 8^2$

= 64 m^2

36. What will be the perimeter of a quarter circle having a radius of 10 cm? [Use = 3.14]

(a) 15.7 cm (b) 35.7 cm

(c) 25.7 cm (d) 51.4 cm

RRB NTPC (Stage-II) –13/06/2022 (Shift-I)

Ans. (b): Perimeter of quarter circle

$= \frac{2 \quad r}{4} \quad 2r$

$= 2 \times \frac{22}{7} \times \frac{1}{4} \times 10 + 2 \times 10$

$= \frac{110}{7} \quad 20$

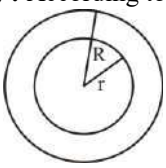
= 15.7+20 = 35.7 cm

37. A circular racing track has been developed in a field. If the difference between the outer circumference and the inner circumference of the racing track is 33 m, then find the width of the track (in m) (Use $= \frac{22}{7}$)

(a) $5\frac{1}{5}$ (b) $4\frac{3}{4}$ (c) $5\frac{3}{4}$ (d) $5\frac{1}{4}$

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (d) : According to the question,



Let the radius of the outer circle be R and the inner circle be r

Now, $2 \quad (R - r) = 33$

$(R - r) = \frac{33 \quad 7}{2 \quad 22}$

$(R - r) = \frac{21}{4} \quad 5\frac{1}{4}$

Hence, width of racing track (in m) = $5\frac{1}{4}$

38. An equilateral triangle of side 12 cm is inscribed in a circle. What is the area (in cm^2) of the circle?

(a) 24 (b) 36

(c) 18 (d) 48

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (d) : Side of a equilateral triangle inscribed in circle = 12 cm

then, Radius of circumscribed circle $\frac{a}{\sqrt{3}}$

$\frac{12 \quad \sqrt{3}}{\sqrt{3} \quad \sqrt{3}} \quad 4\sqrt{3}$

Area of circle r^2

$4\sqrt{3} \quad 4\sqrt{3}$

48

39. If the perimeter of a circle is $\frac{88}{7}$ cm, then find the perimeter (in cm) of the square the length of each of whose sides is equal to the radius of the given circle. $\left(\text{Use } \pi = \frac{22}{7}\right)$

(a) 7 (b) 8
(c) 6 (d) 9

RRB Group-D 23-08-2022 (Shift-II)

Ans. (b) : Given,

The perimeter of a circle $\frac{88}{7}$ cm

$2\ r = \frac{88}{7}$

$2 \times \frac{22}{7} \times r = \frac{88}{7}$

$r = 2$ cm

The perimeter of the square = $4a = 4 \times 2 = 8$ cm

40. A man walks around a circular pond exactly once. If his step is 44 cm long and he takes 700 steps to complete one round of the pond, find the area of the pond.

(a) 7546 m^2 (b) 6546 m^2
(c) 7456 m^2 (d) 6574 m^2

RRB NTPC 30.12.2020 (Shift-II) Stage Ist

Ans. (a) : According to the question-

$700 \times 44 = 2\pi r$

$r = \frac{700 \times 7 \times 44}{22 \times 2}$

$r = 4900$ cm

$\boxed{r = 49 \text{ m}}$

Hence, area of the pond = πr^2

$= \frac{22}{7} \times 49 \times 49$

$= 7546 \text{ m}^2$

41. The area of a circular park is 1386 m^2. If a path of the width 7 m is laid around and inside the park. Then the area of the path is:

(a) 760 m^2 (b) 780 m^2
(c) 770 m^2 (d) 790 m^2

RRB NTPC 19.01.2021 (Shift-I) Stage Ist

Ans. (c) : Area of circular park = 1386 m^2

$r^2 = 1386$

$\frac{22}{7} \times r^2 = 1386$

$r^2 = \frac{1386 \times 7}{22}$

$r = 21$ m

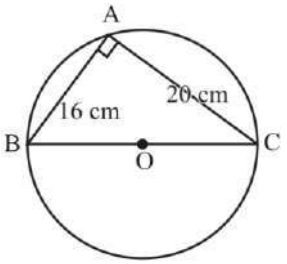
Area of path = Area of larger circular park – Area of smaller circular park

$= 1386 - (r - 7)^2$

$= 1386 - \frac{22}{7} \times 21 \times 7 = 1386 - \frac{22}{7} \times 14 \times 14$

$= 1386 - 616 = 770 \text{ m}^2$

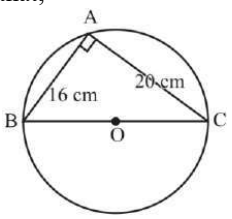
42. Find the area of ABC



(a) 32 cm^2 (b) 160 cm^2
(c) 320 cm^2 (d) 240 cm^2

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (b) : Given that,



In ABC

BAC= 90° {Angle subtended by a diameter on any point of circumference of circle is 90°}

Area of ABC = $\frac{1}{2}$ AB.AC.sin A

$= \frac{1}{2} \times 16 \times 20 \times 1$ [sin 90 1]

$= 160 \text{ cm}^2$

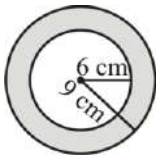
43. Two concentric circles drawn with the radius of inner circle 6 cm and outer circle radius 50% more than inner circle. What is the area of the annulus formed between two circles ?

(a) $\frac{990}{7}$ cm^2 (b) $\frac{890}{7}$ cm^2
(c) $\frac{900}{7}$ cm^2 (d) 990 cm^2

RRB NTPC 14.03.2021 (Shift-I) Stage Ist

Ans. (a) Radius of inner circle (r_2) = 6 cm

: Radius of outer circle (r_1) = $6 \times \frac{150}{100} = 9$ cm



Area of annulus $\pi r_1^2 - \pi r_2^2 = \pi r_1^2 - \pi r_2^2$

$\frac{22}{7} \times 81 - 36 = \frac{22}{7} \times 45$

$\frac{990}{7}$ cm^2

44. If in a circle of radius r = 36 cm a sector of arc length l, satisfies $4l = 3r$, then the area of the sector is :

(a) 486 cm^2 (b) 461 cm^2

(c) 496 cm^2 (d) 476 cm^2

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (a) **:** Given

Radius of circle (r) = 36

$4l = 3r$

$4l = 3 \times 36$ cm

Length of arc (l) = 27 cm

Area of sector $= \frac{1}{2} \times$ Length of arc × Radius

$= \frac{1}{2} \times 27 \times 36 = 27 \times 18$

$= 486\ cm^2$

45. If the area of a circle is 154 cm^2, then the circumference of the circle is:

(a) 11 cm (b) 44 cm

(c) 36 cm (d) 22 cm

RRB NTPC 04.01.2021 (Shift-I) Stage Ist

Ans. (b) : According to the question,

$r^2 = 154$

$r^2 \quad \frac{154 \quad 7}{22} \quad 49$

r = 7 cm.

Then the circumference of circle = 2 r

$2 \quad \frac{22}{7} \quad 7 \quad 44$ cm.

46. If Circumference and area of a circle are numerically equal then radius of the circle is–

(a) 4 units (b) 2 units

(c) 1 units (d) 16 units

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (b) : $\because$ The circumference of circle = 2 r

and area = r^2

According to the question,

$2 \ r = r^2$

Radius (r) = 2 units

47. The diameter of a wheel is 88 cm. Find the number of revolutions in which it will cover a distance of 8712m.

$\left(\text{Use} \quad = \frac{22}{7} \right)$

(a) 3450 (b) 3250

(c) 3350 (d) 3150

RRB NTPC 04.02.2021 (Shift-II) Stage Ist

Ans. (d): Let the number of revolutions = N

Distance = Circumference of wheel × Number of revolutions

$100 \times 8712 \text{ cm} = 2 \times \frac{22}{7} \times 44 \times N$

{Circumference of circle = 2 r}

$N = \frac{7 \quad 8712 \quad 100}{44 \quad 44} = 3150$

N 3150

48. What is the area of the region swept by the minute hand 6 cm long, of a wall clock, in an interval of 5 minutes?

(a) 9.43 cm^2 (b) 9.6 cm^2

(c) 9.8 cm^2 (d) 9.63 cm^2

RRB NTPC 23.02.2021 (Shift-I) Stage Ist

Ans. (a) : The area covered by the minute hand of the wall clock in 60 minutes = r^2

Where r = length of minute hand

Area covered in 5 minutes = $\frac{5}{60} \quad r^2$

$= \frac{5}{60} \quad \frac{22}{7} \quad 6 \quad 6$

$= \frac{1}{12} \quad \frac{22}{7} \quad 36$

Hence covered area = 9.43 cm^2

49. Find the perimeter (in cm) of a square having an area equal to the area of a rhombus of whose diagonals are 8 cm and 16 cm

(a) 32 (b) 34

(c) 36 (d) 35

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (a) : Area of rhombus $\frac{1}{2} \quad d_1 \quad d_2$

(where d = diagonal)

$\frac{1}{2} \quad 8 \quad 16$

$= 64\ cm^2$

According to the question,

Area of square = Area of rhombus

Side of square = $\sqrt{\text{Area of square}}$

$= \sqrt{64}$

= 8cm

Perimeter of square = side of square ×4

= 8×4

= 32 cm

50. The perimeter of a square is equal to the perimeter of a rectangle of length 56 cm and breadth 42 cm. Find the perimeter of a semicircle (in cm) whose diameter is equal to the side of the square (Use $= \frac{22}{7}$)

(a) 182 (b) 224
(c) 198 (d) 126

RRB NTPC (Stage-II) 17/06/2022 (Shift-III)

Ans. (d) : Perimeter of square = Perimeter of rectangle

$4 \times \text{side} = 2(l+b)$

$4 \times \text{side} = 2(56+42)$

$4 \times \text{side} = 2 \times 98$

$4 \times \text{side} = 196$

$4 \times \text{side} = 196$

$\text{side} = 49$

radius of semicircle $= \frac{49}{2}$

Perimeter of semicircle $= r+2r$

$= \frac{22}{7} \quad \frac{49}{2} \quad 49$

$= 77+49 = 126$ cm

51. The length of a diagonal of a square is 18 cm. What is the perimeter of the square?

(a) 72 cm (b) $72\sqrt{2}$ cm
(c) 36 cm (d) $36\sqrt{2}$ cm

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (d) **:** Given,

Diagonal of square = 18 cm

Perimeter of square = ?

Square of Diagonal $= a\sqrt{2} = 18$

$a = \frac{18 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$

Side (a) $= 9\sqrt{2}$ cm

Then, Perimeter of square = 4a

$= 4 \times 9\sqrt{2} = 36\sqrt{2}$ cm

52. The sides of two squares are in the ratio 4:3 and the sum of their areas is 225 cm^2. Find the perimeter of the smaller square (in cm).

(a) 36 (b) 48
(c) 30 (d) 44

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (a) : Let the sides of two squares are 4x and 3x respectively

Sum of areas = 225 cm^2

$(4x)^2 + (3x)^2 = 225$

$16x^2 + 9x^2 = 225$

$25x^2 = 225$

$x^2 = 9$

$x = 3$

Hence, the perimeter of the smaller square = 3x 4

$= 3 \quad 3 \quad 4 = 36$ cm

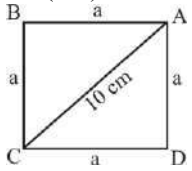
53. The length of each side of a square whose diagonals are 10 cm each is :

(a) $10\sqrt{2}$ cm (b) 5 cm
(c) 7 cm (d) $5\sqrt{2}$ cm

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (d) : Let each side of square = a cm

and diagonal of square (AC) = 10 cm (Given)



In ADC

$\text{Hypotenuse}^2 \quad \text{Base}^2 \quad \text{Perpendicular}^2$

$10^2 \quad a^2 \quad a^2$

$100 = 2a^2$

$a^2 = 50$

$a \quad \sqrt{50}$

$a \quad \sqrt{25 \quad 2}$

$\boxed{a \quad 5\sqrt{2}}$

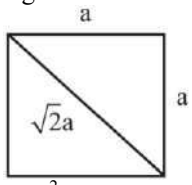
Each side of square $= 5\sqrt{2}$ cm

54. A fence is constructed along the diagonal of a square field. What is the length of the fence (in km) if the area of the square field is 2 km^2?

(a) 2 (b) 5
(c) 4 (d) 3

RRB NTPC 08.04.2021 (Shift-II) Stage Ist

Ans. (a) : Let the length of sides of square field = a



Area of square field $= a^2 = 2$

$a = \sqrt{2}$

Length of diagonals of field $= \sqrt{2}a$

$= \sqrt{2} \quad \sqrt{2}$

$= 2$

55. The area of two squares are in the ratio 16:9. Find the ratio of their respective perimeters.

(a) 4 : 3 (b) 4 : 5
(c) 5 : 4 (d) 3 : 4

RRB NTPC 09.02.2021 (Shift-II) Stage Ist

Ans. (a) : Let the area of squares be A_1 and A_2 respectively and sides be a_1 and a_2 respectively.

According to the question-

$\because A_1 : A_2 \quad 16 : 9$

$a_1^2 : a_2^2 \quad 4^2 : 3^2$

$a_1 : a_2 \quad 4 : 3$

Perimeter of square = 4a

Ratio of their perimeters $4a_1 : 4a_2 \quad 4 : 3$

56. If the side of a square is tripled, then the ratio of the area of the resulting square to that of original square is:

(a) 3 : 1 (b) 9 : 1
(c) 9 : 2 (d) 3 : 2

RRB NTPC 29.01.2021 (Shift-II) Stage Ist

Ans. (b) : From question,

Side of the original square = a

Side of the resulting square = 3a

$$\frac{\text{Area of square}}{\text{Area of resulting square}} \quad \frac{a^2}{9a^2}$$

The Ratio of the area of the resultant and the original square = 9 : 1

57. A square shaped ground has an area of 10,000 m^2. Find the perimeter of a square which sides are as long as the length of diagonals of initial ground.

(a) $400\sqrt{2}$ m (b) 40,000 m
(c) 20,000 m (d) 10,000 m

RRB NTPC 26.07.2021 (Shift-II) Stage Ist

Ans. (a) : Area of the square shaped ground = 10,000 m^2

Side = $\sqrt{10,000}$ 100m

Diagonal of the square = side $\sqrt{2}$

$= 100\sqrt{2}$ m

Perimeter of a square whose side is equal to the diagonal of initial ground = 4 × side

$= 4 \quad 100\sqrt{2}$

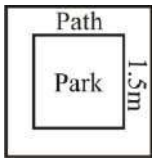
$= 400\sqrt{2}$ m

58. A square park is surrounded by a path of uniform width 1.5 m all around it. The area of the path is 225 m^2. Find the perimeter of the park.

(a) 144 m (b) 142 m
(c) 143 m (d) 144.5 m

RRB NTPC 15.03.2021 (Shift-I) Stage Ist

Ans. (a) :



Area of the path = Area of the square park including the path – Area of the square park.

$[a + 2(1.5)]^2 - a^2 = 225$

$a^2 \quad 9 \quad 6a \quad a^2 \quad 225$

$6a \quad 216$

$a \quad 36$ m

Perimeter of the square park = 4×side = 4a

= 4×36 = 144 m

59. The perimeters of five squares are 24 cm, 32 cm, 40 cm, 76 cm and 80 cm respectively. The perimeter of another square whose area is equal to the sum of the areas of these squares will be :

(a) 128 cm (b) 100 cm
(c) 124 cm (d) 120 cm

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (c) : The perimeters of five squares are 24 cm, 32 cm, 40 cm, 76 cm and 80 cm respectively.

Perimeter = 4 × side

$a_1 = 6, a_2 = 8, a_3 = 10, a_4 = 19, a_5 = 20$

Area = $(\text{Side})^2$

Sum of area of all squares

$= (6)^2 + (8)^2 + (10)^2 + (19)^2 + (20)^2$

$= 36 + 64 + 100 + 361 + 400$

Area = 961 cm^2

$(\text{Side})^2 = \text{Area}$

Side = $\sqrt{961} = 31$

Perimeter = 4 × side = 4 31 = 124 cm

60. If the side of a square is $\frac{1}{10}$ m, then how many such squares will get accommodated in a large square of side 4 m?

(a) 1500 (b) 1600
(c) 1200 (d) 1650

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (b) : Side of small square (a) $\frac{1}{10}$ m

Side of a large square (a) 4m

Number of squares in a large square

$$\frac{(\text{Large side})^2}{(\text{One side of small square})^2}$$

$$\frac{4^2}{1/10^2} \quad \frac{16}{1/100}$$

= 1600

61. The area of a square is 289 cm^2. Find the length of its diagonal.

(a) $13\sqrt{2}$ cm (b) $15\sqrt{2}$ cm
(c) $17\sqrt{2}$ cm (d) $19\sqrt{2}$ cm

RRB NTPC 04.02.2021 (Shift-II) Stage Ist

Ans. (c) : Let side of square = a cm.

According to the question,

Area of square = $(\text{side})^2$

$a^2 \quad 289$

$a \quad 17$ cm.

Hence the diagonal of square = $a\sqrt{2} \quad 17\sqrt{2}$ cm.

62. There is square park of size 18m in length. A road of width 3m is constructed outside the square around it. Find the area of the road.

(a) 352 m^2 (b) 350 m^2

(c) 252 m^2 (d) 250 m^2

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (c)

Length of park including road = 18 + 3 + 3 = 24 m

Length of park excluding road = 18 m

Area of road = Area of park including road – Area of park

$= (24)^2 - (18)^2$

$= (24 + 18) \times (24 - 18)$

$= 42 \times 6 = 252\ m^2$

63. The area of a rectangle is 225 cm^2. The length (x) of the rectangle is 4 more than 4 times the breadth (y). The area in terms of a quadratic form (in x) is:

(a) x^2 4x 900 = 0 (b) $x^2 - 4x - 900 = 0$

(c) $x^2 - 4x$ 900 = 0 (d) x^2 4x – 900 = 0

RRB GROUP-D – 15/09/2022 (Shift-III)

Ans. (b) : Let Length = x

And breadth = y

According to the question,

$x = 4y + 4$

$y \quad \frac{x \quad 4}{4}$

$\because x \quad y = 225$

$x \quad \frac{x \quad 4}{4} \quad 225$

$x^2 - 4x = 900$

$x^2 - 4x - 900 = 0$

64. The diagonal and one side of a rectangular plot are 65 m and 63 m, respectively. What is the perimeter of the rectangular plot?

(a) 225 m (b) 256 m

(c) 196 m (d) 158 m

RRB Group-D 18/08/2022 (Shift-II)

Ans. (d) : Given,

Diagonal of rectangular plot = 65m

Side of a rectangular = 63m

From Pythagoras theorem, second side of rectangular plot = 16m

Perimeter of the Rectangular = 2(l + b)

$= 2(63 + 16)$

$= 2 \times 79$

$= 158m$

65. The length of a rectangle is 5 cm more than its width. If the area of the rectangle is 215 cm^3, then the equation to find the width (w) of the rectangle is:

(a) $w^2 - 5w - 215 = 0$ (b) $w^2 + 5w + 215 = 0$

(c) $2w^2 + 5w - 215 = 0$ (d) $w^2 + 5w - 215 = 0$

RRB GROUP-D – 11/10/2022 (Shift-I)

Ans. (d):

Let breadth of rectangular be w and length (w + 5)

According to the question,

(w+5) w = 215

$w^2 + 5w = 215$

$w^2 + 5w - 215 = 0$

66. The length and the breadth of a rectangular park are in the ratio 7 : 3. The perimeter of the park is 21000 m. What is the difference between the length and the breadth of the park?

(a) 4200 m (b) 3400 m

(c) 3675 m (d) 3150 m

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (a) : Let the length = 7x, Breadth = 3x

According to the question,

The perimeter of the park = 2100 m

2(7x+3x) = 21000

20x = 21000

x = 1050

Difference between length and breadth

$= 7x - 3x = 4x = 4 \times 1050 = 4200$ m

67. The area of a rectangular field, whose sides are in the ratio 13 : 5 is 260 m^2. What is the perimeter of the rectangular field?

(a) 68 m (b) 70 m

(c) 72 m (d) 66 m

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (c) : Given,

Let the sides of rectangular field

= 13x and 5x

Area of rectangular field = 260 m^2

$13x \times 5x = 260$

$x^2 = 4$

x = 2m.

Perimeter of rectangular field = 2 (13x + 5x)

$= 2 \times 18x$

$= 2 \times 18 \times 2$

= 72 m.

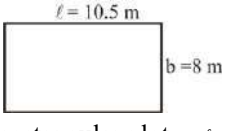
68. The length and the width of a rectangular plot of land are 10.5 m and 8 m, respectively. Find the cost of laying grass in the entire plot at ₹ 15.25 per square metre.

(a) ₹ 1,293 (b) ₹ 1,275

(c) ₹ 1,281 (d) ₹ 1,302

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (c) :



Area of rectangular plot = ℓ b

$= 10.5 \times 8$

$= 84\ m^2$

The cost of laying grass in the entire plot = 84×15.25

= ₹ 1281

69. The area of a rectangle whose length and width are in the ratio 9:5 is given as 180 cm^2. Find the perimeter of the rectangle.

(a) 70 cm (b) 56 cm
(c) 42 cm (d) 54 cm

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (b) : Let the sides of rectangle be 9x and 5x
According to the question,

$9x \quad 5x = 180$

$45x^2 = 180$

$x^2 = 4$

$x = 2$

Sides of rectangle = 9x and 5x

$= 9 \quad 2$ and $5 \quad 2$

= 18cm and = 10 cm

Then,

Perimeter of rectangle = 2 (length + breadth)

= 2 (18+10)

= 56 cm

70. The diagonal of a rectangular plot is 37m and its-area is 420 m^2. What is the cost of fencing the plot at ₹ 37.50 per meter?

(a) ₹3,525 (b) ₹3,750
(c) ₹3,675 (d) ₹3,600

RRB NTPC (Stage-II) 16/06/2022 (Shift-III)

Ans. (a) : Diagonal of a rectangular plot = 37

$\sqrt{\ell^2 \quad b^2} \quad 37$

$\ell^2 \quad b^2 \quad 1369$ ——— (1)

$\ell b = 420$ ——————(2)

$\ell \quad b \quad ^2 \quad \ell^2 \quad b^2 \quad 2\ell b$

$= 1369 + 840 = 2209$

$\ell \quad b \quad = \sqrt{2209} = 47$

Cost of fencing the plot = $2 \quad \ell \quad b \quad 37.5$

$= 94 \quad \frac{75}{2} =$ ₹3525

71. If length of rectangle increase 4m and breadth decrease 2m, then increase his area $2m^2$. If length decrease 3m and breadth increase 5m then are increase $23m^2$, find the perimeter of original rectangle.

(a) 52 (b) 44
(c) 48 (d) 42

RRB Group-D 06/09/2022 (Shift-II)

Ans. (b) : According to question,

Condition- I

$(x + 4)(y - 2) = xy + 2$

$xy - 2x + 4y - 8 = xy + 2$

$x - 2y = -5$ ..... (i)

Condition - II

$(x - 3)(y + 5) = xy + 23$

$xy + 5x - 3y - 15 = xy + 23$

$5x - 3y = 38$ ..... (ii)

From eq. (i) and eq. (ii)

$x = 13$ and $y = 9$

Perimeter of original rectangle = 2(x + y)

= 2(13 + 9)

= 2 × 22

= 44 m

72. The length of a rectangular plot is 60% more than its breadth. If the difference between the length and the breadth of that rectangle is 30 cm, what is the perimeter of that rectangle ?

(a) 300 cm
(b) 260 cm
(c) 330 cm
(d) 270 cm

RRB Group-D 27-09-2022 (Shift-II)

Ans. (b) : Let the breadth of rectangle = x cm

then the length of rectangle = $x \quad \frac{160}{100} \quad 1.6x$ cm

According to the question,

the difference between the length and the breadth of the rectangle = 30

$1.6x - x = 30$

$0.6x \quad 30$

$\boxed{x \quad 50cm}$

Breadth $\quad 50cm$

Length $\quad 50 \quad \frac{160}{100} \quad 80cm$

Hence the perimeter of the rectangle

$2 \quad length \quad breadth$

$2 \quad 80 \quad 50$

$2 \quad 130$

$260cm$

73. The two unequal sides of a rectangle are in the ratio of 3 : 4. If the perimeter is 42 cm, then the length of diagonal will be :

(a) 35 cm (b) 15 cm
(c) 25 cm (d) 30 cm

RRB NTPC 02.02.2021 (Shift-I) Stage Ist

Ans. (b) : Let the length of unequal sides of rectangle = 3x and 4x.

According to the question,

Perimeter of rectangle = 42 cm

$2(3x+4x) = 42$

$14x = 42$

$x = 3$

Length of unequal sides = 9 cm and 12 cm

Diagonal of rectangle $\sqrt{9^2 \quad 12^2}$

$\sqrt{81 \quad 144}$

$\sqrt{225}$

15 cm

74. A rectangular field is 16 meters long and 12 meters wide. A barbed fence has to be drawn on three sides of the field leaving one side open along the width. What is the cost of fencing at the rate of 25 paise per cm?

(a) ₹4,400 (b) ₹1,100

(c) ₹1,900 (d) ₹1,600

RRB NTPC 10.01.2021 (Shift-II) Stage Ist

Ans. (b) : Length of rectangular field = 16 m

Width of rectangular field = 12 m

According to the question,

Perimeter of barbed fence = 16 + 12 + 16 = 44 m

The cost of fencing at the rate of 25 paise per cm

$= 44 \quad 100 \quad \frac{25}{100}$

= ₹1100

75. The ratio of the length to the breadth of a rectangular field is 6 : 5. If the breadth is 25 m less than the length, then perimeter of the field is:

(a) 550 m (b) 530 m

(c) 540 m (d) 560 m

RRB NTPC 25.01.2021 (Shift-II) Stage Ist

Ans. (a) : Let the length of the rectangular field = 6x

Width of the rectangular field = 5x

According to the question,

6x – 5x = 25

x = 25

Perimeter of rectangle = 2 (6x + 5x)

= 22x =22 × 25 = 550m

76. If the length and the perimeter of a rectangle are in the ratio of 3 : 20, then its length and breadth will be in the ratio of :

(a) 3 : 7 (b) 3 : 6

(c) 3 : 5 (d) 3 : 4

RRB NTPC 31.01.2021 (Shift-II) Stage Ist

Ans. (a) : We know that

Perimeter of rectangle is 2 (l + b).

Where,

l = length of rectangle

b = breadth of rectangle

As per question,

Therefore, $\frac{l}{2(l \quad b)} \quad \frac{3}{20}$

$\frac{l}{l \quad b} \quad \frac{3}{10}$

$3l \quad 3b \quad 10l$

$7l \quad 3b$

$\frac{l}{b} \quad \frac{3}{7}$

Hence the ratio of the length and breadth of the rectangle will be 3 : 7

77. The length of each edge of a cube is 2.6 cm. What is the total surface area (in cm^2) of the cube ?

(a) 40.76 (b) 40.56

(c) 39.96 (d) 40.36

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (b) : Total surface area of a Cube = $6a^2$

$= 6\times(2.6)^2$

$= 6\times6.76 = 40.56\ cm^2$

78. The cost of painting a cube on all the external surfaces at the rate of ₹2/cm^2 is ₹588. Find the volume of the cube (in cm^3).

(a) 343 (b) 512

(c) 216 (d) 274.625

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (a) : Surface area of a cube = $\frac{\text{cost of paintings}}{2}$

$6a^2 = \frac{588}{2}$

$6a^2 = 294$

$a^2 = \frac{294}{6}$

$a^2 = 49$

$a = 7$

Volume of the cube = a^3

$= (7)^3 = 343\ cm^3$

79. Find the volume of a cube whose edge is 8 cm.

(a) 264 cm^3 (b) 256 cm^3

(c) 521 cm^3 (d) 512 cm^3

RRB Group-D 05/09/2022 (Shift-III)

Ans. (d) : The volume of a cube = $(side)^3$

$= 8^3 = 512cm^3$

80. Six equal cubes, each of side 7 cm, are placed adjacent to each other. The volume of the new solid formed will be:

(a) 2312 cm^3 (b) 2058 cm^3

(c) 2206 cm^3 (d) 2124 cm^3

RRB Group-D 27-09-2022 (Shift-II)

Ans. (b): Volume of new solid
= Volume of 6 equal Cubes
$= 6 \times (a)^3$
$= 6 \times (7)^3$
$= 6 \times 343$
$= 2058\ cm^3$

81. If the perimeter of one face of a cube is 24 cm, then its volume is :
(a) $180\ cm^3$ (b) $154\ cm^3$
(c) $200\ cm^3$ (d) $216\ cm^3$

RRB GROUP-D – 17/08/2022 (Shift-I)

Ans. (d) : Given Perimeter of one face of cube = 24 cm
Side of this cube = $\frac{24}{4} = 6$ cm
Volume of cube = $(Side)^3$
$= 6^3 = 216\ cm^3$

82. The space diagonal of a cube measures $8\sqrt{3}$ cm. What is the volume of the cube?
(a) $1536\ cm^3$ (b) $512\sqrt{3}\ cm^3$
(c) $512\ cm^3$ (d) $1536\sqrt{3}\ cm^3$

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question,
Length of diagonal of a cube = $a\sqrt{3}$
$8\sqrt{3} \quad a\sqrt{3}$
$a = 8$ cm
Volume of cube = a^3
$= 8^3$
$= 512\ cm^3$

83. The total surface area of a cube of side measuring 2 m is:
(a) $30\ m^2$ (b) $25\ m^2$
(c) $20\ m^2$ (d) $24\ m^2$

RRB NTPC 02.03.2021 (Shift-I) Stage Ist

Ans. (d) : Side of cube (a) = 2m
Total surface area of cube = $6a^2$
$= 6\times (2)^2$
$= 24\ m^2$

84. If the diagonal of a cube is $10\sqrt{3}$ cm long, then what is its volume?
(a) $1000\ cm^3$ (b) $800\ cm^3$
(c) $500\ cm^3$ (d) $9000\ cm^3$

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (a) : According to the question,
$a\sqrt{3} = 10\sqrt{3} \quad a = 10$ cm.
So, volume of cube = $(a^3) = (10)^3 = 1000\ cm^3$

85. If the side of a cube is $9\sqrt{3}$ cm, then its diagonal will be :
(a) 28 cm (b) 26 cm
(c) 27 cm (d) 29 cm

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (c) : Diagonal of cube = side $\times \sqrt{3}$
$\because$ Side = $9\sqrt{3}$ [Given that]
Diagonal of cube = $9\sqrt{3} \quad \sqrt{3}$
$= 9 \quad 3 = 27$ cm

86. A larger cube is formed by melting of three smaller cubes of sides 3 cm, 4 cm and 5 cm each. The ratio of the surface area of the three smaller cubes to the larger cube is.
(a) 9 : 4 (b) 18 : 25
(c) 25 : 18 (d) 27 : 64

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question,
$(3)^3 + (4)^3 + (5)^3 = A^3$
$27 + 64 + 125 = A^3$
$216 = A^3$
$A = 6$ cm
Surface area of larger cube = $6A^2$
$= 6\ (6)^2 = 216\ cm^2$
Sum of the surface area of three smaller cubes = $6\ (3^2 + 4^2 + 5^2)$
$= 6\ (9 + 16 + 25)$
$= 300\ cm^2$
Hence Required ratio $\frac{300}{216} \quad 25:18$

87. The ratio of the volumes of two cubes is 64 : 1331. What is the ratio of their total surface areas?
(a) 16 : 121 (b) 121 : 16
(c) 16 : 4 (d) 4 : 121

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (a) : Let sides of both cubes are a and b respectively.
According to the question,
$\frac{a^3}{b^3} \quad \frac{64}{1331} \quad \frac{4^3}{11^3} \Rightarrow \frac{a}{b} \quad \frac{4}{11}$
The ratio of their total surface area,
$= \frac{6a^2}{6b^2} \quad \frac{a^2}{b^2}$
$= \frac{a}{b}^2 \quad \frac{4}{11}^2 = \frac{16}{121} \quad 16:121$

88. If length of each side of a cube is doubled, then its volume ..... the original volume
(a) Is doubled (b) Becomes 9 times
(c) Becomes 8 times (d) Becomes 6 times

RRB NTPC 05.03.2021 (Shift-I) Stage Ist

Ans. (c) : Let the side of the initial cube = a
Volume of the initial cube = a^3
Length of each side of the cube = 2a
Volume = $(2a)^3 = 8a^3$
Volume = 8 Initial cube/volume of the original cube.
So, if the length of each side of the cube is doubled. Then its volume will become 8 times of the original volume.

89. Rajesh needs to buy some cardboard to build a box that is 12 inches long, 8 inches wide and 10 inches high. How much cardboard is needed to build the box?

(a) 350 sq inches (b) 960 sq inches
(c) 400 sq inches (d) 592 sq inches

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (d) : Cardboard required to make a box,
$= 2(l b+bh+lh)$
$= 2(12\times8+8\times10+10\times12)$
$= 2(96+80+120)$
$= 2\times296 = 592$ square inches

90. Rohan had a cuboidal box having dimensions of 36 cm × 25 cm × 20 cm. He packed into it as many cubes as possible. Each of which has edges 4 cm long. How much space will be still left in the box?

(a) 820 cm^3 (b) 720 cm^3
(c) 780 cm^3 (d) 680 cm^3

RRB NTPC (Stage-II) 15/06/2022 (Shift-I)

Ans. (b) : Volume of cuboid = $36 \times 25 \times 20$
$= 18000\ cm^3$
Total possible number of small cubes = $(36\times25\times20)cm^3$

$$= \frac{36}{4}\ \frac{24}{4}\ \frac{20}{4}$$

(∵ 24 cm because that is the max dimension of the cube of 4 cm that can cover for space of 25 cm)

$= 9 \times 6 \times 5 = 270$
Total volume of small cubes = $270 \times (4)^3$
$= 270 \times 64 = 17280\ cm^3$
Remaining part = $18000 - 17280 = 720\ cm^3$

91. The ratio of the length, breadth and height of a cuboid is 4 : 3 : 5 and the sum of the lengths of all its edges is 144 cm. Find the total surface area of the cuboid.

(a) 756 cm^2 (b) 846 cm^2
(c) 1026 cm^2 (d) 1620 cm^2

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (b) : Let Length of Cuboid = 4x
Breadth = 3x
Height = 5x
According to the question,
$4(4x+3x+5x) = 144$
$4\times12x = 144, \quad x = 3$
Then surface area of cuboid = $2(lb + bh + hl)$
$= 2(12+15+20)x^2$
$= 2\times47x^2$
$= 94\times9$
$= 846\ cm^2$

92. If the length and the height of a cuboid are 18 m and 12 m respectively and its volume is 3024 m^2, then find its breadth:

(a) 16 (b) 14
(c) 13 (d) 15

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (b) : Length of Cuboid (l) = 18 m
Height (h) = 12 m
Volume = 3024 m^3
Breadth (b) = ?
Volume = $\ell \times b \times h$
$3024 = 18 \times b \times 12$

$$b = \frac{3024}{18\ \ 12}$$

b = 14 m

93. If the breadth and height of a closed cuboid are, respectively, 25% and 50% of its length of 12 cm, then find the total surface area of this cuboid.

(a) 126 cm^2 (b) 522 cm^2
(c) 63 cm^2 (d) 252 cm^2

RRB Group-D 26/08/2022 (Shift-III)

Ans. (d) : Given,
Length of the cuboid = 12 cm
Breadth of the cuboid = $12 \times \frac{25}{100}$ = 3 cm
Height of the cuboid = $12 \times \frac{50}{100}$ = 6 cm
Total surface area of the cuboid = $2(\ell b + bh + h\ell)$
$= 2(12 \times 3 + 3 \times 6 + 6 \times 12)$
$= 2(36 + 18 + 72)$
$= 2 \times 126$
$= 252\ cm^2$

94. The edges of a cuboid are in the ratio 1:2:3 and its volume is 1296 cm^3. The surface area of the cuboid is:

(a) 824 cm^2 (b) 792 cm^2
(c) 684 cm^2 (d) 748 cm^2

RRB GROUP-D – 29/09/2022 (Shift-I)

Ans. (b) : Let the sides of cuboid respectively = x, 2x and 3x
length (l) = x
breadth (b) = 2x
height (h) = 3x
Volume of cuboid = lbh
$x \times 2x \times 3x = 1296$
$6x^3 = 1296$
$x^3 = 216$
$x = 6$ cm
length (l) = 6, breadth (b) = 12, height (h) = 18
Surface are of cuboid = $2(lb + bh + hl)$
$= 2(6 \times 12 + 12 \times 18 + 18 \times 6)$
$= 2(72 + 216 + 108)$
$= 2(396)$
$= 792\ cm^2$

95. A cuboid of dimensions 18.5cm × 12.5 cm × 10 cm needs to be painted all over. Find the area to be painted.

(a) 1157.5 cm^2 (b) 1198 cm^2
(c) 1082.5 cm^2 (d) 984.56 cm^2

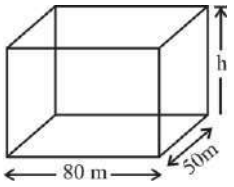
RRB GROUP-D – 17/08/2022 (Shift-III)

Ans. (c):
The total surface area of cuboid = 2(lb + bh + lh)
= 2 (18.5 ×12.5 + 12.5 × 10 + 18.5 × 10)
= 2 (231.25 + 125 + 185)
=2 × 541.25
= 1082.5cm^2

96. 500 persons are taking a dip in a cuboidal pond, which is 80 m long and 50 m broad. What is the rise in the water level in the pond, if the average displacement of the water by one person is 0.04 m^3?
(a) 2.5 cm (b) 1 cm
(c) 1.5 cm (d) 0.5 cm

RRB NTPC 13.01.2021 (Shift-II) Stage Ist

Ans. (d) :
If the height of the pond is h m.
Volume of pond
= l × b × h
= 80 × 50 × h
= 4000 h m^3



Volume of water removed by 500 persons
= 500 × 0.04 = 20.00 m^3 = 20 m^3
Therefore, the rise in the water level of the pond
∵ 1m 100cm
4000 h = 20
h = $\frac{20}{4000}$ = 0.005 m = 0.5 cm

97. How many cubes of side 3 cm can be formed by melting a cuboid of length 9 cm, breadth 6 cm and height 6 cm?
(a) 14 (b) 12
(c) 13 (d) 11

RRB NTPC 29.01.2021 (Shift-I) Stage Ist

Ans. (b) : Required number of cubes
$\frac{\text{Volume of cuboid}}{\text{Volume of cube}} = \frac{lbh}{a^3}$ 9 6 6 3 3 3 12

98. A tank 4 m long, 2 m wide and 1.5 m deep is dug in a field 22 m long and 14 m wide. If the earth dug out is evenly spread out over the remaining field, then the level of the field will rise by:
(a) 4.75 m (b) 5 cm
(c) 3.5 cm (d) 4 cm

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (d) **:** Let the level of the field be increased by h m.
Volume of dug soil = Area of remaining field × height.
4 2 1.5 = (22 14 – 4 2) h
12 = 4(75) h
h $\frac{12}{300}$ m
h $\frac{12}{300}$ 100
h 4 cm

99. If the volume of a cube is equal to the volume of a cuboid of dimensions 54 cm, 18 cm and 6 cm, then find the length of the side of the cube?
(a) 18 cm (b) 24 cm
(c) 12 cm (d) 16 cm

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (a) : Volume of Cuboid = ℓ ×b×h
= 54 × 18 × 6 cm^3
∵ Volume of Cube = Volume of Cuboid
(side)^3 = 18×3×18×6
= 18×18×18
Hence the length of the side of the cube = 18 cm

100. A cuboid having the surface area of 3 adjacent faces as a, b, c has the volume:
(a) abc $^{\frac{1}{2}}$ (b) $a^3b^3c^3$
(c) abc (d) abc $^{\frac{1}{3}}$

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (a) : Given,
Length Breadth = a _____(i)
Breadth Height = b _____ (ii)
Height Length = c _____ (iii)
On multiplying equation (i), (ii) and (iii),
(L × B × H)^2 = a × b × c
Hence, Volume = Length Breadth Height= abc $^{\frac{1}{2}}$

101. The sides of a cuboid are in the ratio of 1:2:3. If its surface area is 88 cm^2, find its volume.
(a) 48 cm^3 (b) 120 cm^3
(c) 64 cm^3 (d) 24 cm^3

RRB JE - 25/05/2019 (Shift-II)

Ans : (a) Let the length (l), breadth (b) and height (h) be x, 2x and 3x respectively.
Surface area of cuboid = 88 cm^2
2 (l.b+ b.h + h.l) = 88 cm^2
2 (x. 2x + 2x. 3x + 3x. x) = 88cm^2
2 (2x^2 + 6x^2 + 3x^2) = 88
22x^2 = 88
x^2 = 4
x 2
Length of cuboid (ℓ) = x = 2cm
Breadth of cuboid (b) = 2x = 2 × 2 = 4cm
Height of cuboid (h) = 3x = 3 × 2 = 6 cm
Volume of cuboid ℓ.b.h
= 2 × 4 × 6
48cm^3

102. Cuboid of dimensions l × b × h is cut into the form of the frames of dimensions l × 0.5 b × 0.4 h. Find the number of frames.
(a) 4 (b) 5
(c) 20 (d) 10

RRB JE - 27/05/2019 (Shift-II)

Ans : (b)
Number of frames $\frac{\text{Volume of large cuboid}}{\text{Volume of small cuboide}}$

$\ell \quad b \quad h$

$\ell \quad 0.5b \quad 0.4h$

$\frac{1}{0.5 \quad 0.4}$

$\frac{1}{0.20} \quad \frac{100}{20} = 5$

103. The circumference of the base of a right circular cylinder is 176 cm and its height is 12 cm. Find the total surface area (in cm^2) of the cylinder. (Use $\pi = \frac{22}{7}$)

(a) 7064 (b) 7640
(c) 7040 (d) 7460

RRB NTPC (Stage-II) 16/06/2022 (Shift-III)

Ans. (c) : Circumference of base of cylinder = 176 cm

$2 \quad r = 176$

$2 \times \frac{22}{7} \times r = 176$

$r = 28$ cm

$h = 12$ cm

Total surface area of cylinder $= 2 \quad r \ (r+h)$

$= 176 \times (28+12)$

$= 176 \times 40 \cdot 7040 \ cm^2$

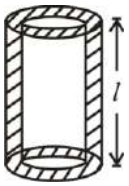
104. Find the cost of painting all surfaces of a 10 m long hollow steel pipe whose internal and external diameters measure 15 cm and 17 cm respectively, if the cost of painting $1cm^2$ of the surface is ₹0.15. [Use $= \frac{22}{7}$]

(a) ₹15,160.80 (b) ₹15,100.80
(c) ₹15,200.80 (d) ₹15,000.80

RRB NTPC (Stage-II) 17/06/2022 (Shift-III)

Ans. (b) : Given,

$R = \frac{17}{2} cm, \quad r \quad \frac{15}{2} cm, \quad l = 1000cm$



Total surface area of Hollow cylinder.

$= 2 \ (R+r)l + 2 \ (R^2 - r^2)$

$= 2 \ (R+r)(l+R-r)$

$= 2 \times \frac{22}{7} \times 16 \times 1000 + 1$

$= 2 \times 22 \times 16 \times 143 \ cm^2$

Cost of painting $= 2 \times 22 \times 16 \times 143 \times 0.15 = 15100.8 \ cm^2$

105. The sum of the radius of the base and the height of a solid right circular cylinder is 39 cm. Its total surface area is $1716cm^2$. What is the Volume (in cm^3) of the cylinder? (Take $\pi = \frac{22}{7}$)

(a) 4620 (b) 5082
(c) 4774 (d) 4928

RRB NTPC (Stage-II) 15/06/2022 (Shift-II)

Ans. (d) : Let the radius and height of the cylinder is r and h respectively.

According to the question,

Total surface area of cylinder = 1716

$2\pi r \ (h+r) = 1716 \qquad (\because h + r = 39cm)$

$2 \quad \frac{22}{7} \quad r \quad 39 \quad 1716$

$r \quad \frac{1716 \quad 7}{39 \quad 2 \quad 22}$

$r = 7$ cm

Volume of cylinder $= \pi r^2 h$

$\frac{22}{7} \quad 7 \quad 7 \quad 32 \qquad [h = 39 - 7 = 32]$

$4928 \ cm^3$

106. Two cylinders have the same volume, but the radius of the base of the second cylinder is 20% less than the radius of the base of the first. How much greater should the height of the second cylinder be in comparison to the height of the first?

(a) 55.25% (b) 56.25%
(c) 55.75% (d) 56.75%

RRB NTPC (Stage-II) 15/06/2022 (Shift-I)

Ans. (b) : Let radius of first cylinder (R) = 100

Radius of second cylinder (r) $= 100 \quad \frac{80}{100} = 80$

According to the question,

$R^2 H \quad r^2 h$

$100^2 \quad H \quad 80^2 \quad h$

$\frac{H}{h} \quad \frac{6400}{10,000}$

Required increase % $= \frac{10000 \quad 6400 \quad 100}{6400}$

$\frac{3600 \quad 100}{6400}$

$\frac{225}{4}$

56.25%

107. The volume of a cylinder having height 21 cm and radius 10 cm is : $\left\{ \text{Use } \pi = \frac{22}{7} \right\}$

(a) 9900 cm^3 (b) 6600 cm^3
(c) 8800 cm^3 (d) 7700 cm^3

RRB Group-D 08/09/2022 (Shift-II)

Ans. (b) : Volume of a cylinder = $r^2 h$

Given,

$h = 21cm$

$r = 10cm$

Volume of a cylinder $\frac{22}{7} \quad 21 \quad 10 \quad 10$

$= 6600cm^3$

108. Find the volume of a cylinder whose radius of base is 5 cm and height is 7 cm.

(a) 157 cm^3 (b) 715 cm^3
(c) 517 cm^3 (d) 157 cm^3

RRB Group-D 30-08-2022 (Shift-II)

Ans. (d) : Given,
Radius of cylinder (r) = 5 cm
Height of cylinder (h) = 7 cm
$\because$ Volume of cylinder (V) = r^2h
= $5^2 \times 7$
175 cm^3

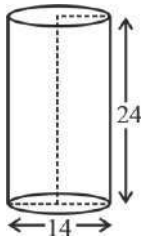
109. Find the curved surface area of a cylinder whose diameter of base is 14 m and height is 24 m.

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(a) 1065 cm^2 (b) 1056 cm^2
(c) 1560 cm^2 (d) 1506 cm^2

RRB Group-D 23-08-2022 (Shift-II)

Ans. (b) : Curved surface are a of a cylinder 2 rh



$2 \quad \frac{22}{7} \quad 7 \quad 24$
$2 \times 22 \times 24$
1056

110. If the volume of a cylinder is 256 cm^3 and the radius of its base is 8 cm, then find the height of the cylinder.

(a) 5 cm (b) 4 cm
(c) 6 cm (d) 3 cm

RRB Group-D 30-08-2022 (Shift-III)

Ans. (b) : Given, Volume of cylinder = 256 × cm^3
Radius = 8 cm
Height = ?
$\because$ Volume of cylinder = r^2h
$256 = (8)^2h$
$h \quad \frac{256}{64} \quad 4 \text{ cm}$
Hence, height of cylinder = 4 cm.

111. The volume of a cylinder having diameter 14 cm and height 5 cm is:

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(a) 880 cm^3 (b) 660 cm^3
(c) 770 cm^3 (d) 990 cm^3

RRB Group-D 05/09/2022 (Shift-III)

Ans. (c) : D = 14, and h = 5cm
r = 7
Volume of cylinder = r^2h
$\frac{22}{7} \quad (7)^2 \quad 5 = 770 cm^3$

112. The ratio of radius of cylinder and height is 3 : 4. If volume is 38808 cm^3. Then using $\frac{22}{7}$ find the radius of cylinder ?

(a) 35 cm (b) 14 cm
(c) 21 cm (d) 28 cm

RRB Group-D 06/09/2022 (Shift-II)

Ans. (c) : Radius of cylinder (r) = 3x
Height = 4x
Volume of cylinder (v) = r^2h
$\frac{22}{7} \quad 9x^2 \quad 4x \quad 38808$
$x^3 = 343$
x = 7
Radius of cylinder (r) = 3 × 7
= 21 cm

113. The total surface area of a cylinder of diameter 10 cm is 330 square centimeters. Find the height of the cylinder?

(a) 5.5 cm (b) 6.5 cm
(c) 10.5 cm (d) 2.5 cm

RRB Group-D 18/08/2022 (Shift-III)

Ans. (a) :
Total surface area of a cylinder of diameter =2 rh+2 r^2
330 = 2 r (h + r)
$330 = 2 \quad \frac{22}{7} \quad 5 \ (h \quad 5)$
42 = 4h + 20
4h = 22
$h \quad \frac{22}{4}$
h = 5.5 cm

114. The volume (in cm^3) of a solid right circular cylinder whose diameter of base is 7cm and height is 20 cm is _____(Use $\pi = \frac{22}{7}$)

(a) 980 (b) 1440
(c) 3080 (d) 770

RRB Group-D 13/09/2022 (Shift-III)

Ans. (d) : Given,
Diameter (d) = 7 cm
radius (r) $\frac{7}{2}$ cm
Height (h) = 20 cm
Volume of solid right circular cylinder = r^2h
$\frac{22}{7} \quad \frac{7}{2} \quad \frac{7}{2} \quad 20$
= 770 cm

115. If area of base of a cylinder is 346.50 cm^2 and height 21 cm. Then find his total surface area (using $\frac{22}{7}$)

(a) 2352 cm^2 (b) 2231 cm^2
(c) 2145 cm^2 (d) 2079 cm^2

RRB GROUP - D – 29/09/2022 (Shift–II)

Ans. (d): According to the question,
Area of base of cylinder = 346.50 cm.

$r^2 = 346.50$

$r^2 \quad \frac{34650 \quad 7}{22 \quad 100}$

$r \quad \frac{21}{2}$

total surface area of cylinder $2 \; r \; h \quad r$

$= 2 \times \frac{22}{7} \times \frac{21}{2} \quad 21 + \frac{21}{2}$

$= 2 \times \frac{22}{7} \times \frac{21}{2} \times 21 \quad 1 + \frac{1}{2}$

$= 2 \times \frac{22}{7} \times \frac{21}{2} \times 21 \times \frac{3}{2} = 2079 \text{ (cm)}^2$

116. If the volume of a solid right circular cylinder is 198 m^3 and the radius of its base is 3 m, then its height (in m) is _____. Take $\pi = \frac{22}{7}$

(a) 7 (b) 9
(c) 27 (d) 6

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (a) : Given :– Volume of cylinder = 198 m^3
Radius of base (r) = 3m
Height (h) = ?
∵ Volume of cylinder = r^2h

$198 = \times 3^2 \times h \quad \because \quad \frac{2}{7}$

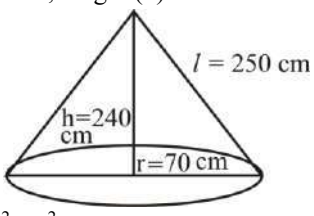
$h \quad \frac{198 \quad 7}{22 \quad 9} = 7 \text{ m}$

117. Find the total surface area (in m^2) of a right circular cone whose radius of base is 70 cm and perpendicular height is 240 cm. $\left[\text{Use } \pi = \frac{22}{7}\right]$

(a) 704 (b) 0.704
(c) 7.04 (d) 70400

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (d) : Given,
radius (r) = 70 cm, height (h) = 240 cm



Then, $l^2 = h^2 + r^2$
$= (240)^2 + (70)^2$
$l = \sqrt{62500} = 250$ cm
Total surface area of cone = $r(\ell + r)$

$= \frac{22}{7} \times 70 \quad 250 + 70$

$= \frac{22}{7} \times 70 \times 320 = 70400 \text{ cm}^2$

118. The slant height of a right circular cone is 13 cm and the area of the base is 144 cm^2. Find the volume (in cm^3) of the cone.

(a) 245 (b) 260
(c) 240 (d) 225

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (c) : Given,
Slant height of cone $\ell \quad 13 \text{cm}$
Area of base = 144 cm^2
$r^2 = 144 \text{ cm}^2$
$r^2 = 144$
Radius (r) = 12 cm
Height (h) = $\sqrt{\ell^2 \quad r^2}$

$= \sqrt{13^2 \quad 12^2}$

$= \sqrt{25}$

h = 5 cm

Volume of cone = $\frac{r^2h}{3}$

$= \frac{12^{\;2} \quad 5}{3}$

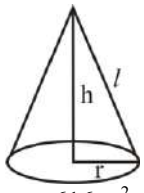
$= \times 12 \times 4 \times 5 = 240$

119. The area of the base of a conical tomb is 616 m^2 and its height is 48 m. What is the cost of plastering in curved surface area at ₹ 150 per m^2? (Take $\pi = \frac{22}{7}$)

(a) ₹ 3,60,000 (b) ₹ 3,15,000
(c) ₹ 3,00,000 (d) ₹ 3,30,000

RRB NTPC (Stage-II) –13/06/2022 (Shift-I)

Ans. (d) :



Area of base of cone =616 m^2

$r^2 = 616$

$\frac{22}{7} \quad r^2 = 616$

$r^2 = 7 \times 7 \times 4$

$r = 14$ m

$l = \sqrt{h^2 \quad r^2}$

$= \sqrt{48^2 \quad 14^2}$

$= \sqrt{2500}$

$= 50$ m

Required cost = $rl \times 150 = \frac{22}{7} \times 14 \times 50 \times 150$

$= ₹ 330,000$

120. The radius of the base of a solid right circular cone is 5 cm and its height is 12 cm . What is its total surface area (in cm^2)?

(a) 34 (b) 90
(c) 84 (d) 70

RRB NTPC (Stage-II) 17/06/2022 (Shift-I)

Ans. (b) : Given,
Radius (r) = 5 cm
Height (h) = 12 cm
Slant-Height (l) = $\sqrt{5^2 \quad 12^2}$
= $\sqrt{169}$
= 13 cm
Total surface area of cone = r (l + r)
= × 5 × 18
= 90

121. The diameter of base of a right circular cone is 20 cm and its slant height is 10.5 cm. What is the curved surface area (in cm^2) of the right circular cone? $\left[\text{Use } \pi = \frac{22}{7}\right]$

(a) 165 cm^2 (b) 660 cm^2
(c) 495 cm^2 (d) 330 cm^2

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (d) : Given,
Diameter of cone = 20 cm
Radius (r) $\frac{20}{2}$ 10 cm
Slant height (l) = 10.5 cm
Curved surface area of cone = rl
= $\frac{22}{7}$ 10 10.5
= 330 cm^2

122. A solid metallic cylinder of base radius 3 cm and height 5 cm is melted to form cones each of height 1 cm and base radius 1 mm. How many cones were formed?

(a) 13,500 cones (b) 12,500 cones
(c) 19,500 cones (d) 10,500 cones

RRB NTPC 10.01.2021 (Shift-II) Stage Ist

Ans. (a) : Let,
Number of formed cones = n
According to the question-
Volume of cylinder = n ×Volume of cone

$r^2h \quad n \quad \frac{1}{3} \quad r^2h$

$\pi \times \quad 3 \quad ^2 \times 5 = n \times \frac{1}{3}\pi \times \quad \frac{1}{10} \quad ^2 \times 1$

n = 9 5 3 100

n = 13500 cones

123. The height of the solid frustum of a cone is 8cm. If the radii of its lower and upper ends are 3 cm and 9 cm respectively, then its slant height is:

(a) 10 cm (b) 12 cm
(c) 15 cm (d) 9 cm

RRB NTPC 11.03.2021 (Shift-I) Stage Ist

Ans. (a): Given that–
Height of frustum (h) = 8 cm
Radius of upper end (R) = 9 cm
Radius of lower end (r) = 3 cm
Slant height (l) = $\sqrt{h^2 \quad (R \quad r)^2}$
$\sqrt{8^2 \quad (9 \quad 3)^2}$
$\sqrt{64 \quad 36}$
$\sqrt{100} \quad 10\text{cm}$

124. Calculate the total surface area of a cone if its radius is $\frac{r}{4}$ and slant height is 4l.

(a) r(l+r) (b) 2 r(l+r)
(c) r l $\frac{r}{16}$ (d) 2 rl

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (c) : Given,
Radius (r_1) = $\frac{r}{4}$
Slant height $\ell_1 = 4\ell$
Total surface area of cone = ($\pi r_1 \ell_1 + r_1^2$)
$\frac{r}{4} \quad 4l \quad \frac{r}{4}^2 = rl \quad \frac{r^2}{16}$
= $\boxed{r \quad l \quad \frac{r}{16}}$

125. Find the total surface area of a cone, if its radius and slant height are 2r and 1/2 respectively.

(a) r (2r + 1) (b) $\frac{4r^2 \quad 1}{2}$
(c) r (4r + 1) (d) $(4r^2 + 1)$

RRB NTPC 17.01.2021 (Shift-I) Stage Ist

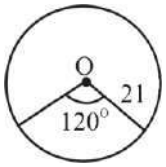
Ans. (c) : Total surface area of cone = rl + r^2
Where, r = Radius
l = Slant height
So, total surface area of a cone whose radius 2r and slant height $\frac{1}{2} = \pi \times 2r \times \frac{1}{2} + \pi \quad 2r \quad ^2$
= $\pi r + \pi 4r^2$
= r (1+4r)
= r (4r+1)

126. A circle sector with radius 21 cm and center is turned into a cone by turning 120º. Find the radius of the cone thus formed.

(a) 42 cm (b) 21 cm
(c) 7 cm (d) 7.5 cm

RRB JE - 29/05/2019 (Shift-I)

Ans: (c) Let radius of cone · R cm



Radius of sector = 21cm
Angle = 120^0

From, Angle = $\frac{\text{Arc}}{\text{radius}}$, $\left[\because \text{where angle will be in radian}\right]$

$120 \quad \frac{\text{Arc}}{180} \quad \frac{\text{Arc}}{21}$

$\frac{2}{3} \quad 21 = \text{arc}$

Circumference of circle formed by base of the cone = length of arc.

$2 \quad R \quad \frac{2}{3} \quad 21$

R = 7 cm

127. A solid hemisphere of metal is melted and is formed into the same radius of 'R' as a cone if the height of the cone is 'H' then.
(a) H = R (b) H = R/2
(c) H = 2R (d) H = R/3

RRB JE - 27/05/2019 (Shift-I)

Ans : (c) We know that

Volume of hemisphere = $\frac{2}{3} \quad r^3$

Volume of cone = $\frac{1}{3} \quad r^2 h$

As per the question,

$\frac{2}{3} \quad r^3 \quad \frac{1}{3} \quad r^2 h \qquad (r = R) \ (h=H)$

$\frac{2}{3} \quad R^3 \quad \frac{1}{3} \quad R^2 H$

$H \quad 2R$

128. There are two cones that have a ratio of volume 1 : 10 and a ratio of height 2 : 5. Find the ratio of their base radius.
(a) 2:1 (b) 5:2
(c) 7:25 (d) 1:2

RRB JE - 28/05/2019 (Shift-I)

Ans : (d)

$V_1 : V_2 = 1 : 10$

$h_1 : h_2 = 2 : 5$

$\frac{V_1}{V_2} \quad \frac{\frac{1}{3} \quad r_1^2 h_1}{\frac{1}{3} \quad r_2^2 h_2} \qquad \frac{1}{10} \quad \frac{r_1^2 \quad 2}{r_2^2 \quad 5}$

$\frac{1}{2} \quad \frac{r_1^2 \quad 2}{r_2^2 \quad 1}$

$r_1 : r_2 \quad 1 : 2$

129. The size of a solid is like a hemisphere with the same radius melted on a cone of radius 2 cm and the height of the cone is equal to its radius. Find the volume of this solid.
(a) 2 cm^3 (b) 6 cm^3
(c) 8 cm^3 (d) 4 cm^3

RRB JE - 30/05/2019 (Shift-I)

Ans : (c) $\because$ Height of cone is equal to radius of cone

Total volume = Volume of hemisphere + Volume of cone

$\frac{2}{3} \quad r^3 \quad \frac{1}{3} \quad r^2 h \qquad [h = r]$

$\frac{2}{3} \quad r^3 \quad \frac{1}{3} \quad r^3 \quad \frac{3 \quad r^3}{3}$

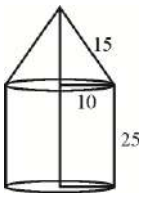
$= \pi \times (2)^3 \qquad [r = 2 \text{ cm}]$

$= 8 \quad cm^3$

130. A tent is in the shape of a cylinder and a cone has been established above it, the radius and height of the cylindrical part are 10 meters and 25 meters respectively. The radius is 10 meters of conical portion and the slant height is 15 meters. Calculate the amount of canvas required for the construction of this tent, taking an additional canvas of 20 percent for sealing, etc.
(a) 3783.26 m^2 (b) 4714.43 m^2
(c) 3772.14 m^2 (d) 2451.40 m^2

RRB JE - 26/06/2019 (Shift-III)

Ans : (d)



Area of tent = 2 rh + r*l*

area of tent = 2× ×10×25 + ×10×15 = 500 + 150

= 650 m^2

Required area = $650 \quad \frac{120}{100} \quad \frac{22}{7}$

$= \frac{780 \quad 22}{7} \quad \frac{17160}{7} \quad 2451.40 \ m^2$

131. Numerical values of the volume and surface area of a cone are equal. If 'h' and 'r' represent the height and base radius of the cone, find the value of $(1/h^2) + (1/r^2)$
(a) 2/9 (b) 1/9
(c) 1/3 (d) 3

RRB JE - 28/05/2019 (Shift-II)

Ans : (b) Volume of cone = Surface area of cone

$\frac{1}{3} \quad r^2 h \quad rl$, Where, *l* = Slant height of cone

$\frac{1}{3} rh = l \qquad$ r – Radius, h – Height

$\frac{r}{3l} = \frac{1}{h}$

On squaring both sides,

$\frac{1}{h^2} = \frac{r^2}{9l^2}$ .....(i)

And $\frac{1}{r^2} = \frac{h^2}{9l^2}$ .....(ii)

On adding equation (i + ii)

$\frac{1}{h^2} + \frac{1}{r^2} = \frac{r^2}{9l^2} + \frac{h^2}{9l^2}$

$\frac{1}{h^2} + \frac{1}{r^2} = \frac{h^2 + r^2}{9l^2}$

$\frac{1}{h^2} + \frac{1}{r^2} = \frac{l^2}{9l^2}$ $\because l^2 \quad h^2 \quad r^2$

$\frac{1}{h^2} + \frac{1}{r^2} = \frac{1}{9}$

132. The surface area of a sphere is 38.5 cm^2. Find the radius of the sphere. [Use $\pi = \frac{22}{7}$]

(a) 1.8 cm (b) 1.4 cm
(c) 1.5 cm (d) 1.75 cm

RRB NTPC (Stage-II) 15/06/2022 (Shift-II)

Ans. (d) : Surface area of sphere = 38.5

$4 \quad R^2 \quad 38.5$

$R^2 \quad \frac{38.5}{4 \quad \frac{22}{7}} \quad \left[\text{Surface area of sphere} \quad 4 \quad R^2\right]$

$R^2 \quad \frac{38.5 \quad 7}{4 \quad 22} \quad \frac{7 \quad 7}{4 \quad 4}$

$R \quad \frac{7}{4} \quad 1.75\,\text{cm}$

133. A hemispherical bowl of internal radius 24 cm is full of liquid. This liquid is to be filled in cylindrical bottles, each of internal radius 6 cm and height 8 cm. How many bottles are required to empty the bowl?

(a) 32 (b) 36
(c) 35 (d) 30

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (a) : Number of bottles required to completely empty the hemispherical bowl

$= \frac{\text{Volume of the hemispherical bowl}}{\text{Volume of cylindrical bottle}}$

$\frac{\frac{2}{3} \quad r^3}{r^2 h}$

$= \frac{\frac{2}{3} \quad 24 \quad 24 \quad 24}{6 \quad 6 \quad 8}$

$=2\times4\times4$

$= 32$

Hence, 32 bottles will be required to completely empty the hemispherical bowl.

134. The total surface area of a solid hemisphere is 1848 cm^2. What is the length of the diameter of the flat surface of the hemisphere. [Use $\pi = \frac{22}{7}$]

(a) 35 cm (b) 21 cm
(c) 14 cm (d) 28 cm

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (d) : According to the question,

Total surface area of solid Hemisphere = 3 r^2

$3 \quad r^2 = 1848\ cm^2$

$r^2 = \frac{1848}{3}$

$r^2 = \frac{1848 \quad 7}{3 \quad 22}$

$r^2 = 196$

$r^2 \quad 14^2$

Radius (r) = 14

Diameter = 2r

$= 2\times14$

$= 28$ cm

135. If three solid gold spherical beads of radii 6 cm. 8 cm. and 10 cm. respectively are melted into one spherical bead, then what is the radius (in cm) of the larger bead?

(a) 15 cm (b) 12 cm
(c) 13 cm (d) 16 cm

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (b) : Radius of larger spherical bead = Sum of volumes of smaller spherical beads

$\frac{4}{3}\pi R^3 = \frac{4}{3}\pi r_1^3 + \frac{4}{3}\pi r_2^3 + \frac{4}{3}\pi r_3^3$

$R^3 = (6)^3 + (8)^3 + (10)^2$

$= 216 + 512 + 1000$

$= \sqrt{1728}$

$R = 12$ cm.

136. A solid metallic sphere of radius 3 cm is melted and drawn into a wire of thickness 4 mm What is the length of the wire (in m)?

(a) 7.5 (b) 8
(c) 9 (d) 9.25

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (c) : Volume of wire = Volume of sphere

$4\text{mm} \quad \frac{4}{10}\text{cm}.$

Radius of wire = $\frac{1}{2} \quad \frac{4}{10} \quad 0.2\,\text{cm}.$

Volume of wire = $r^2 l$

Where, l = length of wire

$(0.2)^2 l = \frac{4}{3} \quad (3)^3$

$0.04 \times l = \frac{4}{3} \quad 27$

$0.04 \times l = 36$

$l = \frac{36}{0.04}$

$l = \frac{36 \quad 100}{4}$

$l = 9 \times 100$ cm $= 9$ m.

137. The total surface area of a hemisphere is 108 cm^2. What is the volume of the hemisphere?

(a) 216 cm^3 (b) $108\sqrt{6}$ cm^3

(c) 144 cm^3 (d) $54\sqrt{3}$ cm^3

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (c) : Total surface area of hemisphere = 108 cm^2

3 $r^2 = 108$

$r^2 = 36$ r = 6 cm

Now the volume of hemisphere $= \frac{2}{3}$ r^3

$= \frac{2}{3}$ 6 6 6 = 144 cm^3

138. Find the surface area of sphere which diameter is $\frac{1}{2}$cm :

(a) 2 ^{2} cm^2 (b) ^{2} cm^2

(c) $\frac{}{4}$ cm^2 (d) $\frac{}{2}$ cm^2

RRB Group-D 26/08/2022 (Shift-III)

Ans. (c) : Given -

d $\frac{1}{2}$cm $\left(\text{where r} \quad \frac{d}{2} \right)$ r $\frac{1}{2 \quad 2}$

surface area of sphere $\cdot 4\pi r^2$

$= 4 \quad \frac{1}{2 \quad 2}^2$

$= 4 \quad \frac{1}{16} = \frac{}{4}$ cm^2

139. The volumes of two spheres are in the ratio 216 : 125. The ratio of their surface areas is :

(a) 25 : 9 (b) 36 : 25

(c) 9 : 4 (d) 16 : 9

RRB Group-D 09/09/2022 (Shift-I)

Ans. (b) : $\frac{\text{Volume of first sphere}}{\text{Volume of second sphere}} \quad \frac{\frac{4}{3} \quad r_1^3}{\frac{4}{3} \quad r_2^3}$

$\frac{r_1^3}{r_2^3} \quad \frac{216}{125}$

$\frac{r_1}{r_2} \quad \frac{6}{5}$

$\frac{\text{Surface area of first sphere}}{\text{Suface are of second sphere}} \quad \frac{4 \quad r_1^2}{4 \quad r_2^2} \quad \frac{r_1}{r_2}^2$

$\frac{6}{5}^2 \quad \frac{36}{25}$

Thus, the ratio both surface area = 36 : 25

140. A hollow spherical sheet is made of a metal of density 6 g/cm^3. its internal and external radii are 8 cm and 9 cm, respectively. What is the weight (in kg) of the shell (take $\pi = \frac{22}{7}$) ?

(a) 5.456 (b) 6.462

(c) 6.642 (d) 4.546

RRB Group-D 08/09/2022 (Shift-I)

Ans. (a) : Given, Density of metal = 6 gm/cm^3

External radius (R) = 9 cm. internal radius (r) = 8 cm.

According to the question

volume of hollow sphere $\frac{4}{3} \quad (9)^3 \quad (8)^3$

$= \frac{4}{3} \times \frac{22}{7} \times (729 - 512)$

$\frac{4}{3} \quad \frac{22}{7} \quad 217 = 909.33$ cm^3.

mass of hollow sphere = volume × density

$= 909.33 \times 6 = 5456$ gm

Weight of hollow sphere = 5.456 kg.

141. Find the volume of a sphere whose diameter is 42m.

(a) 13, 416 m^3 (b) 23, 437 m^3

(c) 38,808 m^3 (d) 42,137 m^3

RRB Group-D 30-08-2022 (Shift-III)

Ans. (c) : Given : Diameter of sphere = 42 m

Radius (r) of sphere = $\frac{42}{2}$ 21 m

Volume of sphere = $\frac{4}{3}$ r^3

$\frac{4}{3} \quad \frac{22}{7} \quad 21 \quad 21 \quad 21$

38808 m^3

142. On melting a solid sphere of radius 12 cm made 27 equal sphere. Find the ratio of surface area of original sphere and the surface area of this kind of made 6 sphere.

(a) 3 : 2 (b) 9 : 4

(c) 9 : 8 (d) 3 : 1

RRB Group-D 06/09/2022 (Shift-I)

Ans. (a) : Volume of solid metallic sphere = volume of 349 equal sphere

$\frac{4}{3} \quad R^3 \quad 27 \frac{4}{3} \quad r^3$

$\frac{12 \quad 12 \quad 12}{27} \quad r^3$

$r = 4$

According to question,

$4 \quad R^2 : 6 \times 4 \quad r^2$

$4 \times 12 \times 12 : 6 \times 4 \times 4 \times 4$

3 : 2

143. How many spherical solid marbles, each having a radius of 0.3 cm, can be made from a solid sphere having a radius of 6 cm?

(a) 7500 (b) 9000
(c) 8000 (d) 8500

RRB Group-D 18/08/2022 (Shift-III)

Ans. (c) : According to the question,

$$\frac{\text{Volume of solid sphere}}{\text{Volume of spherical solid marble}}$$

$$\frac{\frac{4}{3} \quad 6 \quad 6 \quad 6}{\frac{4}{3} \quad 0.3 \quad 0.3 \quad 0.3}$$

$= 2 \times 2 \times 2 \times 1000$

$= 8000$

144. Find the surface area of a sphere of radius 3.5 cm.

(a) 154 cm^2 (b) 210 cm^2
(c) 142 cm^2 (d) 120 cm^2

RRB Group-D 09/09/2022 (Shift-II)

Ans. (a) : ∵Surface area of a sphere= $4\ r^2$

$$4 \quad \frac{22}{7} \quad (3.5)^2$$

$= 154\ cm^2$

145. The total surface area of a solid hemisphere is 42 cm^2. Its radius (in cm) is : Take $\pi = \frac{22}{7}$

(a) $\frac{7\sqrt{2}}{\sqrt{11}}$ (b) $\frac{7\sqrt{3}}{\sqrt{22}}$

(c) $\frac{7}{\sqrt{11}}$ (d) $\frac{7\sqrt{2}}{\sqrt{22}}$

RRB Group-D 13/09/2022 (Shift-III)

Ans. (c) : Given,

Total surface area of hemisphere

$$3\ r^2 = 42$$

$$3 \quad \frac{22}{7} \quad r^2 \quad 42$$

$$r^2 \quad \frac{49}{11}$$

$$r \quad \frac{7}{\sqrt{11}} cm$$

146. The base of a right pyramid is a square with a 16 unit diagonal. It's one slant edge is 17 units. Find its vertical height.

(a) 30 (b) 12
(c) 25 (d) 15

RRB JE - 24/05/2019 (Shift-III)

Ans : (d)

$$h \quad \sqrt{17^2 \quad 8^2}$$

$$h \quad \sqrt{289 \quad 64}$$

$$h \quad \sqrt{225}$$

$h = 15$ unit

147. The base of a triangular prism is a triangle with 8, 15, 17 unit sides and its height is 20 units. Find its total surface area.

(a) 920 (b) 1020
(c) 960 (d) 940

RRB JE - 02/06/2019 (Shift-I)
RRB RPF Constable – 17/01/2019 (Shift-I)

Ans : (a) Given,

Sides of triangular prism is 8, 15, 17 (units)

height (h) = 20 unit

Total surface area = Perimeter of base × Height + 2 × Area of base

$$= (8 + 15 + 17) \times 20 + 2 \times \frac{1}{2} \times 8 \times 15$$

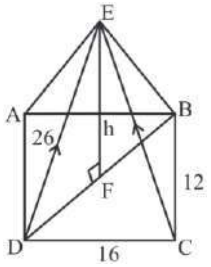
$= 40 \times 20 + 120 = 920$ square units

148. The base of the pyramid is a rectangle whose length and width are 16 cm and 12 cm respectively. If all the lateral edges passing through the top of the right rectangular pyramid are 26 cm in length, find the volume of the pyramid in cubic centimeters.

(a) 1536 (b) 1024
(c) 718 (d) 2072

RRB Group-D – 03/10/2018 (Shift-I)

Ans : (a)



Diagonal of rectangle

$$= \sqrt{16^2 + 12^2} \Rightarrow \sqrt{400} = 20\ cm$$

We draw the perpendicular from the vertex E at the base of the pyramid which is at point F, the height of the pyramid is h and the hypotenuse is 26 cm.

Height $h = \sqrt{26^2 - 10^2} = \sqrt{576} = 24$ cm

Volume of pyramid $\frac{1}{3}$ Area of base height

$$\frac{1}{3} \quad 16 \quad 12 \quad 24$$

$= 1536\ cm^3$

149. Ratio of the sides of the base of a symmetrical triangular prism is 8 : 15 : 17. If the height of the prism is 21 cm and the sum of the area of the lateral surfaces is 840 cm^2, Find the volume of the prism in cubic centimeters.

(a) 1200 (b) 1260
(c) 1280 (d) 1240

RRB Group-D – 12/10/2018 (Shift-II)
RRB Group-D – 01/10/2018 (Shift-II)

Ans : (b) Suppose bases of prism are 8x, 15x and 17x.

Total area of lateral surfaces = 840 cm^2

Lateral surface area = Perimeter of base (right triangular prism) × h

$840 = (8x + 15x + 17x) \times 21$

$840 = 40x \times 21$

$x = \frac{840}{40 \quad 21} = 1$

So sides of triangular prism are 8cm, 15 cm, 17 cm

Triangle (base of prism) is right angled triangle

$(17)^2 = (8)^2 + (15)^2$

$289 = 289$

Volume of prism = Area of base × Height

$= \frac{1}{2} \quad 8 \quad 15 \quad 21 = 60 \times 21 = 1260 \text{ cm}^3$

150. A lawn in the shape of a rectangle has an area of 7260 m^2 and its sides are in the ratio 5 : 3, Its perimeter is equal to the perimeter of a circular garden. What is the area of the circular garden? $\left(\text{Take } \pi = \frac{22}{7} \right)$

(a) 7260 m^2 (b) 9878 m^2

(c) 9856 m^2 (d) 8712 m^2

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (c) : Given,

Let, the sides of rectangular lawn,

$= 5x, 3x$

Area of rectangular lawn = 7260

$5x \times 3x = 7260$

$x^2 = 484$

$x = 22$ m.

Perimeter of rectangular lawn = Circumference of circular garden

$2(5x + 3x) = 2 \quad r$

$2 \times 8 \times 22 = 2 \quad \frac{22}{7} \quad r$

$r = 56$ m.

Area of circular garden = r^2

$= \frac{22}{7} \quad 56 \quad 56 = 9856 \text{ m}^2$

151. The length of each side of a regular hexagon is $2\sqrt{3}$ cm. What is the area of the given hexagon?

(a) 54 cm^2 (b) $18\sqrt{3}$ cm^2

(c) 18 cm^2 (d) $24\sqrt{3}$ cm^2

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (b) : Given,

The length of each side of a regular hexagon = $2\sqrt{3}$ cm.

According to the question,

Area of hexagon = $\frac{3\sqrt{3}a^2}{2}$

$\frac{3\sqrt{3} \quad 2\sqrt{3}^{\ 2}}{2} \quad \frac{3\sqrt{3} \quad 12}{2}$

$= \boxed{18\sqrt{3} \text{ cm}^2}$

152. ABCDEF is a regular hexagon and m ($\overline{BE}$) = 14 cm. What is the perimeter of the hexagon?

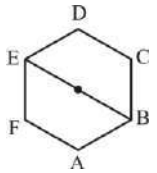
(a) 42 cm (b) 30 cm

(c) 48 cm (d) 36 cm

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (a): Given, hexagon– A B C D E F

m ($\overline{BE}$) = 14 cm



then side $\frac{14}{2}$

$= 7$ cm

Hence, Perimeter of hexagon = 6 × side

$= 6 \times 7 = 42$ cm

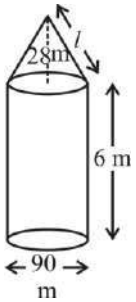
153. A tent is cylindrical upto a height of 6 m and conical above it. The diameter of the base is 90 m and the height of the conical part is 28 m. What is the area (in m^2) of canvas used in making it?

(a) 2925 (b) 2905

(c) 2895 (d) 2940

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (a) :



Diameter (D) = 90 m

Radius (r) = $\frac{90}{2} \quad 45$ m

Slant height of cone (ℓ)^2 = $h^2 + r^2$

$\ell^2 = (45)^2 + (28)^2$

$\ell = \sqrt{2025 \quad 784}$

$\ell = \sqrt{2809} = 53$

Area of canvas used = curved surface area of cylinder + curved surface area of cone

$2 \quad rh + \quad rl$

$= \quad r(2h + l)$

$= \quad \times 45 \times (12 + 53)$

$= \quad \times 45 \times 65 = 2925 \quad m^2$

154. A length of sides of a rectangular field are 77m and 50m. This area is equal area of a circular field. Find the perimeter of circular field (In m) $\left(= \frac{22}{7} \right)$

(a) 110 (b) 220

(c) 165 (d) 330

RRB Group-D 06/09/2022 (Shift-I)

Ans. (b) : According to the question,

Area of rectangular field = Area of circular field

$77 \quad 50 \quad r^2$

$r^2 = \frac{77 \quad 50 \quad 7}{22}$

$r = 35$ m

perimeter, of circular field $= 2 \quad r$

$2 \quad \frac{22}{7} \quad 35 = 220$ m

155. If the perimeter of a square is 44 cm, then find the perimeter of a circle whose radius is equal to the length of a side of the given square.

(a) 22 (b) 11 (c) 12 (d) 21

RRB Group-D 27-09-2022 (Shift-II)

Ans. (a) : Given that

Perimeter of a square $44cm$

Side of a square $\frac{44}{4} \quad 11cm$

According to the question,

Radius of the Circle = length of a side of square

$r \quad 11cm$

Hence the Perimeter of a circle $2 \quad r$

$= 2\pi \times 11$

$= 22\pi$

156. Two regular polygons have the same number of sides. Their lengths are in the ratio 7 : 5 and the area of the larger polygon is 1127 cm^2. Find the area of the smaller polygon.

(a) 565 cm^2 (b) 585 cm^2

(c) 575 cm^2 (d) 550 cm^2

RRB NTPC 14.03.2021 (Shift-I) Stage Ist

Ans. (c) :

$\frac{\text{Area of larger polygon} \quad A_1}{\text{Area of smaller polygon} \quad A_2} \quad \frac{a_1^2}{a_2^2}$

$\frac{1127}{A_2} \quad \frac{7^2}{5^2}$

$A_2 = \frac{1127 \quad 5 \quad 5}{49}$

$A_2 = 23 \times 5 \times 5$

$A_2 = 575\ cm^2$

Hence, Area of smaller polygon = 575 cm^2

157. If the base of a cylinder is the same as that of a cone, and the height of the cylinder is also the same as that of the cone, then find the ratio of the volumes of the cylinder and the cone.

(a) 1 : 3 (b) 2 : 3

(c) 3 : 2 (d) 3 : 1

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (d) : According to the question,

Let, the base of the cylinder and the cone = d

Then, radius = d/2 = r (Let)

And, height = h (Let)

So,

$\frac{\text{Volume of cylinder}}{\text{Volume of cone}} \quad \frac{r^2 h}{\frac{1}{3} \quad r^2 h}$

Hence, required ratio = 3:1

158. A cuboid of 6 cm long, 4 cm width and 4 cm height melted. How many cubes of each 2 cm side can be made?

(a) 14 (b) 16

(c) 12 (d) 18

RRB NTPC 05.04.2021 (Shift-II) Stage Ist

Ans. (c) : Volume of Cuboid = $l \times b \times h$

$= 6 \times 4 \times 4 = 96$

Volume of a cube = $a^3 = 2^3 = 8$

$\text{Then, the number of cubes} = \frac{\text{Volume of cuboid}}{\text{Volume of a cube}}$

$= \frac{96}{8} \quad 12$ cubes

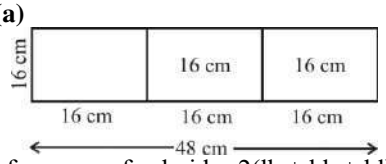
159. 3 cubes each with side 16 cm are joined side by side in a line. Find the surface area of the cuboid so formed.

(a) 3584 cm^2 (b) 3588 cm^2

(c) 3600 cm^2 (d) 3564 cm^2

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (a)



Surface area of cuboid = 2(lb + bh + hl)

$= 2(48 \times 16 + 16 \times 16 + 16 \times 48)$

$= 2(48 \times 16 + 48 \times 16 + 256)$

$= 2(1536 + 256)$

$= 2 \times 1792 = 3584\ cm^2$

160. A sector of a circle has a radius of 18 cm and a central angle of 125º. What will be its approximate perimeter?

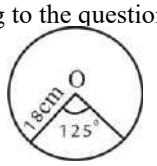
$\left(\text{Use } \pi = \frac{22}{7} \right)$

(a) 75.3 cm (b) 73.85 cm

(c) 74 cm (d) 73 cm

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (a) : According to the question,



Given that,

r = 18cm

Perimeter of sector of a circle = $\frac{}{360} \quad 2 \quad r \quad 2r$

$= \frac{125}{360} \quad 2 \quad \frac{22}{7} \quad 18 \quad 2 \quad 18$

$= \frac{275}{7} \quad 36$

$= \frac{527}{7} \quad 75.28$

75.3cm

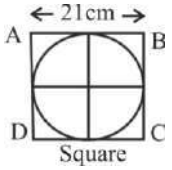
161. The area of the greatest circle that can be inscribed inside a square of side 21 cm is:

(a) 351.5 cm^2 (b) 350.5 cm^2

(c) 346.5 cm^2 (d) 347 cm^2

RRB NTPC 17.01.2021 (Shift-II) Stage Ist

Ans. (c): According to the question,



$\because$ Radius $= \frac{\text{Diameter}}{2} = \frac{\text{Side of square}}{2}$

$= \frac{21}{2} = 10.5$ cm

$\therefore$ Area of circle $= r^2$

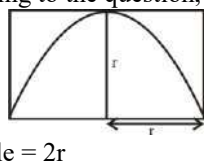
$= \frac{22}{7} \times 10.5 \times 10.5 = 346.5$ cm^2

162. The area of semicircle is 1250 cm^2 inscribed inside a rectangle. The diameter of the semicircle coincides with the length of the rectangle. The area of the rectangle is:

(a) 4000 cm^2 (b) 3000 cm^2
(c) 2000 cm^2 (d) 5000 cm^2

RRB NTPC 13.01.2021 (Shift-I) Stage Ist

Ans. (d) : According to the question,



Length of rectangle = 2r
Width of rectangle = r
Area of rectangle = Length Width
$= 2r \times r$
$= 2r^2$

Again, According to the question, $\frac{r^2}{2}$ 1250

$r^2 = 2500$
$r = 50$
Area of rectangle $= 2r^2 = 2 \times (50)^2 = 5000$ cm^2

163. A few lead spheres of diameter 6 cm are dropped into a cylindrical beaker containing some water such that they are fully submerged. If the diameter of the beaker is 9 cm and the water level has risen by 32 cm, find the number of lead spheres dropped into the beaker.

(a) 16 (b) 14
(c) 18 (d) 15

RRB NTPC 04.01.2021 (Shift-II) Stage Ist

Ans. (c) : Let number of lead spheres is n.

Radius of beaker $= \frac{\text{Diameter}}{2} = \frac{9}{2}$ cm

Radius of each sphere $= \frac{6}{2} = 3$ cm

According to the question

(Volume of Sphere n = The volume of risen water in cylindrical breaker).

$\frac{4}{3} r_1^3 \quad n \quad r_2^2 h$

$\frac{4}{3}\pi(3)^3 \times n = \pi \quad 9/2 \quad ^2 \times 32$

$n \quad \frac{81}{4} \quad 32 \quad \frac{3}{4} \quad \frac{1}{27}$

$n \quad 9 \quad 2$

$\boxed{n \quad 18}$

164. Find the length of the longest pole that can be placed in a room of dimensions 30m × 15m × 10m.

(a) 31 m (b) 35 m
(c) 33 m (d) 18 m

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (b) : Given–
Length of the room (l) = 30 m
Breadth (b) = 15 m
Height (h) = 10 m

Diagonal of room is the length of longest pole

Diagonal $= \sqrt{l^2 \quad b^2 \quad h^2}$

$\sqrt{30^2 \quad 15^2 \quad 10^2}$

$= \sqrt{900 + 225 + 100}$

$\sqrt{1225}$

$= 35$ m

165. The radius of a sphere 'r', is equal to the radius of the base of a right circular cylinder. The total volume of these two solids = $\frac{7}{3}\pi r^3$. If 'h' is the height of the cylinder. Find $\frac{h}{r}$.

(a) 1 (b) 1.5
(c) 3 (d) 2

RRB NTPC 23.07.2021 (Shift-I) Stage Ist

Ans. (a) : Volume of sphere $= \frac{4}{3} r^3$

Volume of cylinder $= r^2 h$

Total volume of both solid $= \frac{7}{3} r^3$

or $\frac{4}{3} r^3 \quad r^2 h \quad \frac{7}{3} r^3$

$\frac{7}{3} r^3 \quad \frac{4}{3} r^3 \quad r^2 h$

$\frac{3}{3} r^3 \quad r^2 h$

$r^3 = r^2 h$

$r = h$

$\frac{h}{r} \quad 1$

or h : r = 1 : 1

05 Algebra

(Quadratic Equations and Arithmetic Progression)

Quadratic Equation

(i) If $ax^2+bx+c=0$
Where, a 0, a, b, c are real numbers.
Then, the given equation is quadratic equation.
If and are the roots of the equation, then,

$$\frac{b \quad \sqrt{b^2 \quad 4ac}}{2a}$$

$$\frac{b \quad \sqrt{b^2 \quad 4ac}}{2a}$$

Where, $b^2 \quad 4ac \quad D$ is discriminant
If D> 0 both roots are real and different
D = 0 both roots are real and same
D< 0 no root will not be real

(ii) Sum of roots $\frac{b}{a} \quad \frac{\text{Multiple of } x}{\text{Multiple of } x^2}$

(iii) Multiplication of roots . $\frac{c}{a} \quad \frac{\text{constant term}}{\text{Multiple of } x^2}$

(iv) When roots are given, then
Quadratic equation,
x^2– (Sum of roots)x+ (Multiplication of roots) = 0

■ **Remainder theorem :–**
"If a polynomial P(x) is divided by a linear factor (x – a), the remainder is equal to P(a)."

Ex. : $P(x)= x^3+2x^2–x+1$ is divided by (x–2)
Remainder, $P(2)= 2^3+2(2)^2–2+1$
$= 8 +2 \quad 4–2+1$
$= 8+8–2+1 = 15$

■ **Factor theorem–**
"If a polynomial P(x) is divided by a linear factor (x – a), the remainder is equal to P(a). "
If P(a) = 0,
then (x – a) is a factor of P(x).

Ex. : $P(x) = x^3+2x^2–x–14$
$P(2) = 2^3+2(2)^2–2–14$
$= 8+8–16$
$= 16–16$
$= 0$
Hence, (x–2) is a factor of polynomial $x^3+2x^2–x–14$

Important Formula

1. (i) $a + b \quad ^2 = a^2 + 2ab + b^2$

$a \quad b \quad ^2 \quad 4ab$

(ii) $a - b \quad ^2 = a^2 - 2ab + b^2$

$a \quad b \quad ^2 \quad 4ab$

(iii) $a + b \quad ^2 + a - b \quad ^2 = 2 \quad a^2 + b^2$

(iv) $a + b \quad ^2 - a - b \quad ^2 = 4ab$

(v) $a^2 - b^2 = a - b \quad a + b$

(vi) $(a+b+c)^2= a^2+b^2+c^2+2ab+2bc+2ca$

(vii) $(a+b+c+d)^2= a^2+b^2+c^2+d^2+2ab+2ac+2ad +2bc+2bd+2cd$

2. (i) $(a+b)^3=a^3+b^3+3ab(a+b)$
(ii) $(a–b)^3=a^3–b^3–3ab(a–b)$
(iii) $a^3+b^3= (a+b)(a^2–ab+b^2)$
(iv) $a^3–b^3= (a–b)(a^2+ab+b^2)$
(v) $a^3+b^3+c^3–3abc= (a+b+c)\ (a^2+b^2+c^2–ab–bc–ca)$

$\frac{1}{2}[(a+b+c)\{(a–b)^2+(b-c)^2+(c–a)^2\}]$

(vi) $(a+b+c)^3–a^3–b^3–c^3=3(a+b)(b+c)(c+a)$

(vii) $x^n \quad y^n = x \quad y \left[x^{n\ 1} \cdot x^{n\ 2}y \ ^1 \ldots\ldots \ ^1 xy^{n\ 2} \ ^1 y^{n\ 1}\right]$

3. Componendo–dividondo

(i) If $\frac{a}{b} \quad \frac{c}{d}$

then, $\frac{a \quad b}{b} \quad \frac{c \quad d}{d}$ (componendo)

and $\frac{a \quad b}{b} \quad \frac{c \quad d}{d}$ (dividendo)

together with,

If $\frac{a}{b} \quad \frac{c}{d}$ then, $\frac{a \quad b}{a \quad b} \quad \frac{c \quad d}{c \quad d}$

and $\frac{a \quad b}{a \quad b} \quad \frac{c \quad d}{c \quad d}$

(ii) If $\frac{a \quad b}{a \quad b} \quad \frac{c}{d}$, then $\frac{a}{b} \quad \frac{c \quad d}{c \quad d}$

4. Ratio - Proportion

(i) $\frac{a}{b} = \frac{c}{d} = \frac{a+c}{b \quad d} = \frac{a-c}{b \quad d} = \frac{\sqrt{ac}}{\sqrt{bd}} = \frac{\sqrt{a^2+c^2}}{\sqrt{b^2 \quad d^2}}$

(ii) $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{a+c-e}{b \quad d \quad f} = \frac{a-c-e}{b \quad d \quad f} = \frac{\sqrt[3]{ace}}{\sqrt[3]{bdf}} = \frac{\sqrt{a^2+c^2+e^2}}{\sqrt{b^2 \quad d^2 \quad f^2}}$

5. Some important cyclic equation :

(i) $a^2 (b–c) = a^2(b–c)+b^2(c–a)+c^2(a–b)$
$= –(a–b)(b–c)(c–a)$

(ii) $a^2(b+c)+b^2(c+a)+c^2(a+b)+2abc= (a+b)(b+c)(c+a)$

(ii) $(a+b+c+) (ab+bc+ca)–abc= (a+b)(b+c)(c+a)$

Series

(i) Arithmetic Progression:

a, a+d, a+2d, a+3d.....n^{th} term
Where, a = first term, d = difference

n^{th} term $(T_n) \quad a \quad n \quad 1 \quad d$

[Where $T_n= l$ (last term)]

sum of n terms $(S_n) \quad \frac{n}{2}[2a \quad n \quad 1 \quad d$

$S_n \quad \frac{n}{2} \quad a \quad l$

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. The first and last terms of an A.P. are 28 and 31. If the sum of its terms is 236, then the number of terms will be?

(a) 11 (b) 6
(c) 5 (d) 8

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (d) : Given that- $a = 28, l = 31, S = 236$

$\because \quad S = \frac{n}{2}(a + l)$

According to question, $236 = \frac{n}{2}(28 + 31)$

$$n = \frac{2 \times 236}{59} = 8$$

Hence, the number of terms (n) = 8

2. The product of two consecutive positive integers is 277. If the smaller of these two integers is represented by x, which of the options below will correspond to the equation for finding out the value of x?

(a) $x^2 - x + 277 = 0$ (b) $x^2 + x - 277 = 0$
(c) $x^2 + x + 277 = 0$ (d) $x^2 - x - 277 = 0$

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (b) : Let the two consecutive numbers be x, (x + 1) respectively,

According to question

$x(x + 1) = 277$

$x^2 + x = 277$

$x^2 + x - 277 = 0$

Hence, option (b) is correct.

3. If 16^{th} and 20^{th} terms of an A.P. be 385 and 441 respectively, then its 90^{th} term is :

(a) 1421 (b) 1423
(c) 1420 (d) 1419

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) : n^{th} terms in A.P.

$a_n = a + (n-1)d$

$a_{16} = a + (16-1)d = 385$

$a + 15d = 385 \quad \ldots (i)$

$a_{20} = a + (20-1)d = 441$

$a + 19d = 441 \quad \ldots (ii)$

Solving equation (i) and equation (ii)

$a = 175, d = 14$

Then $a_{90} = a + (90-1)d$

$= 175 + 89 \times 14$

$= 175 + 1246$

$a_{90} = 1421$

Hence, 90^{th} term 1421

4. The quadratic equation whose roots are 9 and 11 is :

(a) $x^2 + 20x - 99 = 0$ (b) $x^2 + 20x + 100 = 0$
(c) $x^2 - 20x + 98 = 0$ (d) $x^2 - 20x + 99 = 0$

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (d) : If and are two roots,

Then the quadratic equation- $x^2 - x + 0$

According to question, $x^2 - (9 + 11)x + 9 \times 11 = 0$

$x^2 - 20x + 99 = 0$

5. The product of (x - 9) and (x + 8) is :

(a) $x^2 + x + 72$ (b) $x^2 - x - 72$
(c) $x^2 + 72$ (d) $x^2 + 2x - 72$

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (b) : Given that,

$(x - 9)(x + 8)$

$= (x-9) \times (x+8) = x^2 + 8x - 9x - 72 = x^2 - x - 72$

The product of (x–9) and (x +8) is $x^2 - x - 72$

6. If 15^{th} and 28^{th} terms of an A.P. be 208 and 416 respectively, then its 49^{th} term is :

(a) 752 (b) 755
(c) 751 (d) 749

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (a) : Given that,

$T_{15} = 208$

$T_{28} = 416$

We know that;

$T_n = a + (n-1)d$

$T_{15} = a + (15-1)d$

$T_{15} = a + 14d = 208$

$a + 14d = 208 \quad \ldots (i)$

$T_{28} = a + (28-1)d$

$T_{28} = a + 27d = 416$

$a + 27d = 416 \quad \ldots (ii)$

equation (i) subtract from equation (ii)

$13d = 208$

$d = \frac{208}{13} = 16$

Value of d put in equation (i)

$a = 208 - 14 \times 16$

$a = 208 - 224$

$a = -16$

$T_{49} = a + 48d$

$= -16 + 48 \times 16$

$= -16 + 768$

$T_{49} = 752$

7. The first and last terms of an A.P. are 20 and 55. If the sum of its terms is 600, then the number of terms will be?

(a) 15 (b) 16
(c) 17 (d) 14

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (b) : Given that,
First term (a) = 20
Last term (l) = 55
Sum of term (S_n) = 600

$\because$ Sum of terms $(S_n) = \frac{n}{2}(a + l)$

$$600 = \frac{n}{2}(20 + 55)$$
$$1200 = n(75)$$
$$n = \frac{1200}{75}$$
$$n = 16$$

So the number of term will be 16

8. If 8^{th} and 12^{th} terms of an A.P. be 82 and 478 respectively, then its 50^{th} term is :
(a) 4241 (b) 4240
(c) 4242 (d) 4238

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (b) : Let us consider first term of A.P is a and common difference is d
According to question
$T_8 = a + 7d = 82$ ..... (i)
$T_{12} = a + 11d = 478$ ..... (ii)
From equation (i) and (ii)
a = –611, d = 99
Hence,
$T_{50} = a + 49d$
$= -611 + 49 \times 99$
$= -611 + 4851$
$= 4240$

9. The value of the discriminant of the quadratic equation $7x^2 - 18x - 11 = 0$ is :
(a) 616 (b) 619
(c) 638 (d) 632

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : Given,
Quadratic equation $ax^2 + bx + c = 0$
discriminant $D = b^2 - 4ac$
From equation $7x^2 - 18x - 11 = 0$
$a = 7, \quad b = -18, \quad c = -11$
discriminant $D = b^2 - 4ac$
$= (-18)^2 - 4 \times 7 \times (-11)$
$324 + 308$
632

10. The first and last terms of an A.P. are 36 and 46. If the sum of its terms is 574, then the number of terms will be?
(a) 15 (b) 17
(c) 16 (d) 14

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : Given that,
First term of A.P. (a) = 36
Last term (l) = 46
Sum of terms (s) = 574
(s) $\frac{n}{2}(a + l)$
$574 = \frac{n}{2}(36 + 46)$
$574 = 41n$
$n = 14$
So, Number of terms (n) = 14

11. If the sum and product of the roots of a quadratic equation are $\frac{11}{2}$ and $\frac{15}{2}$, respectively, then the equation whose roots are double the roots of the given equation is :
(a) $x^2 + 11x - 30 = 0$ (b) $x^2 - 11x - 30 = 0$
(c) $x^2 + 11x + 30 = 0$ (d) $x^2 - 11x + 30 = 0$

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : Let and are the roots of a quadratic equation.
According to the question,
In Ist condition
Sum of the roots $\frac{11}{2}$,
Product of the roots $\frac{15}{2}$
In 2nd condition
Sum of the roots $2(\ ) + 2(\ ) = \frac{11}{2} \times 2 = 11$
Product of the roots $4(\ ) = \frac{15}{2} \times 4 = 30$
Equation $x^2 -$ (Sum of roots) $x +$ Product of roots $= 0$
$x^2 - 11x + 30 = 0$

12. If 23rd and 24th terms of an A.P. be 42 and 312 respectively, then its 37th term is :
(a) 3822 (b) 3820
(c) 3821 (d) 3823

RRB Technician Gr.I Signal 20.12.2024, Shift-I

Ans. (a) : The n^{th} term in AP-
$a_n = a + (n - 1)d$
According to question-
$a_{23} = a + (23 - 1)d = 42$
$a + 22d = 42$ ... (I)
$a_{24} = a + (24 - 1)d = 312$
$a + 23d = 312$ ... (II)
Solving equation (I) and (II)
a = –5898, d = 270
$a_{37} = a + (37 - 1)d$
$a_{37} = -5898 + 36 \times 270$
$a_{37} = 3822$

13. The first and last terms of an A.P. are 18 and 48. If the sum of its terms is 396, then the number of terms will be?
(a) 10 (b) 9
(c) 15 (d) 12

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (d) : $S = \frac{n}{2}(a + l)$

Where, S Sum of terms

a First terms

l Last terms

n number of terms

According to question,

$$396 = \frac{n}{2}(18 + 48)$$

$$n = \frac{396 \times 2}{66}$$

$n = 12$

14. The minimum value of $8x + 14 + 3x^2$ is:

(a) $-8\frac{2}{3}$ (b) $8\frac{2}{3}$

(c) $-\frac{28}{3}$ (d) $\frac{28}{3}$

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (b)

For minimum value $\frac{4ac - b^2}{4a}$

$$\frac{4 \times 3 \times 14 - 8^2}{4 \times 3}$$

$$\frac{168 - 64}{12}$$

$$\frac{104}{12} = \frac{26}{3} = 8\frac{2}{3}$$

15. If α and β are the roots of the equation $x^2 - 11x + 24 = 0$, then what is the value of $(\alpha^2 + \beta^2)$?

(a) 80 (b) 64 (c) 73 (d) 75

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (c) : Equation, $x^2 - 11x + 24 = 0$

Sum of roots $= \alpha + \beta = \frac{b}{a} = 11$

Product of roots $= \frac{c}{a} = 24$

$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2 \times \alpha\beta$$

$$= 11^2 - 2 \times 24 = 121 - 48 = 73$$

Hence, $\alpha^2 + \beta^2 = 73$

16. The factorization of $x^2 + 11xy + 24y^2$ is :

(a) (x – 8y) (x – 3y) (b) (x + 8y) (x – 3y)

(c) (x + 8y) (x + 3y) (d) (x - 8y) (x + 3y)

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (c) $x^2 + 11xy + 24y^2$

$x^2 + 8xy + 3xy + 24y^2$

$x(x + 8y) + 3y(x + 8y)$

$(x + 8y)(x + 3y)$

17. If (x + 1) and (x + 2) are factors of $ax^3 + 3x^2 + bx$ then the values of a and b are-

(a) a = 2 and b = 3 (b) a = 3 and b = 2

(c) a = 2 and b = 1 (d) a = 1 and b = 2

RRB NTPC 03.03.2021 (Shift-II) Stage Ist

Ans. (d) : Given Expression

$$ax^3 + 3x^2 + bx = 0 \quad ...(i)$$

$\because$ (x + 1) is factor of given expression then x + 1 = 0

Putting x = –1 in equation (i)

$-a + 3 - b = 0 \quad a + b = 3 ...(ii)$

And, (x + 2) = 0

{$\because$ (x+2), is factor of expression}

Putting x = –2 in equation (i),

$-8a + 12 - 2b = 0 \quad 4a + b = 6 \quad ...(iii)$

From equation (iii) and (ii)

a =1

Putting the value of a in equation (ii)

$1 + b = 3 \quad b = 3 - 1$

$b = 2$

18. If $(2x-1)$ is a factor of $2x^4 - 7x^3 + x + k = 0$, then find the value of 'k'.

(a) $\frac{1}{4}$ (b) $\frac{5}{12}$

(c) 0 (d) $\frac{1}{4}$

RRB NTPC 09.01.2021 (Shift-II) Stage Ist

Ans. (a) : According to the question-

$$2x^4 - 7x^3 + x + k = 0 \quad \text{... (1)}$$

$\because$ Equation (1) is divisible by (2x – 1)

Hence, $2x - 1 = 0 \quad x = \frac{1}{2}$

On putting the value of x in equation .....(i)

$$2 \times \left(\frac{1}{2}\right)^4 - 7 \times \left(\frac{1}{2}\right)^3 + \frac{1}{2} + k = 0$$

$$\frac{1}{8} - \frac{7}{8} \quad \frac{1}{2} \quad k \quad 0$$

$$-\frac{2}{8} \quad -k$$

$$\boxed{k \quad \frac{1}{4}}$$

19. If $x^2 - 1$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e$, then which of the following is a possible relation between the coefficients of powers of x.

(a) b + c + d = a + e (b) a + b + c = d + e

(c) a + b + e = c + d (d) a + c + e = b + d

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (d) : $x^2 - 1$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e = 0$

On putting the value of x = –1

$a(-1)^4 + b(-1)^3 + c(-1)^2 + d(-1) + e = 0$

$a - b + c - d + e = 0$

$\boxed{a \quad c \quad e \quad b \quad d}$

20. Which of the following is a factor of the polynomial $x^2 - x - 20$?

(a) x - 4 (b) x - 5

(c) x + 2 (d) x + 5

RRB NTPC 05.02.2021 (Shift-I) Stage Ist

Ans. (b) Given,

$x^2 - x - 20$

$= x^2 - 5x + 4x - 20$

$= x(x - 5) + 4(x - 5)$

$= (x-5)(x+4)$

Hence $(x-5)$ is a factor of given polynomial.

21. Factors of $x^2 + 7x + 10$ are.

(a) $(x - 5)(x - 2)$ (b) $(x + 5)(x + 2)$

(c) $(x - 5)(x + 2)$ (d) $(x - 4)(x + 2)$

RRB RPF SI – 12/01/2019 (Shift-II)

Ans : (b) Factor of $x^2 + 7x + 10$

$= x^2 + 5x + 2x + 10$

$= x(x+5) + 2(x+5)$

$= (x+5)(x+2)$

22. If $(4y - 1)$ and $(y + 4)$ both are factors of $py^2 + 15y - q$ then:

(a) $p = 4q$ (b) $p = \frac{q}{4}$

(c) $p = q$ (d) $p = -q$

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (c) : Given-

$(4y-1)$ and $(y+4)$ both the factors of $py^2+15y-q$.

$4y - 1 = 0$ $y + 4 = 0$

$4y = 1$ $y = -4$

$y = \frac{1}{4}$

On putting $y = \frac{1}{4}$ in the expression

$p \times \left(\frac{1}{4}\right)^2 + 15 \times \frac{1}{4} - q = 0$

$\frac{p}{16} + \frac{15}{4} - q = 0$

$\frac{p + 60 - 16q}{16} = 0$

$16q - p = 60$ ……(i)

On putting $y = -4$ in the expression

$p \times (-4)^2 + 15 \times (-4) - q = 0$

$16p - 60 - q = 0$

$16p - q = 60$ .....(ii)

From equation (i) and (ii)

$16q - p = 16p - q$

$17q = 17p$

$q = p$

Hence option (c) is true.

23. If $(x^4 - 2x^3 + 3x^2 - x + k)$ is a multiple of $x - 3$ then value of k is

(a) 51 (b) –51

(c) 165 (d) –165

RRB NTPC 10.01.2021 (Shift-I) Stage Ist

Ans. (b) : $x^4 - 2x^3 + 3x^2 - x + k$,

$(x - 3)$ is a factor of the given expression,

On putting, $x = 3$

$3^4 - 2 \times 3^3 + 3(3)^2 - 3 + k = 0$

$81 - 54 + 27 - 3 + k = 0$

$51 + k = 0$

$k = -51$

24. Find the factors of $(x^2 + x - 42)$

(a) $(x+14)(x-3)$ (b) $(x+6)(x-7)$

(c) $(x-6)(x+7)$ (d) $(x-14)(x+3)$

RRB NTPC 30.03.2016 Shift : 1

Ans : (c) $x^2 + x - 42$

$= x^2 + 7x - 6x - 42$

$= x(x + 7) - 6(x+7)$

$= (x-6)(x+7)$

25. $x^3+5x^2-2x-24$ has a zero x=2. Find the other zero.

(a) –3, 5 (b) –2, 3

(c) –3, –4 (d) 3, 4

RRB JE - 24/05/2019 (Shift-III)

Ans : (c) $(x-2)$ is a factor of $x^3 + 5x^2 - 2x - 24$

$x^2(x - 2) + 7x^2 - 2x - 24 = 0$

$x^2(x - 2) + 7x(x - 2) + 12x - 24 = 0$

$x^2(x - 2) + 7x(x - 2) + 12(x - 2) = 0$

$(x^2 + 7x + 12)(x - 2) = 0$

$(x + 4)(x + 3)(x - 2) = 0$

$x = -4, -3, 2$

26. If $(x - 1)$ and $(x + 3)$, is factor of $x^2 + ax + b$, then find the value of 'a' and 'b' respectively.

(a) 2, 3 (b) 2, – 3

(c) –2, –3 (d) –2, 3

RRB JE - 25/05/2019 (Shift-I)

Ans. (b) Equation x^2+ax+b has a factor of $(x-1)$ and $(x+3)$

$(x - 1)(x + 3) = x^2 + ax + b$

$x^2 + 3x - x - 3 = x^2 + ax + b$

$x^2 + 2x - 3 = x^2 + ax + b$

On comparing of both sides

$a = 2$ $b = -3$

27. What is the square root of $(x^2+4x+4)(x^2+6x+9)$

(a) $(2x + 3)(x + 3)$ (b) $(x + 2)(x+3)$

(c) $(x + 2)(2x + 3)$ (d) $(x+2)(x+4)$

RRB Group-D – 31/10/2018 (Shift-II)

Ans : (b) $(x^2 + 4x + 4)(x^2 + 6x + 9)$

On comparing with $(a^2 + 2ba + b^2)(a^2 + 2.a.b + b^2)$

$(a+b)^2 (a+b)^2$

$\{(x^2 + 2.2x + (2)^2\}\ \{(x^2 + 2.3.x + (3)^2\}$

$(x+2)^2 (x+3)^2$

Square root = $x + 2 \quad x + 3$

28. Select the correct factor of $f(x) = 2x^2 - 5x + 2$

(a) $x - 2$ (b) $x - 3$

(c) $x - 4$ (d) $x - 5$

RRB RPF Constable – 20/01/2019 (Shift-III)

Ans : (a) $f(x) = 2x^2 - 5x + 2$

$= 2x^2 - 4x - x + 2$

$= 2x(x - 2) - 1(x - 2)$

$= (2x - 1)(x - 2)$

29. Factors of $x^2 - 8x + 12$

(a) $(x - 6)(x - 2)$ (b) $(x - 6)(x + 2)$

(c) $(x - 4)^2$ (d) $(x + 6)(x - 2)$

RRB NTPC 27.04.2016 Shift : 1

Ans : (a) $x^2 - 8x + 12$

$= x^2 - 6x - 2x + 12$

$= x(x - 6) - 2(x - 6)$

$= (x - 6)(x - 2)$

30. If the factor of $3x^4 - (a + 2)x^3 - x^2 - 4$ is $(x-2)$, then find the value of 'a'

(a) 5 (b) -1

(c) 3 (d) 4

RRB NTPC 22.04.2016 Shift : 1

Ans : (c) Given -

Factor of $3x^4 - (a + 2)x^3 - x^2 - 4 = (x - 2)$

$\because x - 2$, is a factor

$x - 2 = 0 \quad x = 2$

$\Rightarrow 3 \times (2)^4 - (a + 2) \times (2)^3 - (2)^2 - 4 = 0$

$\Rightarrow 3 \times 16 - (a + 2) \times 8 - 4 - 4 = 0$

$\Rightarrow 48 - 8a - 16 - 8 = 0$

$24 - 8a = 0$

$8a = 24$

$a = \frac{24}{8}$

$\boxed{a = 3}$

31. Factors of $x^2 - 6x + 8$

(a) $(x - 4)(x - 2)$ (b) $(x + 4)(x + 2)$

(c) $(x + 8)(x - 2)$ (d) $(x - 4)(x + 2)$

RRB NTPC 29.04.2016 Shift : 2

Ans : (a) Given expression $x^2 - 6x + 8$

$= x^2 - 4x - 2x + 8$

$= x(x-4) - 2(x-4)$

$= (x-4)(x-2)$

32. Factors of $x^2 + 6x + 8$

(a) $(x + 4)(x + 2)$ (b) $(x - 4)(x + 2)$

(c) $(x -)2$ (d) $(x - 4)(x - 2)$

RRB NTPC 30.04.2016 Shift : 2

Ans : (a) $x^2 + 6x + 8$

$= x^2 + 4x + 2x + 8$

$= x(x + 4) + 2(x + 4)$

$= (x + 4)(x + 2)$

33. What is the sum of the first 25 odd numbers?

(a) 150 (b) 625

(c) 250 (d) 144

RRB NTPC 23.02.2021 (Shift-I) Stage Ist

Ans. (b) : The first 25 odd numbers will be 1,3,5,7,9.....49 respectively which are in the arithmetic progression.

Where first term (a) = 1

and common difference (d) = 3 – 1 = 2

And number of terms (n) = 25

So, sum of n numbers of term in arithmetic progression

$$S_n = \frac{n}{2}[2a \quad (n \quad 1)d]$$

$$= \frac{25}{2}[2 \quad 1 \quad (25 \quad 1) \quad 2]$$

$$= \frac{25}{2}[2 \quad 24 \quad 2]$$

$$= \frac{25}{2} \quad 2 \quad 48$$

$$= \frac{25 \quad 50}{2}$$

$= 25 \times 25 = 625$

Hence, sum of the first 25 odd number = 625

34. How many numbers are there between 1000 and 3000 that are completely divisible by 7 ?

(a) 281 (b) 284

(c) 286 (d) 283

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (c) : Numbers divisible by 7 between 1000 and 3000

1001, 1008 ..... 2996.

$\because \ l = a + (n - 1)d$

Where, l = Last term

a = First term, d = Common difference

n = Number of terms

$2996 = 1001 + (n - 1) \times d$

$1995 = (n - 1) \times 7$

$(n - 1) = 285$

$n = 286$

35. $\left(1 - \frac{1}{n}\right) + \left(1 - \frac{2}{n}\right) + \left(1 - \frac{3}{n}\right) +$ .....up to n terms will result as:

(a) $\frac{1}{2n}$ (b) $\frac{1}{2n - 1}$

(c) $\frac{1}{n^2}$ (d) $\frac{n - 1}{2}$

RRB NTPC 10.01.2021 (Shift-II) Stage Ist

Ans. (d) : $\left(1 - \frac{1}{n}\right) + \left(1 - \frac{2}{n}\right) + \left(1 - \frac{3}{n}\right) +$ .....up to n terms

$= 1 + 1 + 1 \ldots . n \text{ term} - \left(\frac{1}{n} + \frac{2}{n} + \frac{3}{n} \ldots\ldots \frac{n}{n}\right)$

$= n - \left(\frac{1}{n} \quad \frac{2}{n} \quad \frac{3}{n} \ldots\ldots \frac{n}{n}\right)$

Where $\left(\frac{1}{n} \quad \frac{2}{n} \quad \frac{3}{n} \ldots\ldots \frac{n}{n}\right)$ is A.P.

So, difference $= \frac{2}{n} - \frac{1}{n} \quad \frac{1}{n}$

We know that,

Sum of n terms in A.P. $(S_n) = \frac{n}{2}\left[2a \quad n-1 \quad d\right]$

$$= n - \left[\frac{n}{2}\left\{2 \quad \left(\frac{1}{n}\right) \quad n-1 \quad \left(\frac{1}{n}\right)\right\}\right]$$

$$= n \quad \left[\frac{n}{2}\left\{\frac{2}{n} \quad \frac{n \quad 1}{n}\right\}\right]$$

$$= n \quad \left\{1 \quad \frac{n}{2} \quad \frac{n \quad 1}{n}\right\}$$

$$= n - \frac{n \quad 1}{2} = \frac{n-1}{2}$$

36. What is the value of k in the following Arithmetic progression?
15+13+11+9+…….+k = –105

(a) 7 (b) –21
(c) –5 (d) –25

RRB NTPC 08.04.2021 (Shift-II) Stage Ist

Ans. (d) : 15 + 13 + 11 + 9 + --------+ k = –105

We know that sum of n terms

$S_n \quad \frac{n}{2}\left[2a \quad n-1 \quad d\right]$

n = No. of terms, a = First number,

d = Common difference

$-105 = \frac{n}{2}\left[2 \times 15 + \quad n-1 \quad \times -2\right]$

$-210 - n \quad 30 - 2n + 2$

$32n - 2n^2 \quad -210$

$2n^2 - 32n - 210 \quad 0$

$n^2 - 16n - 105 \quad 0$

$n^2 - 21n + 5n - 105 \quad 0$

n (n–21) + 5(n–21) = 0

(n + 5) (n–21) = 0

n = –5, n = 21

$\because a_n = a_1 + (n-1)\,d$

On putting, n = 21

k = 15+(21–1) –2

k = 15–40

k = –25

37. The sum of all odd numbers between 0 and 52 is:

(a) 729 (b) 576
(c) 676 (d) 625

RRB NTPC 01.03.2021 (Shift-I) Stage Ist

Ans. (c) : Total odd numbers between 0 and 52

= 1, 3, 5, 7, 9, 11, ..., 51

No. of terms (n) = 26

First term (a) = 1

Last term (ℓ) = 51

$$\text{Sum of n terms} = \frac{n}{2}(a + \ell)$$

$$= \frac{26}{2}(51 + 1)$$

$$= 13 \quad 52 = 676$$

38. The sum of the first 20 terms of the series $\frac{1}{5\times6} + \frac{1}{6\times7} + \frac{1}{7\times8} + \ldots\ldots$ is :

(a) 0.16 (b) 16
(c) 1.6 (d) 0.016

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (a) : Number of terms $= \frac{\text{Last term} \quad \text{First term}}{\text{Difference}}$

$20 \quad \frac{\text{Last term} - 5}{1}$

Last term = 25

First term = 5

Sum of 20 terms $= \frac{1}{\text{difference}}\left[\frac{1}{\text{first term}} \quad \frac{1}{\text{last term}}\right]$

$\frac{1}{1}\ \frac{1}{5} - \frac{1}{25} \quad \frac{5-1}{25} \quad \frac{4}{25}$

$\boxed{0.16}$

39. What is the 50th term of arithmetic progression 3, 8, 13, 18, 23, ...?

(a) 150 (b) 248
(c) 267 (d) 345

RRB NTPC 01.02.2021 (Shift-I) Stage Ist

Ans. (b) : 3, 8, 13, 18, 23, ...50^{th} term

a = 3 d = 8 – 3 = 5 n = 50

Formula : $T_n = a + (n-1)d$

$= 3 + (50-1) \times 5$

$= 3 + 245$

$= 248$

40. Find the ninth term of an arithmetic progression whose first term is 5 and the common difference is 4.

(a) 41 (b) 37
(c) 35 (d) 39

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (b) : Given that-

n = 9

First term (a) = 5

Difference (d) = 4

$T_n = a + (n-1)\,d$

$T_9 = 5 + (9-1) \quad 4$

$T_9 = 5 + 8 \quad 4$

$T_9 = 37$

41. Find the sum of the all even natural number less than 85.

(a) 4700 (b) 840
(c) 1806 (d) 1408

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (c) : Even natural numbers smaller than 85 are.
2, 4, 6, 8, 10, ...80, 82, 84

$$n = \frac{l - a}{d} \quad 1$$

(Where l - Last term, a - First term,
d - Common difference)

$$= \frac{84 - 2}{2} \quad 1$$

$$\boxed{n = 42}$$

Sum of even natural number $= n(n + 1)$
$= 42(42 + 1)$
$= 1806$

42. The 10th term, of the Arithmetic Progression 2, 7, 12, ... is:

(a) 27 (b) 37
(c) 47 (d) 57

RRB NTPC 29.01.2021 (Shift-I) Stage Ist

Ans. (c) : Given that,
Arithmetic progression 2, 7, 12 ..... n
First term (a) = 2
Number of terms (n) = 10
Common difference (d) = $T_2 - T_1 = 7 - 2 = 5$
By the formula we know,
$T_n = a + (n - 1)d$
$T_{10} = 2 + (10 - 1)5$
$= 2 + 45$
$= 47$

43. If the ratio of the 11th term of an AP to its 18th term is 2 : 3. Find the ratio of the sum of its first five terms to the sum of its first 10 terms.

(a) 1 : 2 (b) 5 : 4
(c) 6 : 17 (d) 17 : 6

RRB NTPC 12.01.2021 (Shift-II) Stage Ist

Ans. (c) : Let the first term of A.P. is a and common difference is d.

n^{th} term $(a_n) = a + (n - 1).d$

$$\frac{a_{11}}{a_{18}} \quad \frac{a \quad 10d}{a \quad 17d} = \frac{2}{3}$$

$3a + 30d = 2a + 34d$
$a = 4d$

$\because S_n = \frac{n}{2}[2a + (n - 1).d]$

$$\frac{S_5}{S_{10}} = \frac{\frac{5}{2}[2a \quad 4d]}{\frac{10}{2}[2a \quad 9d]}$$

$$= \frac{8d \quad 4d}{2[8d \quad 9d]} \qquad [\because a = 4d]$$

$$= \frac{6d}{17d} = 6 : 17$$

44. Subtract, the sum of (2x - 3y +7z) and (4z - 5x) from (12x - Z) :

(a) 3x + 3y – 3z (b) 4x + 7y
(c) 1x + 12y – 12z (d) 15x + 3y – 12z

RRB Group-D 29/08/2022 (Shift-I)

Ans. (d) : From the question,
$(12x - z) - \{(2x - 3y + 7z) + (4z - 5x)\}$
$= 12x - z + 3x + 3y - 11z$
$= 15x + 3y - 12z$

45. If x + y = 8 product of x and y is, 15 then find the value of $x^4 + y^4$:

(a) 606 (b) 806
(c) 906 (d) 706

RRB Group-D 08/09/2022 (Shift-III)

Ans. (d) : Given,
$x + y = 8$ .....(i)
$xy = 15$ .....(ii)
From the eq. (i)
$(x + y)^2 = 8^2$
$x^2 + y^2 + 2xy = 64$
$x^2 + y^2 + 2 \times 15 = 64 \qquad \because xy \quad 15$
$(x^2 + y^2) = 34$
$(x^2 + y^2)^2 = (34)^2$
$x^4 + y^4 + 2x^2y^2 = 1156$
$x^4 + y^4 = 1156 - 2 \times (15)^2$
$x^4 + y^4 = 706$

46. If $x = 2 + \sqrt{5}$ and $y = 2 - \sqrt{5}$ then find the value of $x^2 + y^2$.

(a) 18 (b) 20
(c) 16 (d) 22

RRB Group-D 26/08/2022 (Shift-III)

Ans. (a) : Given,
$x = 2 \quad \sqrt{5}$
$y = 2 \quad \sqrt{5}$
According to the question,

$$x^2 + y^2 = \left(2 + \sqrt{5}\right)^2 + \left(2 - \sqrt{5}\right)^2$$

$= 4 + 5 + 4\sqrt{5} + 4 + 5 - 4\sqrt{5}$
$= 9 + 9 = 18$

47. For what value of K such that the equations 2x+3y+11 = 0 and 6x+ky+33 = 0 represent coincident lines.

(a) 6 (b) 9
(c) 12 (d) 5

RRB NTPC 11.01.2021 (Shift-I) Stage Ist

Ans. (b) : $2x + 3y + 11 = 0$ ..... (i)

$6x + ky + 33 = 0$ ..... (ii)

On multiplying by 3 in equation (i)-

$6x + 9y + 33 = 0$ ..... (iii)

From equation (iii) – equation (ii),

$9y - ky = 0$

$ky = 9y$

$k = 9$

48. If there is no solution of the equation 4x+3y+5 = 0 and 6x–ky–7= 0, then the value of k will be-

(a) – 4. 5 (b) – 8

(c) 8 (d) 4.5

RRB RPF SI – 12/01/2019 (Shift-III)

Ans : (a)

Given equation is $4x+3y+5=0$ and $6x-ky-7=0$

$a_1x+b_1y+c_1= 0$ and $a_2x+b_2y+c_2=0$ if–

$$\frac{a_1}{a_2} - \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{4}{6} - \frac{3}{k} \neq \frac{5}{7}$$

$$\Rightarrow \frac{4}{6} = \frac{3}{k} \Rightarrow -4k = 6 \times 3$$

$$k \quad \frac{18}{4}$$

$$\boxed{k \quad 4.5}$$

49. Find the value of x and y by solving the following equations: 9x + 3y + 12 = 0; 18x + 6y + 24 = 0

(a) x = 4; y = – 16

(b) x = 2; y = 10

(c) x = 1; y = 7

(d) not unique solution but infinite solution

RRB JE - 25/05/2019 (Shift-II)

Ans : (d) $9x + 3y + 12 = 0$

On comparing from equation $a_1x + b_1y + c_1 = 0$

$a_1 = 9, b_1 = 3, c_1 = 12$

$18x + 6y + 24 = 0$

On comparing from equation $a_2x + b_2y + c_2 = 0$

$a_2 = 18, b_2 = 6, c_2 = 24$

$$\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$$

$$\frac{9}{18} \quad \frac{3}{6} \quad \frac{12}{24}$$

$$\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$$

So no unique solution but infinite solutions.

50. For which value of p, will have only one solution of the following equation.

2x + 3y = –5 and 2x + py = 2

(a) 3 is the only one solution of p

(b) p has many solution

(c) p has other solution except 3

(d) 2 is the only one solution of p

RRB RPF Constable – 17/01/2019 (Shift-I)

Ans : **(c)** For unique solution

$$\frac{a_1}{a_2} \quad \frac{b_1}{b_2}$$

$$\frac{2}{2} \quad \frac{3}{p}$$

$p \quad 3$

Hence p has any solution except 3

51. If there is no solution of the equations 14x + 8y + 5 = 0 and 21x – ky – 7 = 0 is possible, then the value of k will be:

(a) -16 (b) 12

(c) 8 (d) -12

RRB Group-D – 23/09/2018 (Shift-I)

Ans : (d) $14x + 8y + 5 = 0$ — (1)

$21x - ky - 7 = 0$ — (2)

No solution of equation (1) and (2) will be possible if–

$$\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$$

$$\frac{14}{21} \quad \frac{8}{k}$$

$$\frac{2}{3} \quad \frac{8}{k} \qquad \boxed{k \quad 12}$$

Hence no solution is possible for the value of k = –12.

52. What is the value of k for which the equation 16x – 12y + 9 = 0 and 12x + ky – 11 = 0 has no solution

(a) –16 (b) 16

(c) –9 (d) 9

RRB Group-D – 04/12/2018 (Shift-III)

Ans. (c) When there is no solution–

$$\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$$

Equation $16x - 12y + 9 = 0$ ...(i)

$12x + ky - 11 = 0$ ...(ii)

From equation (i) and (ii) when there is no solution on comparison then,

$$\frac{16}{12} \quad \frac{12}{k} \quad \frac{9}{11}$$

$$\frac{16}{12} \quad \frac{12}{k}$$

$16k = -144$

$$k \quad \frac{144}{16}$$

$k = -9$

53. If there is no solution of 20x + 5y + 11 = 0 and 50x – ky – 9 = 0, then find the value of k.

(a) 12.5 (b) -12.5

(c) 18 (d) -18

RRB Group-D – 10/12/2018 (Shift-I)

Ans. (b) :
$20x + 5y + 11 = 0$ .....(i)
$50x - ky - 9 = 0$ .....(ii)
$a_1 = 20$ $b_1 = 5$ $c_1 = 11$
$a_2 = 50$ $b_2 = -k$ $c_2 = -9$
Two linear equation have no solution if

$$\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$$

So taking $\frac{a_1}{a_2} \quad \frac{b_1}{b_2}$

$$\frac{20}{50} \quad \frac{5}{k}$$

$$k \quad \frac{0 \quad 5}{20} = -12.5$$

54. If no solution of the equations 4x + 3y + 5 = 0 and 10x–ky–7= 0 is possible, then what will be the value of k?
(a) -8 (b) 7.5
(c) 8 (d) -7.5
RRB Group-D – 08/10/2018 (Shift-I)

Ans. (d) : The equation have no solution when their slopes are same.

From formula - $\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$

$$\frac{4}{10} \quad \frac{3}{k}$$

$-2k = 15$
$k = -7.5$

55. If the equations $6x - 5y + 11 = 0$ and $15x + ky - 9 = 0$ have no solution, then the value of k is :
(a) – 18 (b) 12.5
(c) – 12.5 (d) 18
RRB ALP & Tec. (21-08-18 Shift-III)

Ans : (c) When equation have no solution then,
$a_1x + b_1y + c_1 = 0$
$a_2x + b_2y + c_2 = 0$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$$

As per question,
Equation $6x \quad 5y + 11 = 0$
$15x + ky \quad 9 = 0$
Then $\frac{6}{15} = \frac{-5}{k} \neq \frac{11}{-9}$

$$\frac{2}{5} = \frac{5}{k}, \; k = \frac{25}{2}$$

$k \quad 12.5$

56. The pair of linear equations 3x + y = 1 and px + 2y = 5 has no finite solution if :
(a) $0 < p < 6$ (b) $p = 6$
(c) $p = 0$ (d) P 6
RRB ALP & Tec. (17-08-18 Shift-III)

Ans : (b) Linear equation will not be solution for 3x+y = 1 and px+2y = 5

$$\frac{3}{p} = \frac{1}{2} \neq \frac{1}{5} \left\{ \because \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \right\}$$

$p = 6$

57. The number of solutions of the pair of linear equations x + 2y 8 = 0 and 2x + 4y = 16 is
(a) 0 (b) 1
(c) infinite (d) 2
RRB ALP & Tec. (10-08-18 Shift-II)

Ans : (c)

(I) Unique solution will be equation of $\frac{a_1}{a_2} \quad \frac{b_1}{b_2}$

(II) No solution of equation $\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$

(III) Infinite solution must be equation of $\frac{a_1}{a_2} \quad \frac{b_1}{b_2} \quad \frac{c_1}{c_2}$

Equation $x + 2y - 8 = 0$, $2x + 4y - 16 = 0$

Then $\frac{1}{2} \quad \frac{2}{4} \quad \frac{8}{16}$

$\boxed{\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}}$ So, the equation will have infinite solutions.

58. Find the value of

$$\frac{4x^2 - 9y^2 \;^3 + 9y^2 - 49z^2 \;^3 + 49z^2 - 4x^2 \;^3}{2x - 3y \;^3 + 3y - 7z \;^3 + 7z - 2x \;^3}$$

(a) (2x–3y)(3y–7z)(7z–2x)
(b) 42xyz(2x+3y)(3y+7z)(7z+2x)
(c) 42xyz(2x–3y)(3y–7z)(7z–2x)
(d) (2x+3y)(3y+7z)(7z+2x)
RRB Group-D 22/08/2022 (Shift-III)

Ans. (d) : From the question,

$$\frac{4x^2 - 9y^2 \;^3 + 9y^2 - 49z^2 \;^3 + 49z^2 - 4x^2 \;^3}{2x - 3y \;^3 + 3y - 7z \;^3 + 7z - 2x \;^3}$$

If $a + b + c = 0$ then $a^3 + b^3 + c^3 = 3abc$
$4x^2 - 9y^2 + 9y^2 - 49z^2 + 49z^2 - 4x^2 = 0$
$2x - 3y + 3y - 7z + 7z - 2x = 0$
Hence,

$$\frac{3 \; 4x^2 - 9y^2 \quad 9y^2 - 49z^2 \quad 49z^2 - 4x^2}{3 \; 2x - 3y \quad 3y - 7z \quad 7z - 2x}$$

$$\frac{2x \; 3y \quad 2x \quad 3y \quad 3y \quad 7z \quad 3y \; 7z \quad 7z \; 2x \quad 7z \quad 2x}{2x \quad 3y \quad 3y \quad 7z \quad 7z \quad 2x}$$

$= (2x + 3y)(3y + 7z)(7z + 2x)$

59. Simplify $\frac{5p - q^{\;2} - (3p - 2q)^2 - q + 2p^{\;2}}{13pq - 15p^{\;2} - 2q^{\;2}}$

(a) 6p-3q (b) -6p+3q
(c) 6p+3q (d) -6p-3q
RRB GROUP-D – 27/09/2022 (Shift-II)

Ans. (d) : $\frac{5p-q)^3+(-3p+2q)^3+(-q-2p)^3}{-15p^2-13pq+2q^2}$

$\frac{3(5p-q)(-3p+2q)(-q-2p)}{-15p^2-10pq-3pq+2q^2}$

$\frac{3(5p-q)(-3p+2q)(-q-2p)}{-(3p-2q)(5p-q)}$

$\frac{-3(5p-q)(3p-2q)(-q-2p)}{-(3p-2q)(5p-q)}$

$= 3(-q-2p)$
$= -3q-6p$
$= -6p-3q$

60. If $x+\frac{1}{x}=3$ then find the value of $x^2+\frac{1}{x^2}$

(a) 7 (b) 8
(c) 9 (d) 6

RRB Group-D 01/09/2022 (Shift-II)

Ans. (a) : $x+\frac{1}{x}=3$

Squaring both side

$\left(x+\frac{1}{x}\right)^2=9$

$x^2+\frac{1}{x^2}+2=9$

$x^2+\frac{1}{x^2}=7$

61. If p + q + r = 13 and pq + qr + rp = 30, then the value of $p^3 + q^3 + r^3 - 3pqr$ is :

(a) 1125 (b) 1145
(c) 1027 (d) 1216

RRB Group-D 09/09/2022 (Shift-II)

Ans. (c) : $p + q + r = 13$
$pq + qr + rp = 30$
$p^3 + q^3 + r^3 - 3pqr = ?$
putting r = 0 in equation
$p + q + 0 = 13$
$p + q = 13$ ..... (i)
$pq + q \times 0 + 0 \times p = 30 \quad p = 30$..... (ii)
$p^3 + q^3 + 0^3 - 3pq \times 0 = ?$
$p^3 + q^3 = ?$
from eq. (i) and (ii) p = 10, q = 3
$p^3 + q^3 = (10)^3 + 3^3$
$= 1000 + 27$
$= 1027$
Hence,
$p^3 + q^3 + r^3 - 3pqr = 1027$

62. If $x+\frac{1}{x}=42$ then Find the value of $x^3+\frac{1}{x^3}$.

(a) 74, 130 (b) 73,962
(c) 72,629 (d) 74,926

RRB Group-D 30/08/2022 (Shift-II)

Ans. (b) : $x+\frac{1}{x}=42$ .....(i)

Squaring both side

$x^2+\frac{1}{x^2}+2=(42)^2$

$x^2+\frac{1}{x^2}+2=1764$

$x^2+\frac{1}{x^2}=1762$.....(ii)

$x^3+\frac{1}{x^3}=\left(x+\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}-1\right)$

From equation (i) and (ii)-
$= (42)(1762 - 1)$
$= 42 \times 1761 = 73962$

63. If a + b = 56 and $(a - b)^2 = 496$ then find the product of a and b.

(a) 460 (b) 760
(c) 560 (d) 660

RRB Group-D 18/08/2022 (Shift-II)

Ans. (d) : Given,
$a + b = 56$
$(a - b)^2 = 496$
$a + b = 56$
Squaring both side
$a^2 + b^2 + 2ab = 3136$
$a^2 + b^2 = 3136 - 2ab$
$(a - b)^2 = 496$
$a^2 + b^2 - 2ab = 496$
$3136 - 2ab - 2ab = 496$
$3136 - 4ab = 496$
$4ab = 3136 - 496$
$4ab = 2640$
$ab = 660$

64. If 3x – 2y = 10 and xy = 11 then find the value of $27x^3 - 8y^3$

(a) 2569 (b) 3336
(c) 3170 (d) 2980

RRB Group-D 18/08/2022 (Shift-II)

Ans. (d) : Given,
3x – 2y = 10
xy = 11
According to the question,
$27x^3 - 8y^3 = (3x)^3 - (2y)^3$
$= (3x - 2y)[(3x)^2 + (2y)^2 + 6xy]$
$= (3x - 2y)[(3x)^2 + (2y)^2 + 6xy + 12xy - 12xy]$
$= (3x - 2y)[(3x - 2y)^2 + 18xy]$
$= 10[(10)^2 + 18 \times 11]$
$=10[100 + 198] = 2980$

65. If a + b = 48 and ab = 56 then find the value of $a^3 + b^3$.

(a) 1,20,825 (b) 1,02,258
(c) 1,02,528 (d) 1,20,528

RRB Group-D 29/08/2022 (Shift-I)

Ans. (c) : Given

$a + b = 48, ab = 56$

Then

$a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$

$= (a + b)((a + b)^2 - 3ab))$

$= 48 \times ((48)^2 - 3 \times 56)$

$= 48 \times 2136$

$= 102,528$

66. If $a^2 - b^2 \div a + b = 25$ then the value of a-b is-

(a) 15 (b) 18

(c) 25 (d) 30

RRB RPF SI – 13/01/2019 (Shift-II)

Ans : (c) Given- $a^2 \quad b^2 \quad a \quad b \quad 25$

$$\frac{a \quad b \quad a \quad b}{a \quad b} \quad 25$$

$a \quad b \quad 25$

67. If $x + y = 1$, then $x^3 + y^3 + 3xy - 1 = ?$

(a) 0 (b) 1

(c) 5 (d) 2

RRB Group-D – 04/10/2018 (Shift-II)

Ans : (a) $x + y = 1$

On cubing both sides,

$(x+y)^3 = (1)^3$

$x^3 + y^3 + 3xy(x+y) = 1 \quad [\because x + y = 1]$

$x^3 + y^3 + 3xy - 1 = 0$

68. Expand: $(c-3)^3$

(a) $c^3+9c^2+27c+27$ (b) $c^3-9c^2+27c-9$

(c) $c^3-9c^2+27c-27$ (d) $c^3-9c^2-27c-27$

RRB NTPC 30.03.2016 Shift : 2

Ans : (c) $(c-3)^3 = c^3 - 27 - 9c^2 + 27c$

$= c^3 - 9c^2 + 27c - 27$

$[\because (a-b)^3 = a^3 - b^3 - 3a^2b + 3ab^2]$

69. Expand : $(s + 2)^3$

(a) $s^3 + 3s^2 + 12s + 8$ (b) $s^3 + 3s^2 + 6s + 8$

(c) $s^3 + 6s^2 + 12s + 8$ (d) $s^3 + 6s^2 + 6s + 8$

RRB NTPC 29.03.2016 Shift : 3

Ans : (c) $(s + 2)^3 = s^3 + (2)^3 + 3 \times s \times 2(s + 2)$

$= s^3 + 8 + 6s^2 + 12s$

$= s^3 + 6s^2 + 12s + 8$

70. If $a + b + c = 0$, then $(a^3 + b^3 + c^3)^2 = ?$

(a) $3a^2b^2c^2$ (b) $9a^2b^2c^2$

(c) 9abc (d) 27abc

RRB ALP & Tec. (09-08-18 Shift-II)

Ans : (b) According to the formula−

$a^3+b^3+c^3 \quad 3abc = (a + b + c)(a^2+b^2+c^2 \quad ab \quad bc \quad ca)$

$\because$ Given− $(a + b + c) = 0$

$a^3 + b^3 + c^3 \quad 3abc = 0 \; (a^2 + b^2 + c^2 \quad ab \quad bc \quad ca)$

$a^3 + b^3 + c^3 \quad 3abc = 0$

$a^3 + b^3 + c^3 = 3abc$

Squaring on both side−

$(a^3 + b^3 + c^3)^2 = (3abc)^2$

$a^3 \quad b^3 \quad c^3 \quad ^2 \quad 9a^2b^2c^2$

71. If $x^2 + 25y^2 = 10xy$, then x : y = ?

(a) 5 : 1 (b) 2 : 3

(c) 1 : 5 (d) 3 : 5

RRB NTPC 08.03.2021 (Shift-II) Stage Ist

Ans. (a) : Given,

If $x^2 + 25y^2 = 10xy$ then,

$= x^2 + (5y)^2 - 2 \times x \times 5y = 0 \ldots\ldots ((a-b)^2 = a^2 + b^2 - 2ab)$

$(x - 5y)^2 = 0$

$x - 5y = 0$

$x = 5y$

$\frac{x}{y} = \frac{5}{1}$

Hence, x : y = 5 : 1

72. If x = 12 and y = 7, then the value of $\left\{\frac{x^2 + y^2 - xy}{x^3 + y^3}\right\}$ is-

(a) $\frac{1}{5}$ (b) $\frac{2}{19}$

(c) $\frac{1}{2}$ (d) $\frac{1}{19}$

RRB NTPC 04.02.2021 (Shift-I) Stage Ist

Ans. (d) : $x = 12 \;,\; y = 7$

$$\frac{x^2 \quad y^2 \quad xy}{x^3 \quad y^3} \quad \frac{12^2 \quad 7^2 \quad 12 \quad 7}{12^3 \quad 7^3}$$

$$= \frac{144 \quad 49 \quad 12 \quad 7}{1728 \quad 343}$$

$$= \frac{193 \quad 84}{2071} \quad \frac{109}{2071} = \frac{1}{19}$$

73. Simplify: $x(2x-5) + 6(x^2-4) + 18$

(a) $8x^2 - 5x + 6$

(b) $8x^2 + 5x + 6$

(c) $8x^2 - 5x - 6$

(d) $8x^2 + 5x - 6$

RRB Group-D 29/08/2022 (Shift-II)

Ans. (c) : $x(2x - 5) + 6(x^2 - 4) + 18$

$= 2x^2 - 5x + 6x^2 - 24 + 18$

$= 8x^2 - 5x - 6$

74. If polynomials $4x^3 + ax^2 - 3x + 1$ and $x^4 + x^3 - x^2 + 6$ leave the same remainder when each is divided by (x+1), then the value of a is:

(a) 4 (b) −1

(c) 5 (d) 9

RRB NTPC 15.03.2021 (Shift-II) Stage Ist

Ans. (c) : $4x^3+ax^2-3x+1$ _____(i)

$x^4+x^3-x^2+6$ _____(ii)

According to the question-

$4x^3+ax^2-3x+1 = x^4+x^3-x^2+6$

On putting the value of x = –1

$4(-1)^3+a(-1)^2-3(-1)+1 = (-1)^4+(-1)^3-(-1)^2+6$

$-4+a+3+1=1-1-1+6$

a = 5

75. If the polynomial $6x^4+8x^3+17x^2+21x+7$ is divided by another polynomial $3x^2+4x+1$, the remainder comes out to be ax + b, find a and b

(a) a = 1; b = 3 (b) a = 3; b = 1

(c) a = 1; b = 1 (d) a = 1; b = 2

RRB NTPC 16.01.2021 (Shift-I) Stage Ist

Ans. (d) According to the question,

$$3x^2+4x+1 \overline{)\ 6x^4+8x^3+17x^2+21x+7\ (\ 2x^2+5}$$

$$\underline{6x^4+8x^3+2x^2}$$

$$15x^2+21x+7$$

$$\underline{15x^2+20x+5}$$

$$x+2$$

Remainder = x + 2 ... (1)

Given remainder is = ax + b ...(2)

On comparing equation (1) and equation (2)

a = 1; b = 2

76. What will be the remainder when $27x^3-9x^2+3x-8$ is divided by 3x + 2

(a) –22 (b) +22

(c) +16 (d) –16

RRB RPF SI – 11/01/2019 (Shift-III)

Ans : (a) $27x^3-9x^2+3x-8$,

$3x+2=0$

$3x=-2$

Then, $x=\frac{-2}{3}$

So $27\left(\frac{-2}{3}\right)^3-9\left(\frac{-2}{3}\right)^2+3\left(\frac{-2}{3}\right)-8$

$\Rightarrow 27\left(\frac{-8}{27}\right)-9\left(\frac{4}{9}\right)+3\left(\frac{-2}{3}\right)-8$

$-8-4-2-8$

-22

77. If $2x^m+x^3-3x^2-26$ is divided by x–2, the remainder 994 is left, find the value of 'm'

(a) 10 (b) 9

(c) 11 (d) 8

RRB RPF Constable – 20/01/2019 (Shift-II)

Ans : (b) On dividing $2x^m+x^3-3x^2-26$ by x–2, remainder is 994 or (x–2) a factor of equation is given so x – 2 = 0

Putting in equation, x = 2

$2 \quad 2^m+8-12-26=994$

$2 \quad 2^m=1024$

$2^m=512=2^9$

m 9

78. On dividing $2x^2+ax+b$ by $x-3$, then remainder is 31 and on dividing x^2+bx+a by $x-3$, the remainder is 24 then the value of a + b will be equal to-

(a) -7 (b) 23

(c) -23 (d) 7

RRB Group-D – 19/09/2018 (Shift-II)

Ans. (d) : $2x^2+ax+b$ ..... (i)

x^2+bx+a ..... (ii)

Dividing to both equations from (x–3) left remainder is 31 and 24 respectively.

So a factor of both equation is (x-3)

Putting x = 3 in both equation

From equation (i)

$2 \quad 9+a \quad 3+b=31$

$3a+b=13$ .....(iii)

From equation (ii),

$9+3b+a=24$

$a+3b=15$ ..... (iv)

Equation (iv) 3

$3a+9b=45$ ....(v)

Subtracting equation (iii) from equation (v)–

$3a+9b=45$

$3a+b=13$

$8b=32$

b 4

Putting the value of b in equation (iii)

$3a+4=13$

$3a=9$

a 3

So a b 7

79. On dividing $4x^6-5x^3-3$ by x^3-2, the remainder left is-

(a) 3 (b) 0

(c) 1 (d) 2

RRB Group-D – 20/09/2018 (Shift-II)

Ans : (a) Divide $4x^6-5x^3-3$ to x^3-2

$x^3-2=0$

$x \quad 2^{\frac{1}{3}}$

Putting the value of x in equation

$=4\times\left[2^{\frac{1}{3}}\right]^6-5\left[2^{\frac{1}{3}}\right]^3-3$

$=4 \quad 2^2-5 \quad 2-3=16-10-3=3$

So, the remainder left is 3.

80. When x^2+ax+b is divided by $x-7$ the remainder left is 35 and when x^2+bx+a is divided by x - 7, the remainder left is 31. Then a + b is equal to-

(a) 3 (b) 4
(c) –3 (d) –4

RRB Group-D – 24/09/2018 (Shift-II)

Ans : (d) Divide $x^2 + ax + b$ from $x–7$ remainder = 35

Putting, $x = 7$

$(7)^2 + 7a + b = 35$

$7a + b = 35 – 49$

$7a + b = –14$ -------(i)

Again divide $x^2 + bx + a$ from $x – 7$ remainder = 31

Putting, $x = 7$

$(7)^2 + 7b + a = 31$

$a + 7b = 31 – 49$

$a + 7b = –18$ -------(ii)

Adding equation (i) and (ii) –

$7a + b = – 14$

$a + 7b = – 18$

$8a + 8b = – 32$

$8 (a + b) = – 32$

$\boxed{a + b = – 4}$

81. If $2x^2 + ax + b$ is divided by x – 3 , leaves a remainder of 35 and when $2x^2 + bx + a$ is divided by x – 3, leaves a remainder of 29, then the value of a + b will be-

(a) -7 (b) -23
(c) 7 (d) 23

RRB Group-D – 08/10/2018 (Shift-II)

Ans : (c) $2x^2 + ax + b = 35$ ____ (i)

$2x^2 + bx + a = 29$ _____ (ii)

On putting x = 3 in equation (i) and (ii)

$18 + 3a + b = 35$

$3a + b = 17$ _____ (iii)

$18 + 3b + a = 29$

$3b + a = 11$ _____ (iv)

Adding equation (iii) and (iv)

$4a + 4b = 28$

$a + b = \frac{28}{4}$ 7

$a + b = 7$

82. If the value for k for which $x^2 + 5kx + k^2 + 5$, is completely divisible by x+2 but not divisible by x+3

(a) neither 1 nor 9 (b) both 1 and 9
(c) 1 (d) 9

RRB Group-D – 18/09/2018 (Shift-II)

Ans. (d) : $x^2+5kx+k^2 + 5$, is completely divisible by x + 2

Putting x = –2 remainder = 0

$(–2)^2 + 5k(–2) + k^2 + 5 = 0$

$4 – 10k + k^2 + 5 = 0$

$k^2 –10k + 9 = 0$

$(k – 9) (k – 1) = 0$

$k = 9, 1$

Putting k = 9

$= x^2 + 45x + 81 + 5$

$= x^2 + 45x + 86$

$= x(x + 43) + 2(x + 43)$

$= (x + 43)(x + 2)$

Putting k = 1

$= x^2 + 5x + 1 + 5$

$= x^2 + 5x + 6$

$= (x + 3) (x +2)$

But from (x+3) is not divisible

k = 9

83. If $2x^2+ax+2b$, is when divided by x - 1, leaves remainder 16 and when $x^2+bx+2a$ is divided by x + 1, leaves remainder -1 then a+b is equal to-

(a) -8 (b) -14
(c) 14 (d) 8

RRB Group-D – 26/09/2018 (Shift-II)

Ans. (d) : In these questions which to divide out of that, keep the value of x in equation and write a remainder equal to new equation

$2x^2 + ax + 2b$

Putting $x–1 = 0, \ x = 1$

$2 + 1^2 + a \times 1 + 2b = 16$

$2 + a + 2b = 16$

$a + 2b = 14$ _____ (i)

$x^2 + bx + 2a$

$x + 1 = 0$

Putting x = (-1)

Again $(-1)^2 + b(-1) + 2a = - 1$

$2a-b = - 2$ _____(ii)

Equation (i) + equation (ii) × 2

$a + 2b = 14$

$\underline{4a - 2b = - 4}$

$5a = 10$

$\boxed{a = 2}$

Putting the value of a in equation (i)

$2+2b = 14$

$2b = 12$

$\boxed{b = 6}$

$a + b = 2 + 6$

$= 8$

84. If $3x^2 + ax + 4$, is completely divisible by x – 8 then the value of 'a' will be-

(a) –24.5 (b) 25.5
(c) 24.5 (d) –25.5

RRB Group-D – 28/09/2018 (Shift-I)

Ans : (a) $3x^2 + ax + 4 = 0$

$x – 8 = 0, \quad x = 8$

Putting, x = 8 in given equation,

$3 \quad 64 + a \quad 8 + 4 = 0$

$192 + 8a + 4 = 0$

$8a = –192–4$

$8a = – 196$

$a \quad \frac{196}{8} \quad 24.5$

85. If $4x^3 - 2x^2 + 5x - 8$ is divided by (x–2) then the remainder will be -

(a) 16 (b) 26
(c) 42 (d) 81

RRB Group-D – 16/10/2018 (Shift-II)

Ans : (b) Divide if $4x^3 - 2x^2 + 5x - 8$ from (x–2)
Putting x = 2 in expression $4x^3 - 2x^2 + 5x - 8$
Remainder-
$= 4 \quad (2)^3 - 2 \quad (2)^2 + 5 \quad 2 - 8$
$= 4 \quad 8 - 2 \quad 4 + 10 - 8$
$= 32 - 8 + 2$
$= \boxed{26}$

86. Find the value of 'A' when the polynomial is P (x) = $x^3 + 3x^2 - 2Ax + 3$ Where 'A' is the constant which divided by $x^2 + 1$ the remainder is equal to -5x

(a) 3 (b) -2
(c) 2 (d) -3

RRB Group-D – 22/10/2018 (Shift-II)

Ans : (c) Polynomial P (x) = $x^3+3x^2-2Ax+3$
Remainder on divident = –5x
So $x^2 + 1 = 0$
Putting the value of $x^2 = -1$ in polynomial
P (x) = $-x^2x + 3x^2 - 2Ax + 3$
$(-1) \times x + 3\times(-1) - 2Ax + 3 = -5x$
$-x - 3 - 2Ax + 3 = -5x$
$-2Ax = -4x$
A = 2

87. When $3x^2 + 2ax + 4b$ is divided by x + 3, leaves a remainder of 15 and when $2x^2 + 3bx + 5a$ is divided by x-3, leaves a remainder 65 then the value of a+b is.

(a) 9 (b) 6
(c) 7 (d) 11

RRB Group-D – 30/10/2018 (Shift-III)

Ans. (c) : First expression = $3x^2 \quad 2ax \quad 4b$
Second expression = $2x^2 \quad 3bx \quad 5a$
Divide first expression from x + 3 left remainder is 15
$x + 3 = 0$
Putting in first expression x = –3
$3 \times (-3)^2 + 2a \times (-3) + 4b = 15$
$27 - 6a + 4b = 15$
$3a - 2b = 6$ .....(i)
Divide second expression from x – 3 left remainder is 65
$x - 3 = 0$
x = 3 Putting in second expression
$2(3)^2 + 3b\,(3) + 5a = 65$
$18 + 9b + 5a = 65$
$5a + 9b = 47$ .....(ii)
equation (i) × 9 + equation (ii) × 2
$27a - 18b = 54$
$10a + 18b = 94$
$37a = 148$
$a = 4$
Putting the value of a in equation (i)
$3a - 2b = 6$
$3 \times 4 - 2b = 6$
$12 - 6 = 2b$
$6 = 2b$
$b = 3$
So b = 3
Then a + b = 4 + 3 = 7

88. Which of the following describes the nature of the roots of the quadratic equation $3x^2 \quad 4x + 10 = 0$?

(a) No real roots
(b) One real root and one imaginary root
(c) Two equal roots
(d) Two distinct real roots

RRB GROUP-D – 15/09/2022 (Shift-III)

Ans. (a) : $3x^2 - 4x + 10 = 0$
$D = b^2 - 4ac$
$= (-4)^2 - 4 \quad 3 \quad 10$
$= 16 - 120$
$D = -104$
Hence, D < 0
when $b^2 - 4ac < 0$ then any root will not be real.

89. If r and s are the roots of $x^2 - 3x + 2 = 0$, then the quadratic equation in x whose roots are $r^2 + s^2$ and $(rs)^2$ is:

(a) $x^2 + 9x - 20 = 0$ (b) $x^2 + 9x + 20 = 0$
(c) $x^2 - 9x + 20 = 0$ (d) $x^2 - 9x - 20 = 0$

RRB Group-D 27-09-2022 (Shift-II)

Ans. (c) : The given equation are -
$x^2 \quad 3x \quad 2 \quad 0$
Sum of roots $r + s = \frac{-b}{a} = \frac{3}{1}$ I
Product of roots $rs = \frac{c}{a} = \frac{2}{1}$ II
For quadratic equation in x whose roots are $r^2 + s^2$ and $(rs)^2$
sum of roots = $r^2 \quad s^2 \quad rs^2$

$P \quad 5 \quad 2^2$ (from eq^n (II) & (III))
$\boxed{P \quad 9}$
And Product of roots $q \quad r^2 \quad s^2 \quad rs^2$
$5 \quad 2^2$
$\boxed{q \quad 20}$
Hence the equation is -
$x^2 \quad px \quad q \quad 0$
$\boxed{x^2 \quad 9x \quad 20 \quad 0}$

90. The roots of the equation $a x^2 + x + b = 0$ are equal if :

(a) $ab = \frac{1}{4}$ (b) $b^2 < 4a$

(c) $b^2 > 4a$ (d) $b^2 = 4a$

RRB GROUP-D – 17/08/2022 (Shift-I)

Ans. (a) : roots of the equation

$ax^2 + x + b = 0$ are equal

$B^2 = 4AC$

here $B = 1, A = a, C = b$

$1^2 = 4 \times a \times b$

$ab = \frac{1}{4}$

91. If 2 is a root of the equation $x^2 - px + 6 = 0$ and the quadratic equation $x^2 + 2px + q = 0$ has equal roots, then the value of q is:

(a) 36 (b) 12

(c) 16 (d) 25

RRB GROUP-D – 27/09/2022 (Shift-I)

Ans. (d) : $x^2 - px + 6 = 0$

Let roots are and

$= 2$

then, $+ = p$ | $= 6$

$2 + = P$ | $= 6/2$

$p = 2 + 3 = 5$ | $= 3$

$x^2 + 2px + q = 0$

$D = 0$

$b^2 - 4ac = 0$

$(2p)^2 - 4 \quad 1 \quad q = 0$

$4p^2 = 4q$

$q = 25$

92. What is the sum of the solutions of the roots of equation $2y^2 - 6y - 7 = 0$?

(a) $\frac{7}{2}$ (b) -3

(c) 3 (d) 7

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (c) : Given,

Equation

$2y^2 - 6y - 7 = 0$ —— (i)

We know that:–

Quadratic equation $ax^2 + bx + c = 0$ —— (ii)

On comparing equation I and II,

$a = 2, b = -6, c = -7$

Hence, sum of roots $= \frac{b}{a} \quad \frac{6}{2} \quad \frac{6}{2} = 3$

93. Which of the quadratic equations below will not have real roots?

(a) $x^2 + 4x - 5 = 0$ (b) $x^2 + 4x + 4 = 0$

(c) $x^2 + 4x + 5 = 0$ (d) $x^2 + 4x - 4 = 0$

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (c) :

Note :- (i) if $ax^2 + bx + c = 0$ and $b^2 - 4ac > 0$ then The roots of the equation will be real and unequal

(ii) $ax^2 + bx + c = 0$ and $b^2 - 4ac = 0$ then, The Roots of the equation will be real and equal.

(iii) if $ax^2 + bx + c = 0$ and $b^2 - 4ac < 0$ then, The Roots of the equation imaginary.

From option (c)

$x^2 + 4x + 5 = 0$

$b^2 - 4ac < 0$

$(4)^2 - 4 \times 1 \times 5 < 0$

$16 - 20 < 0$

Hence, the roots of the equation are imaginary, that is the roots are not real.

94. If the roots of the equation $2x^2 - 3x + a = 0$ are in the ratio 1:2 , then find the value of a.

(a) 2 (b) 1

(c) –1 (d) –2

RRB NTPC (Stage-II) 17/06/2022 (Shift-II)

Ans. (b) : Given,

$2x^2 - 3x + a = 0$

The ratio of the roots = 1:2 then a=?

Let roots be K and 2K

According to the question,

$+ = \frac{-b}{a}$

$K \quad 2K \quad \frac{- \ -3}{2}$

$3K \quad \frac{3}{2}$

$\boxed{K \quad \frac{1}{2}}$

Again, product of roots $(\ . \ ) = \frac{c}{a}$

$K \ . 2K \quad \frac{a}{2}$

$\frac{1}{2} \quad 2 \quad \frac{1}{2} \quad \frac{a}{2}$ (On putting $K = \frac{1}{2}$)

$a = 1$

95. If $6y^2 - 13y + 6 = 0$, then find the product of the two roots of the equation.

(a) 1 (b) –1

(c) $\frac{13}{6}$ (d) $\frac{13}{6}$

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (a) : Given, equation

$6y^2 - 13y + 6 = 0$

On comparing this with the standard form of quadratic equation, $ax^2 + bx + c = 0$

Where, $a = 6, b = -13, c = 6$

The product of the roots $= \frac{c}{a}$

$= \frac{6}{6} = 1$

96. If roots of quadratic equation $x^2 - kx + 169 = 0$ are equal, then find the value of k.

(a) 14 (b) 26

(c) 13 (d) 17

RRB Group-D 26/08/2022 (Shift-I)

Ans. (b) : equation $x^2 - kx + 169 = 0$

$a = 1\ b = -k\ c = 169$

$\because$ roots are equal, Hence $b^2 - 4ac = 0$

$(-k)^2 - 4 \times 1 \times 169 = 0$

$k^2 = 4 \times 169$

$k \quad \sqrt{4 \quad 169}$

$k \quad 26$

97. If $x^2 + 2x + 9 = (x - 2)(x - 3)$, then the resultant equation is:

(a) a cubic polynomial

(b) not a quadratic equation

(c) a cubic equation

(d) a quadratic equation

RRB Group-D 18/08/2022 (Shift-II)

Ans. (b) : quadratic equation - $ax^2 + bx + c = 0$

$x^2 + 2x + 9 = (x - 2)(x - 3)$

$x^2 + 2x + 9 = x^2 - 3x - 2x + 6$

$2x + 5x = + 6 - 9$

$7x = - 3$

$x \quad \frac{3}{7}$

Hence, this is not quadratic equation

98. Find the roots of $\frac{6}{x} - \frac{2}{x-1} - \frac{1}{x-2} = 0$

(a) $\frac{4}{5}$ and $\frac{3}{2}$ (b) $\frac{4}{3}$ and 3

(c) $\frac{4}{5}$ and 3 (d) $\frac{4}{3}$ and $\frac{3}{2}$

RRB Group-D 18/08/2022 (Shift-II)

Ans. (b) : $\frac{6}{x} - \frac{2}{x-1} - \frac{1}{x-2} = 0$

$\frac{6(x-1)(x-2) - 2x(x-2) - 1x(x-1)}{x(x-1)(x-2)} \quad 0$

$\frac{6(x^2 - 2x - x + 2) - 2x^2 + 4x - x^2 + x}{x(x^2 - 2x - x + 2)} \quad 0$

$\frac{6x^2 - 18x + 12 - 2x^2 + 4x - x^2 + x}{x^3 - 3x^2 + 2x} \quad 0$

$3x^2 - 13x + 12 = 0$

$3x^2 - 9x - 4x + 12 = 0$

$3x(x - 3) - 4(x - 3) = 0$

$(3x - 4)(x - 3) = 0$

roots $\frac{4}{3}, 3$

99. If the roots of quadratic equation $(2 - p)x^2 + 2px - (p + 1) = 0$ are equal, then the value of p is:

(a) 2 (b) 1

(c) –1 (d) –2

RRB Group-D 29/08/2022 (Shift-I)

Ans. (d) : $(2 - p)x^2 + 2px - (p + 1) = 0$

On Being equal roots

$b^2 - 4ac = 0$

$(2p)^2 - 4 \times (2 - p) \times -(p + 1) = 0$

$4(p^2 + 2p + 2 - p^2 - p) = 0$

$p + 2 = 0$

$p = - 2$

100. Find the sum of roots of quadratic equation $7x^2 + 28x + 1 = 0$:

(a) 28 (b) $\frac{1}{7}$

(c) – 4 (d) 1

RRB Group-D 29/08/2022 (Shift-I)

Ans. (c) : $7x^2 + 28x + 1 = 0$

Sum of roots $\frac{b}{a} \quad \frac{28}{7} \quad 4$

(where b = coefficient of x coefficient of x^2)

101. Find the negative roots of quadratic equation $3x^2 + 12x - 15 = 0$:

(a) $x = - 1$ (b) $x = - 5$

(c) $x = 5$ (d) $x = 1$

RRB Group-D 29/08/2022 (Shift-I)

Ans. (b) : $3x^2 + 12x - 15 = 0$

On solving

$3x^2 + 15x - 3x - 15 = 0$

$3x(x + 5) - 3(x + 5) = 0$

$(x + 5)(3x - 3) = 0$

$x = - 5, 1$

Hence, negative root = –5

102. What is the nature of the roots of $3x^2 + 6x - 5 = 0$?

(a) The roots are real and distinct

(b) The roots are real and equal

(c) The roots are real and more than 2

(d) There are no real roots

RRB GROUP-D – 17/08/2022 (Shift-II)

Ans. (a) : The given equation is

$3x^2 + 6x - 5 = 0$

Here, a = 3, b = 6 and c = – 5

Discriminant

$D = b^2 - 4ac$

$= (6)^2 - 4 \times 3 \times (-5)$

$= 36 + 60$

$= 96$

Hence, the roots are real and distinct

103. If $x^4 - 6x^2 - 1 = 0$, then what is the value of $(x^6 - x^{-6}) - 3(x^4 + x^{-4})$?

(a) 178 (b) 148
(c) 120 (d) 156

RRB NTPC (Stage-II) –13/06/2022 (Shift-I)

Ans. (c) : $x^4 - 6x^2 - 1 = 0$

On dividing by x^2 both sides we get

$$x^2 - 6 - \frac{1}{x^2} \quad 0$$

$$x^2 - \frac{1}{x^2} \quad 6 \qquad \ldots. (1)$$

On cubing both sides of equation,

$$x^6 - \frac{1}{x^6} - 3x^2 \times \frac{1}{x^2}\ x^2 - \frac{1}{x^2} \quad = 216$$

$$x^6 - \frac{1}{x^6} \quad 216 \quad 18$$

$$= 234 \qquad .....(2)$$

On squaring equation (1)

$$x^4 + \frac{1}{x^4} - 2x^2 \quad \frac{1}{x^2} \quad 36$$

$$x^4 + \frac{1}{x^4} \quad 36 \quad 2$$

$$= 38 \qquad .....(3)$$

According to the question,

$$(x^6 - x^{-6}) - 3(x^4 + x^{-4})$$

$$= \left(x^6 - \frac{1}{x^6}\right) - 3\left(x^4 \quad \frac{1}{x^4}\right)$$

On putting the value of equation (2) and (3)-

$= 234 - 3 \times 38$
$= 234 - 114$
$= 120$

104. If x (x + y + z) = 30, y (x + y + z) = 64, z (x + y + z) = 50 then find the value of 2 (x + y + z) Where x,y,z > 0.

(a) 22 (b) 26
(c) 24 (d) 20

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (c) : Given,
$x (x + y + z) = 30$ and x, y, z > 0
$y (x + y + z) = 64$
$z (x + y + z) = 50$
$(x + y + z) [x + y + z] = 30 + 64 + 50$
$(x + y + z)^2 = (12)^2$
$(x + y + z) = 12$
Then,
$2 (x + y + z)$
$= 2 \quad 12$
$= 24$

105. If (y + z) = 8 and yz = 6 find the value $(y - z)^2$

(a) 49 (b) 36
(c) 40 (d) 44

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (c) : Given,
$(y + z) = 8$
$yz = 6$
$(y–z)^2 = ?$
$(y + z)^2 = y^2 + z^2 + 2yz$
$(8)^2 = y^2 + z^2 + 2 \quad 6$
$y^2 + z^2 = 64 - 12$
$y^2 + z^2 = 52 \qquad .....(i)$
Now again,
$(y - z)^2 = y^2 + z^2 - 2yz$
$= 52 - 12$
$(y - z)^2 = 40$

106. Simplify: $3x(x - 6) + x^2 + 6x - 9 + 24 - x^3$

(a) $15 + 12x + 4x^2 + x^3$ (b) $15 - 12x + 4x^2 + x^3$
(c) $15 + 12x + 4x^2 - x^3$ (d) $15 - 12x + 4x^2 - x^3$

RRB Group-D 22/08/2022 (Shift-I)

Ans. (d) : Given equation
$3x(x - 6) + x^2 + 6x - 9 + 24 - x^3$
$3x^2 - 18x + x^2 + 6x - 9 + 24 - x^3$
$15 - 12x + 4x^2 - x^3$

107. Simplify:
$x^3 - 3x^2 + 9x - 12 - x^3 - 7x^2 - 8x - 16$

(a) $10x^2 + x - 28$
(b) $-10x^2 + x + 28$
(c) $-10x^2 + x - 28$
(d) $10x^2 - x - 28$

RRB Group-D 30/08/2022 (Shift-III)

Ans. (c): $x^3 - 3x^2 + 9x - 12 - x^3 - 7x^2 - 8x - 16$
$= -10x^2 + x - 28$

108. Simplify: $6(x^3 - 2x^2 + 3x) - (x^3 + 2x - 3)$

(a) $5x^3 - 12x^2 + 16x + 3$
(b) $5x^3 - 12x^2 + 16x - 3$
(c) $5x^3 + 12x^2 + 16x - 3$
(d) $5x^3 + 12x^2 + 16x + 3$

RRB Group-D 18/08/2022 (Shift-III)

Ans. (a) : $6(x^3 - 2x^2 + 3x) - (x^3 + 2x - 3)$
$= 6x^3 - 12x^2 + 18x - x^3 - 2x + 3$
$= 5x^3 - 12x^2 + 16x + 3$

109. Value of $16x^2 + 4y^2 + 25z^2 - 16xy + 20yz - 40zx$ is equal to :

(a) $(4x - 2y + 5z)^2$
(b) $(4x + 2y + 5z)^2$
(c) $(4x - 2y - 5z)^2$
(d) $(4x + 2y - 5z)^2$

RRB Group-D 13/09/2022 (Shift-III)

Ans. (c) : $16x^2 + 4y^2 + 25z^2 - 16xy + 20yz - 40zx$
$= (-4x + 2y + 5z)^2$ { $(-x + y + z)^2 = x^2 + y^2 + z^2 - 2xy + 2yz - 2zx$}
$= (4x - 2y - 5z)^2$

110. Simplify the given expression.
$3x(x-9)-9x^2+2x+24-x^3$
(a) $24+25x-6x^2-x^3$ (b) $24-25x-6x^2-x^3$
(c) $24-25x+6x^2-x^3$ (d) $24-25x-6x^2+x^3$
RRB Group-D 29-09-2022 (Shift-II)

Ans. (d) : $3x(x-9)-9x^2+2x+24-x^3$
$=3x^2-27x-9x^2+2x+24-x^3$
$=24-25x-6x^2-x^3$

111. If $4^{3x}-8^{x+1}+16=0$ is written as a quadratic equation where $y=2^{3x}$, then which of the options below will represent the quadratic equation mentioned above?
(a) $4y^2-8y+16=0$ (b) $4y^2-4y+16=0$
(c) $y^2-4y+16=0$ (d) $y^2-8y+16=0$
RRB GROUP-D – 29/09/2022 (Shift-I)

Ans. (d) : $4^{3x}-8^{x+1}+16=0$
$(2^{3x})^2-2^{3x}.2^3+16=0$
$y^2-8y+16=0$ [$\because 2^{3x}=y$ on putting]

112. Simplify: $3(3x-2)+x\ \frac{4x}{2}+15-12$
(a) $2x^2+9x-3$ (b) $2x^2+9x+6$
(c) $2x^2+9x+3$ (d) $2x^2+6x-3$
RRB Group-D 22/08/2022 (Shift-II)

Ans. (a) : $3\ 3x-2+x\ \frac{4x}{2}-15-12$
$=9x-6+2x^2+3$
$=2x^2+9x-3$

113. If $2^x-2^{x-1}=8$ then find the value of $2x^2+4x+3$.
(a) 41 (b) 20
(c) 21 (d) 51
RRB RPF Constable – 25/01/2019 (Shift-III)

Ans : (d) $2^x\ \ 2^{x\ 1}\ \ 8$
$\Rightarrow 2^x(1-2^{\ 1})=2^3$
$\Rightarrow 2^x\ \ 1-\frac{1}{2}\ =2^3$
$2^x\ \ \frac{1}{2}\ \ \ 2^3$
Multiply by 2 in both side-
$2^x\ \ 2^4$
$x\ \ 4$
Put, $x=4$ in the equation, $(2x^2+4x+3)$
$2x^{\ 2}+4x+3=2^{\ x}(4)^{\ 2}+4\times4+3$
$=2\ \ 16+16+3=32+19=51$

114. If $a^{x+y}=a^6$ and x is 2 more than y find x.
(a) 1 (b) 2
(c) 3 (d) 4
RRB RPF Constable – 22/01/2019 (Shift-III)

Ans : (d) $a^{x\ y}\ \ a^6\ \ x\ \ y\ \ 6$.....(i)
from the question $x=y+2\Rightarrow$ $\boxed{y=x-2}$
from the equation (i)-
$x\ \ (x\ \ 2)\ \ 6$
$2x\ \ 8\ \ x\ \ 4$

115. If $\frac{p}{b-c}=\frac{q}{c-a}=\frac{r}{a-b}$ then find the value of p+q+r .
(a) -1 (b) 1
(c) 2 (d) 0
RRB JE - 28/06/2019 (Shift-III)

Ans. (d) $\frac{p}{b-c}=\frac{q}{c-a}=\frac{r}{a-b}=k$ (suppose)
$p=(b-c)k=bk-ck$
$q=(c-a)k=ck-ak$
$r=(a-b)k=ak-bk$
$p+q+r=bk-ck+ck-ak+ak-bk=0$

116. If y = 5 then find the value of $5y\sqrt{y^3\ \ y^2}$.
(a) 500 (b) 250
(c) 50 (d) $50\sqrt{2}$
RRB JE - 26/05/2019 (Shift-II)

Ans : (b) Given–
$y=5,\ \ 5y\sqrt{y^3\ \ y^2}\ \ ?$
$5y\sqrt{y^3\ \ y^2}\ \ \ 5\ \ 5\sqrt{5^{\ 3}\ \ 5^{\ 2}}$
$25\sqrt{125\ \ 25}\ \ \ 25\sqrt{100}$
$=25\ \ 10=250$

117. If $3x-y=5$ then find the value of $8^x/2^y$.
(a) 32 (b) 256
(c) 64 (d) 16
RRB JE - 27/05/2019 (Shift-II)

Ans : (a) $3x-y=5$ ..... (i)
$\because \frac{8^x}{2^y}\ \ \frac{2^{3x}}{2^y}$
$=2^{3x-y}$ (From equation (i))
$=2^5$
$=32$

118. Find the value of x in $5x+7y=19$, $7x+5y=17$
(a) 1 (b) 2
(c) 3 (d) 4
RRB NTPC 03.04.2016 Shift : 3

Ans : (a) $5x+7y=19$ ……..(i)
$7x+5y=17$ ……..(ii)
After subtracting equation (i) × 5 and equation (ii) × 7,
$25x+35y=95$
$49x+35y=119$
$-\ \ -\ \ -\ \ .$
$-24x\ \ =-24$
$x\ \ \frac{24}{24}\ \ 1$

119. If $\frac{x}{2}+\frac{2}{y}=1$ and $\frac{y}{2}+\frac{2}{z}=1$, then the value of $\frac{z}{2}+\frac{2}{x}$ is:

(a) –1 (b) 1

(c) 0 (d) 2

RRB NTPC 28.12.2020 (Shift-I) Stage Ist

Ans. (b) : Given,

$\frac{x}{2}\ \frac{2}{y}\ 1$

$xy + 4 = 2y$

$2y - xy = 4$

$y = \frac{4}{2-x}$ _____(i)

$\frac{y}{2}\ \frac{2}{z}\ 1$

$yz + 4 = 2z$ _____(ii)

On putting the value of y in equation (ii),

$\frac{4}{2-x}\ z\ 4\ 2z$

$4z + 8 - 4x = 4z - 2xz$

$8 - 4x = -2xz$

$4 - 2x = -xz$

$2x = 4 + xz$

$1 = \frac{4}{2x}\ \frac{xz}{2x}$

or $\frac{2}{x}\ \frac{z}{2}\ 1$

120. If $a^{2x} = b$, $b^{2y} = c$, $c^{2z} = a$ then the value of xyz is:

(a) 1 (b) $\frac{1}{8}$

(c) 8 (d) 0

RRB NTPC 15.03.2021 (Shift-II) Stage I

Ans. (b) : Given,

$a^{2x} = b,\ \ b^{2y} = c,\ \ c^{2z} = a$ then $xyz = ?$

Where,

$a = c^{2z}$

$a = (b^{2y})^{2z}$

$a = (b)^{4yz}$

$a = (a^{2x})^{4yz}$

$a = (a)^{8xyz}$

$a^1 = a^{8xyz}$

$8xyz = 1$

$\boxed{xyz\ \ \frac{1}{8}}$

121. If $P = 2 + \sqrt{3}, Q = 2 - \sqrt{3}$ then find the value of $\frac{P}{Q}$

(a) $4\sqrt{3}\ \ 5$ (b) $7\ \ 2\sqrt{6}$

(c) $4\sqrt{6}\ \ 5$ (d) $\frac{7\ \ 4\sqrt{3}}{1}$

RRB NTPC 07.01.2021 (Shift-I) Stage Ist

Ans. (d) : Given,

$P = 2 + \sqrt{3}$

$Q = 2 - \sqrt{3}$

$\frac{P}{Q}\ \ \frac{2\ \sqrt{3}}{2\ \sqrt{3}}\ \ \frac{2\ \sqrt{3}}{2\ \sqrt{3}}$

$\frac{2\ \sqrt{3}^{\ 2}}{2^{\ 2}\ \ \sqrt{3}^{\ 2}}$

$\frac{4\ \ 3\ \ 4\sqrt{3}}{4\ \ 3}$

$\frac{7\ \ 4\sqrt{3}}{1}$

122. If $a^2 + b^2 = 80$ and $a - b = 4$, then $ab = ?$

(a) 20 (b) 24

(c) 28 (d) 32

RRB NTPC 05.04.2016 Shift-1

Ans : (d) Given-

$a^2 + b^2 = 80,\ a - b = 4$

$\because (a-b)^2 = a^2 + b^2 - 2ab$

$(4)^2 = 80 - 2ab$

$2ab = 80 - 16$

$2ab = 64$

$ab = \frac{64}{2}$ $ab = 32$

123. If $40x^2 = 334^2 - 134^2$ then value of x^2 is–

(a) 2340 (b) 234

(c) 1234 (d) 144

RRB NTPC 12.04.2016 Shift : 1

Ans : (a) From the question,

$40x^2 = 334^2 - 134^2$ $\{a^2-b^2 = (a+b)(a-b)\}$

$40x^2 = (334 - 134)(334+134)$

$40x^2 = 200 \times 468$

$x^2 = 2340$

06 Trigonometry

(Trigonometrical Ratios and Height and Distance)

Formula:

1. 180^0= Radian; 1 Radian = $57^o16'22''$ approx.

2. $\operatorname{cosec}\theta = \frac{1}{\sin\theta}; \sec\theta = \frac{1}{\cos\theta}; \tan\theta = \frac{\sin\theta}{\cos\theta}; \cot\theta = \frac{\cos\theta}{\sin\theta}$

3. (i) $\sin^2 + \cos^2 = 1$
(ii) $\sec^2 = 1 + \tan^2$
(iii) $\operatorname{cosec}^2 = 1 + \cot^2$

4. (i)

Angle	0^0	30^0	45^0	60^0	90^0
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cosine	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tangent	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	
cotangent		$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
secant	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	
cosecant		2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

(ii) $\sin 15^0 = \frac{\sqrt{3}-1}{2\sqrt{2}}, \cos 15^0 = \frac{\sqrt{3}+1}{2\sqrt{2}}$

$\tan 15^0 = 2 - \sqrt{3}, \cot 15^0 = 2 + \sqrt{3}$

(iii) $\sin 18^0 = \frac{\sqrt{5}-1}{4}, \cos 18^0 = \frac{\sqrt{10+2\sqrt{5}}}{4}$

(iv) $\sin 36^0 \quad \frac{\sqrt{10 \quad 2\sqrt{5}}}{4}$], $\cos 36^0 \quad \frac{\sqrt{5} \quad 1}{4}$,

(v) $\sin 22\frac{1^0}{2} = \frac{\sqrt{2-\sqrt{2}}}{2}, \cos 22\frac{1^0}{2} = \frac{\sqrt{2+\sqrt{2}}}{2}$

(vi) $\tan 22\frac{1^0}{2} = \sqrt{2}-1, \cot 22\frac{1^0}{2} = \sqrt{2}+1$

5. (i) sin(A+B) = sinAcosB+cosAsinB
(ii) sin (A–B)= sinAcosB –cosAsinB
(iii) cos(A+B)= cosAcosB–sinAsinB
(iv) cos(A–B)= cosAcosB+sinAsinB

(v) $\tan(A \mid B) = \frac{\tan A \mid \tan B}{1 \quad \tan A \tan B}; \tan \quad \frac{\pi}{4} \cdot \theta \quad = \frac{1 \mid \tan\theta}{1 \quad \tan\theta}$

(vi)

$\tan(A \quad B) = \frac{\tan A \quad \tan B}{1 \mid \tan A \tan B}; \tan \quad \frac{\pi}{4} \quad \theta \quad = \frac{1 \quad \tan\theta}{1 \mid \tan\theta}$

(vii) $\cot(A \quad B) \quad \frac{\cot A \cot B \quad 1}{\cot A \quad \cot B}$

(viii) $\cot(A \quad B) \quad \frac{\cot A \cot B \quad 1}{\cot B \quad \cot A}$

(ix) $\tan(A \quad B \quad C) \quad \frac{\tan A + \tan B - \tan C - \tan A \tan B \tan C}{1 - \tan A \tan B - \tan B \tan C - \tan C \tan A}$

6. (i) sin(A+B) sin(A–B)
$=\sin^2A–\sin^2B=\cos^2B–\cos^2A$
(ii) cos(A+B) cos(A–B)
$=\cos^2A–\sin^2B=\cos^2B–\sin^2A$

7. (i) $\sin C \quad \sin D \quad 2\sin\frac{C \quad D}{2}\cos\frac{C \quad D}{2}$

(ii) $\sin C \quad \sin D \quad 2\cos\frac{C \quad D}{2}\sin\frac{C \quad D}{2}$

(iii) $\cos C \quad \cos D \quad 2\cos\frac{C \quad D}{2}\cos\frac{C \quad D}{2}$

(iv) $\cos C \quad \cos D \quad 2\sin\frac{C \quad D}{2}\sin\frac{D \quad C}{2}$

8. (i) 2sinAcosB= sin(A+B)+sin(A–B)
(ii) 2cosAsinB= sin(A+B)–sin(A–B)
(iii) 2cosAcosB= cos(A+B)+cos(A–B)
(iv) 2sinAsinB= cos(A–B)–cos(A+B)

9. (i) $\sin 2A = 2\sin A\cos A = \frac{2\tan A}{1 \quad \tan^2 A}$

(ii) $\cos 2A = \cos^2 A - \sin^2 A = 1 - 2\sin^2 A$

$- 2\cos^2 A - 1 - \frac{1 \quad \tan^2 A}{1 \quad \tan^2 A}$

(iii) $\tan 2A - \frac{2\tan A}{1 \quad \tan^2 A}, \cot 2A - \frac{\cot^2 A \quad 1}{2\cot A}$

10. (i) sin3A=3sinA–4sin^{3}A
(ii) cos3A = 4cos^{3}A–3cosA

(iii) $\tan 3A \quad \frac{3\tan A \quad \tan^3 A}{1 \quad 3\tan^2 A}$

(iv) $\cot 3A \quad \frac{\cot^3 A \quad 3\cot A}{3\cot^2 A \quad 1}$

11. (i) $\sin A - 2\sin\frac{A}{2}\cos\frac{A}{2} - \frac{2\tan\frac{A}{2}}{1 \quad \tan^2\frac{A}{2}}$

(ii) $\cos A = \cos^2\frac{A}{2} - \sin^2\frac{A}{2} = 1 - 2\sin^2\frac{A}{2}$

$= 2\cos^2\frac{A}{2} - 1 = \frac{1 \quad \tan^2\frac{A}{2}}{1 \quad \tan^2\frac{A}{2}}$

(iii) $\tan A \quad \frac{2\tan\frac{A}{2}}{1-\tan^2\frac{A}{2}}$

(iv) $\cot A \quad \frac{\cot^2\frac{A}{2}-1}{2\cot\frac{A}{2}}$

12. (i) $\sin A \quad 3\sin\frac{A}{3}-4\sin^3\frac{A}{3}$

(ii) $\cos A \quad 4\cos^3\frac{A}{3}-3\cos\frac{A}{3}$

13. (i) $\sin\frac{A}{2} \quad \sqrt{\frac{1-\cos A}{2}}$

(ii) $\cos\frac{A}{2} \quad \sqrt{\frac{1+\cos A}{2}}$

14. The sum of interior angles of triangle A+B+C= 180^0, then

(i) sinA=sin(B+C); cosA = –cos(B+C)

(ii) $\sin\frac{A}{2}=\cos\frac{B+C}{2}; \cos\frac{A}{2}=\sin\frac{B+C}{2}$

$\sin(\quad)=\quad\sin$

$\cos(\quad)=\cos$

$\sin(90^0\quad)=\cos$

$\cos(90^0\quad)=\mp\sin$

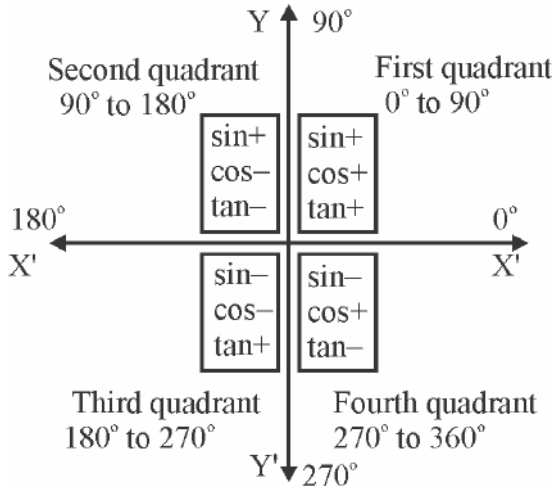
$\sin(180^0\quad)=\mp\sin$

$\cos(180^0\quad)=-\cos$

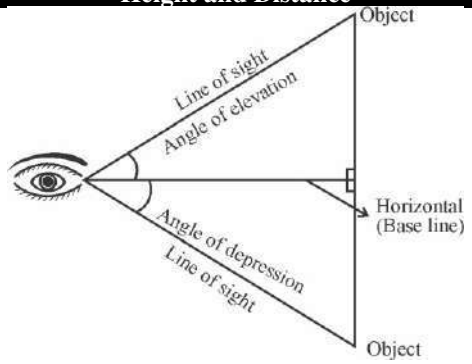
$\sin(360^0\quad)=\quad\sin$

$\cos(360^0\quad)=\cos$

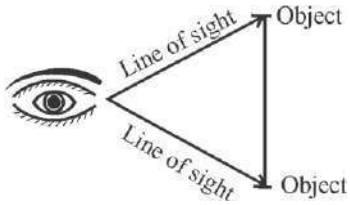
Trigonometric quadrant –



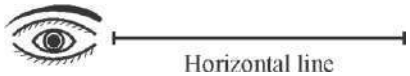
Height and Distance



Line of sight :– The line which is drawn from the eyes of the observer to the point being viewed on the object.

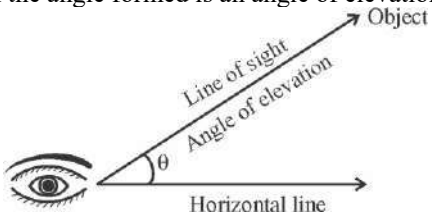


Horizontal line or Base line :– If the person looks straight ahead without lifting or bending the head, then this line is called horizontal line.



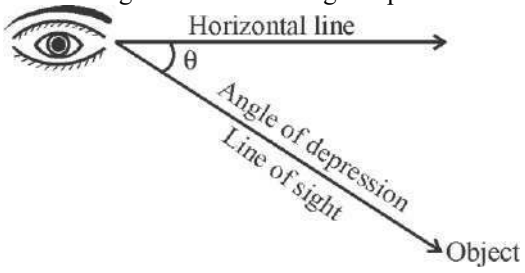
Angle of elevation :– The term angle of elevation denotes the angle from the horizontal upward to an object.

If the line of sight is upward from the horizontal line then the angle formed is an angle of elevation.

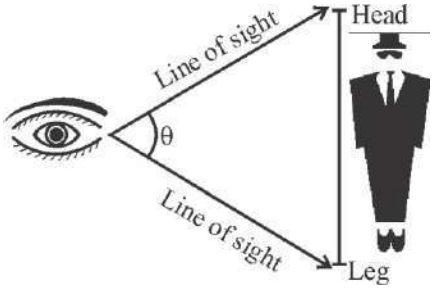


Angle of depression :– The term angle of depression denotes the angle from the horizontal downward to an object.

If the line of sight is downward from the horizontal line then the angle formed is an angle depression.



Subtended angle :– The angle formed between both lines of sight, i.e. the angle subtended by the head and legs of an object is called the subtended angle.



Complementary angle :– Two angles are called complementary when their measures add to 90°.

If , are complementary each other.

then, $\boxed{\quad 90 \quad}$

➢ (90 –) is the complementary angle of .

Supplementary angle :– Two angles are called supplementary when their measures add to 180°.

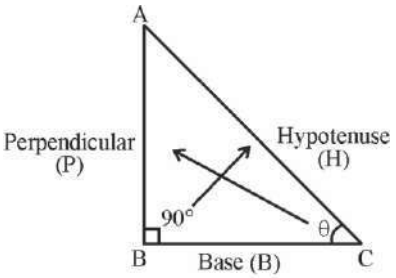
If , are supplementary angle each others.

then, $\boxed{\quad 180 \quad}$

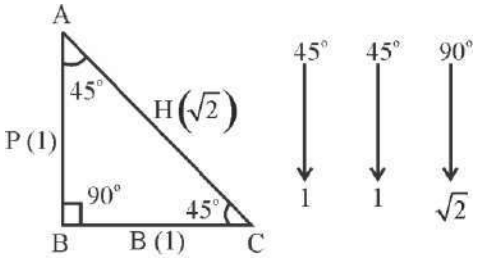
➢ (180° –) is the supplementary angle of .

Angle-side ratio

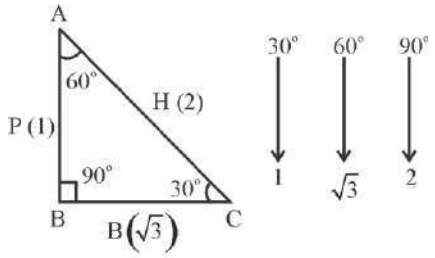
$$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{P}{B}$$



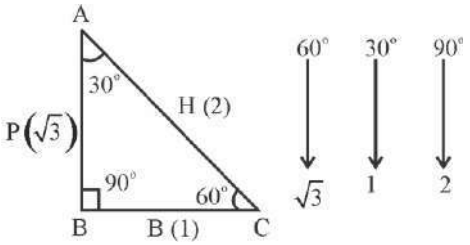
➢ $\tan 45 \quad \frac{1}{1} \quad \frac{P}{B} \quad \frac{1}{1}$



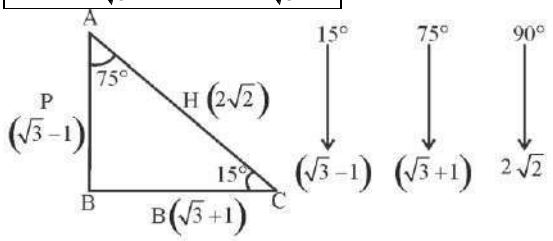
➢ $\tan 30 \quad \frac{1}{\sqrt{3}} \quad \frac{P}{B} \quad \frac{1}{\sqrt{3}}$



➢ $\tan 60 \quad \frac{\sqrt{3}}{1} \quad \frac{P}{B} \quad \frac{\sqrt{3}}{1}$

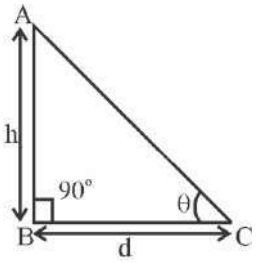


➢ $\tan 15 \quad \frac{\sqrt{3}\ 1}{\sqrt{3}\ 1} \quad \frac{P}{B} \quad \frac{\sqrt{3}\ 1}{\sqrt{3}\ 1}$



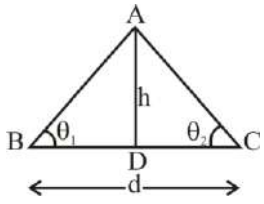
(Relation between distance and height)

➢



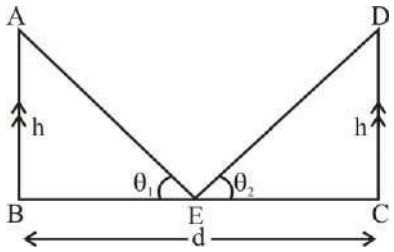
$$d = h\cot\theta$$

➢



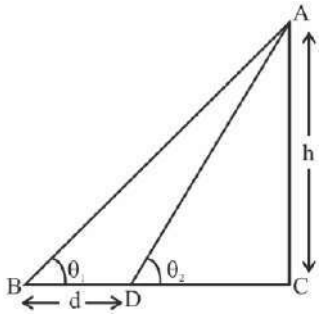
$$d = h(\cot\theta_1 + \cot\theta_2)$$

➢



$$d = h(\cot\theta_1 + \cot\theta_2)$$

➢

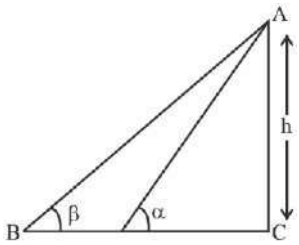


$\because\ \theta_1 < \theta_2$

the value of $\cot\theta_1$ > the value of $\cot\theta_2$

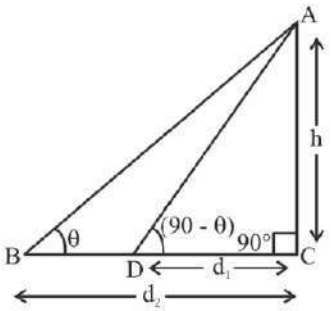
$$d = h(\cot\theta_1 - \cot\theta_2)$$

➢



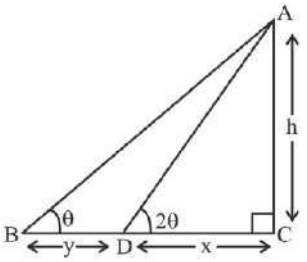
$$h = \sqrt{ab\tan\alpha\tan\beta}$$

➢



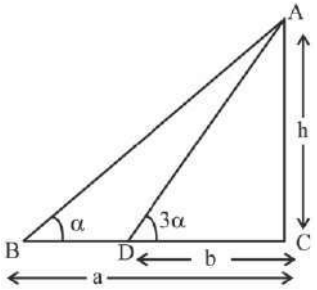
$$h = \sqrt{d_1 d_2}$$

➢



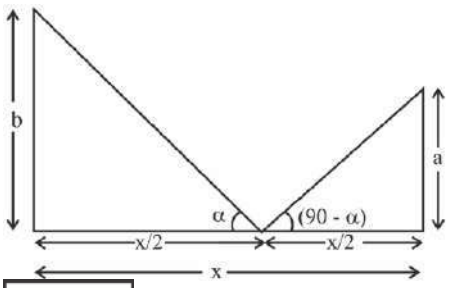
$$h = \sqrt{y^2 - x^2}$$

➢



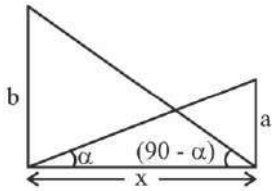
$$h = a\sqrt{\frac{a-3b}{3a-b}}$$

➢



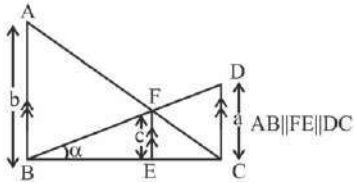
$$h = 2\sqrt{ab}$$

➢



$$x = \sqrt{ab}$$

➢

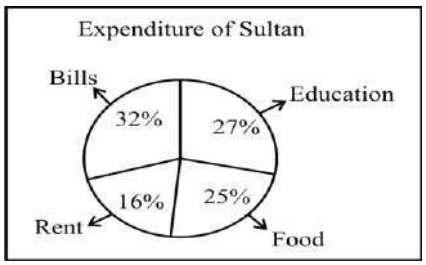


$$\frac{1}{c} = \frac{1}{a} + \frac{1}{b}$$

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. Study the given pie-chart and answer the question that follows.

Monthly percentage expenditure of a Sultan is given in the pie-chart.



What is the monthly expenditure on Food by the Sultan (in ₹) if the total monthly expenditure of the Sultan is ₹10,000?

(a) 2000 (b) 2500

(c) 7700 (d) 1700

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (b) : Monthly expenditure of Sultan = ₹ 10000

Monthly expenditure of Sultan on food

$$= 10000 \quad \frac{25}{100} = ₹\ 2500$$

2. If $\frac{18\cos\theta + 5\sin\theta}{5\cos\theta + 4\sin\theta} = 2$ then find the value of cot .

(a) $\frac{3}{8}$ (b) $\frac{3}{5}$ (c) $\frac{1}{7}$ (d) $\frac{1}{3}$

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) :

$$\frac{18\cos \quad 5\sin}{5\cos \quad 4\sin} \quad 2$$

$$18\cos + 5\sin = 10\cos + 8\sin$$

$$8\cos = 3\sin$$

$$\frac{\cos}{\sin} \quad \frac{3}{8} \qquad \cot = \frac{3}{8}$$

3. If the height of a tower is $\sqrt{3}$ times its shadow, then the angle of the elevation of the top of the tower is equal to :

(a) 90º (b) 30º

(c) 45º (d) 60º

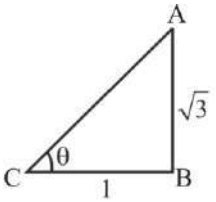
RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (d) : According to the question-

AB = Height of tower

Let shadow (BC) = 1

AB = $\sqrt{3}$



In ABC

$$\tan = \frac{\sqrt{3}}{1} \qquad \tan 60^0$$

$$= 60°$$

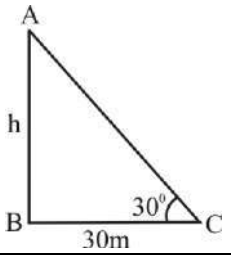
4. A tower stands vertically on the ground. From a point on the ground, 30 m away from the foot of the tower, the angle of elevation of the top of the tower is 30º. What is the height (in metres) of the tower?

(a) $30\sqrt{3}$ (b) $20\sqrt{3}$

(c) $10\sqrt{3}$ (d) $15\sqrt{3}$

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c) : Let, Height of tower is h



In ABC,

$$\tan 30^0 \quad \frac{h}{30}$$

$$\frac{1}{\sqrt{3}} \quad \frac{h}{30}$$

$$h \quad \frac{30}{\sqrt{3}}$$

$$= \frac{30}{\sqrt{3}} \quad \frac{\sqrt{3}}{\sqrt{3}}$$

$$= 10\sqrt{3} \text{ m}$$

Hence, Height of the tower (h) = $10\sqrt{3}$ m

5. Find the value of the given expression.

$$\frac{\cos A}{1 - \tan A} + \frac{\sin^2 A}{\sin A - \cos A} + 2\sin A - \cos A$$

(a) 3cosA (b) cosA

(c) 3sinA (d) sinA

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c): $\frac{\cos A}{1-\tan A}+\frac{\sin^2 A}{\sin A-\cos A}+2\sin A-\cos A$

$\frac{\cos A}{\frac{\cos A-\sin A}{\cos A}}+\frac{\sin^2 A}{\sin A-\cos A}+2\sin A-\cos A$

$\frac{\cos^2 A}{\cos A-\sin A}-\frac{\sin^2 A}{\cos A-\sin A}+2\sin A-\cos A$

$\frac{\cos^2 A-\sin^2 A}{\cos A-\sin A}\quad 2\sin A\quad \cos A$

$\frac{\cos A-\sin A\quad \cos A+\sin A}{\cos A-\sin A}\quad 2\sin A\quad \cos A$

$\cos A + \sin A + 2\sin A - \cos A$

$= 3\sin A$

6. If the quadratic equation $x^2-4ax+(b+1)=0$, where a and b are real constants, has no real roots, then :

(a) $b < (2a+1)(2a-1)$ (b) $b < (a+1)(a-1)$

(c) $b > (a+1)(a-1)$ (d) $b > (2a+1)(2a-1)$

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (d) : Equation-

$x^2-4ax+(b+1)=0$

If no root is real then $D < 0$

$-4a^2-4\times 1\times b-1<0$

$16a^2\quad 4b\quad 4\quad 0$

or $4a^2\quad b\quad 1\quad 0$

$4a^2\quad 1\quad b \qquad \because a^2-b^2-a+b\quad a-b$

$b > (2a+1)(2a-1)$

7. If the angle of elevation of the sun changes from 30º to 45º, the length of the shadow of a pillar decreases by 80 m. The height of the pillar is :

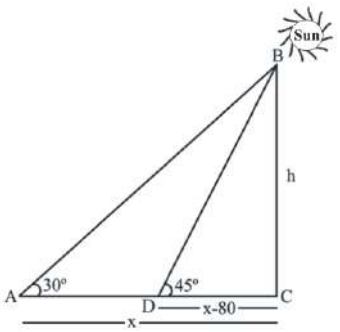
(a) $40\sqrt{3}\quad 1$ cm (b) $20\sqrt{3}\quad 1$ cm

(c) $30\sqrt{3}\quad 1$ cm (d) $10\sqrt{6}\quad 1$ cm

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (a) : Let us consider that length of shadow is x and height of pillar is h

According to question,



In triangle ABC,

$\tan 30^\circ\quad \frac{h}{x}$

$\frac{1}{\sqrt{3}}\quad \frac{h}{x}$

$x\quad \sqrt{3}\,h$ ..... (i)

In triangle DCB

$\tan 45^\circ\quad \frac{h}{x\quad 80}$

$1\quad \frac{h}{x\quad 80}$

$x\quad 80\quad h$ ..... (ii)

From equation (i) and (ii)-

$\sqrt{3}\,h\quad h\quad 80$

$h\quad \sqrt{3}\quad 1\quad 80$

$h\quad \frac{80}{\sqrt{3}\quad 1}\quad \frac{\sqrt{3}\quad 1}{\sqrt{3}\quad 1}\quad \frac{80\quad \sqrt{3}\quad 1}{2}$

$40\quad \sqrt{3}\quad 1$ cm

8. Simplify $\frac{1}{\sin^2 A}-1$, where $0<A\le 90^\circ$

(a) $\cot^2 A$ (b) $\sec^2 A$

(c) $\tan^2 A$ (d) $\cos^2 A$

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (a) : $\frac{1}{\sin^2 A}\quad 1 = \operatorname{cosec}^2 A - 1$

$= \cot^2 A$

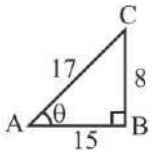
9. If $\tan\theta = \frac{8}{15}$, then the value of $\frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}}$ is :

(a) $\frac{3}{5}$ (b) $\frac{3}{4}$ (c) $\frac{3}{7}$ (d) $\frac{5}{7}$

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (a) : According to the question

$\tan\quad \frac{8}{15}$ then $\sin\quad \frac{8}{17}$



$= \frac{\sqrt{1\quad \sin}}{\sqrt{1\quad \sin}}\quad \frac{\sqrt{1\quad \frac{8}{17}}}{\sqrt{1\quad \frac{8}{17}}} = \sqrt{\frac{\frac{9}{17}}{\frac{25}{17}}} = \sqrt{\frac{9}{25}} = \frac{3}{5}$

10. If 0 90 then the value of $\frac{\cot\theta - 1}{1 - \tan\theta} \div \left(\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} \right)$ is equal to :

(a) $\frac{\cos}{2}$ (b) $\sin$ □

(c) $\cos$ □ (d) $\frac{\sec}{2}$

RRB NTPC (Stage-2) 16/06/2022 (Shift-III)

Ans. (a) :

$$\frac{\cot\theta - 1}{1 - \tan\theta} \div \left(\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} \right)$$

$$= \frac{1 \quad \tan}{1 - \tan\theta \ .\tan\theta} \left[\frac{\sin^2 \quad 1 \quad \cos^{\ 2}}{1+\cos\theta \ \sin\theta} \right]$$

$$= \frac{1}{\tan\theta} \left[\frac{\sin^2\theta + 1 + \cos^2\theta + 2\cos\theta}{1+\cos\theta \ \sin\theta} \right]$$

$$= \frac{1}{\tan\theta} \left[\frac{2 \ 1 \ \cos}{1+\cos\theta \ .\sin\theta} \right]$$

$$= \frac{1}{\tan} \quad \frac{2}{\sin}$$

$$= \frac{\cos\theta}{\sin} \quad \frac{\sin\theta}{2} \quad \frac{\cos\theta}{2}$$

11. If $\sqrt{3}\tan 2\theta - 3 = 0$ then find the value of tan . sec – sin (0 < < 90º)

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$

(c) $\frac{2}{3}$ (d) $\frac{2}{3}$

RRB NTPC (Stage-2) 12/06/2022 (Shift-I)

Ans. (a) : $\sqrt{3}\tan 2\theta - 3 = 0$

$\tan 2\theta = \sqrt{3}$

$\tan 2\theta = \tan 60^\circ \Rightarrow 2\theta = 60^\circ \Rightarrow \theta = 30^\circ$

tan .sec – sin

$= \tan 30^\circ . \sec 30^\circ - \sin 30^\circ$

$= \frac{1}{\sqrt{3}} \quad \frac{2}{\sqrt{3}} \quad \frac{1}{2} \quad \frac{2}{3} \quad \frac{1}{2} \quad \frac{1}{6}$

12. Find the value of (sin + cosec)^2 + (cos + sec)^2

(a) $7 + \cot^2 + \tan^2$

(b) $5 + \cot^2 + \tan^2$

(c) $7 - \cot^2 + \tan^2$

(d) $5 - \cot^2 + \tan^2$

RRB GROUP-D – 27/09/2022 (Shift-II)

Ans. (a) : (sin + cosec)^2 + (cos + sec)^2

$= (\sin^2 + \text{cosec}^2 + 2\sin . \text{cosec}) + (\cos^2 + \sec^2 + 2\cos . \sec)$

$= \sin^2 + \text{cosec}^2 + 2 + \cos^2 + \sec^2 + 2$

$= \sin^2 + \cos^2 + \text{cosec}^2 + \sec^2 + 4$

$= 1 + 1 + \cot^2 + 1 + \tan^2 + 4$

$= 7 + \cot^2 + \tan^2$

13. Simplify $\sqrt{\frac{1+\cos A}{1 \quad \cos A}}$

(a) sec A + tan A

(b) sec A – tan A

(c) cosec A – cot A

(d) cosec A + cot A

RRB Group-D 30/08/2022 (Shift-II)

Ans. (d) : $\sqrt{\frac{1 \quad \cos A}{1 \quad \cos A}}$

$$- \sqrt{\frac{1 \quad \cos A}{1 \quad \cos A} \times \frac{1 \quad \cos A}{1 \quad \cos A}}$$

$$\sqrt{\frac{1 \quad \cos A^{\ 2}}{\sin^2 A}}$$

$$\frac{1 \quad \cos A}{\sin A}$$

$$\frac{1}{\sin A} \quad \frac{\cos A}{\sin A}$$

$= \text{cosec}A + \text{cot}A$

14. Find the value of sec A (1 - cos A) (cosec A + cot A)

(a) cosec A (b) tan A

(c) sec A (d) cot A

RRB Group-D 09/09/2022 (Shift-I)

Ans. (b) : $\sec A \ 1 - \cos A \quad \text{cosec}A + \cot A$

$$= \sec A \ 1 - \cos A \left(\frac{1}{\sin A} + \frac{\cos A}{\sin A} \right)$$

$$\sec A \ 1 \quad \cos A \quad \frac{1 \quad \cos A}{\sin A}$$

$$\frac{1 \quad \cos^2 A}{\sin A \cos A}$$

$$\frac{\sin^2 A}{\sin A \cos A}$$

$$\frac{\sin A}{\cos A}$$

$= \text{tan}A$

15. Find the value of $\tan\theta + \frac{1}{\tan\theta}$

(a) cos sec (b) cosec sin

(c) cosec cot (d) cosec sec

RRB Group-D 30/08/2022 (Shift-III)

Ans. (d) : Given,

$$\tan \quad \frac{1}{\tan} \quad ?$$

$$\frac{\sin}{\cos}\ \frac{\cos}{\sin}$$

$$\frac{\sin^2\ \ \cos^2}{\cos\ .\sin}$$

$$\frac{1}{\cos\ .\sin}$$

cosec . sec

16. Find the value of $\sin x + \frac{\cos x}{\tan 90\ \ x}$

(a) cot x (b) 2 sin x
(c) 2 cosec x (d) tan x

RRB GROUP-D – 16/09/2022 (Shift-II)

Ans. (b) : Given -

$$\sin x\ \ \frac{\cos x}{\tan 90\ \ x}$$

$$= \sin x\ \ \frac{\cos x}{\cot x}$$

$$= \sin x\ \ \frac{\cos x}{\frac{\cos x}{\sin x}}$$

$$= \sin x\ \ \frac{\cos x.\sin x}{\cos x}$$

= 2 sinx

17. Find the value of (cosec x + cot x + 1) (sec x – tan x – 1), if x = 45°

(a) –2 (b) 1
(c) 0 (d) –1

RRB Group-D 09/09/2022 (Shift-II)

Ans. (a) : (cosecx + cotx + 1) (secx – tanx – 1)
Put, x = 45º
(cosec45 + cot 45 + 1) (sec 45 – tan 45 – 1)

$$= \sqrt{2} + 2\ \ \sqrt{2} - 2$$

= 2 – 4
= – 2

18. If tan □ = 4, Then find the value of

$$\frac{4\cos\ \ 2\sin}{2\sin\ \ \cos}$$

(a) $\frac{12}{7}$ (b) $\frac{12}{5}$
(c) $\frac{12}{8}$ (d) $\frac{12}{10}$

RRB Group-D 23/08/2022 (Shift-II)

Ans. (a) : Given, tan = 4

$$\frac{4\cos\theta + 2\sin\theta}{2\sin\theta - \cos\theta}$$

$$\frac{4\ \ 2\tan}{2\tan\ \ 1}$$

$$= \frac{4 + 2 \times 4}{2 \times 4 - 1} = \frac{12}{7}$$

19. Which of the following represents the right hand side (RHS) of the given equation ?

$$\sqrt{\frac{1 + \sin A}{1 - \sin A}} = ?$$

(a) $\frac{1}{\text{cosec A}}$ (b) sec A + cot A
(c) sin A + cos A (d) sec A + tan A

RRB Group-D 24/08/2022 (Shift-I)

Ans. (d) : Given

$$= \sqrt{\frac{1\ \ \sin A}{1\ \ \sin A}}$$

$$= \sqrt{\frac{1\ \ \sin A}{1\ \ \sin A} \times \frac{1\ \ \sin A}{1\ \ \sin A}}$$

$$= \sqrt{\frac{1\ \ \sin A^2}{(1\ \ \sin^2 A)}}$$

$$= \sqrt{\frac{1\ \ \sin A^2}{\cos^2 A}}$$

$$= \frac{1\ \ \sin A}{\cos A}$$

$$= \frac{1}{\cos A}\ \ \frac{\sin A}{\cos A}$$

= secA + tanA

20. If cot(A+B).cot(A–B) = 1, then the value of cot $\frac{2A}{3}$ **is:**

(a) $\frac{\sqrt{3}}{2}$ (b) $\sqrt{3}$
(c) $\frac{\sqrt{2}}{3}$ (d) $\frac{1}{\sqrt{3}}$

RRB NTPC 09.02.2021 (Shift-II) Stage I

Ans. (b) : cot(A+B) cot (A–B) = 1
cot(A+B) = tan(A–B)
cot(A–B) = cot [90–(A–B)]
A+B = 90 – (A–B)
2A = 90
A = 45

$$\cot\frac{2A}{3} = \cot\frac{2\ \ 45^\circ}{3} = \cot 30^\circ = \sqrt{3}$$

21. In a triangle ABC, tanA + tanB + tanC = ?

(a) 1
(b) -tanA.tanB.tanC
(c) tanA.tanB + tanB.tanC + tanC.tanA
(d) tanA.tanB.tanC

RRB NTPC 17.02.2021 (Shift-I) Stage Ist

Ans. (d) : tanA + tanB + tanC = ?
A + B + C = 180°
A + B =180°– C

tan (A+B) = tan (180°– C)

$\frac{\tan A \quad \tan B}{1 \quad \tan A \quad \tan B} \quad \tan C$

tan A + tanB = – tanC + tan A tanB tanC

tan A + tan B + tan C = tan A tanB tanC

22. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{3}$, then the value of sin is:

(a) $\frac{3}{4}$ (b) $\frac{2}{3}$

(c) $\frac{1}{4}$ (d) $\frac{1}{3}$

RRB NTPC 23.02.2021 (Shift-I) Stage Ist

Ans. (c) : Given that,

$\frac{\sec \quad \tan}{\sec \quad \tan} \quad \frac{5}{3}$

3(sec + tan) = 5 (sec – tan)

3 sec + 3 tan = 5 sec – 5 tan

2 sec = 8 tan

$2 \quad \frac{1}{\cos} \quad \frac{8\sin}{\cos}$

2 = 8 sin

$\sin \quad \frac{2}{8} \quad \frac{1}{4}$

Hence, $\sin \quad \frac{1}{4}$

23. Solve the following :

$\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = ?$

(a) 0 (b) $2\cos^2$

(c) $2\sec^2$ (d) 1

RRB ALP & Tec. (17-08-18 Shift-III)

Ans : (c) Given that,

$\frac{1}{1 \quad \sin} \quad \frac{1}{1 \quad \sin} \quad \frac{1 \quad \sin \quad 1 \quad \sin}{1 \quad \sin^2}$

$\frac{2}{1 \quad \sin^2} \quad \left[\because 1 \quad \sin^2 \quad \cos^2\right]$

$\frac{2}{\cos^2} = 2\sec^2$

24. Simplify:

sin /(1 - cos)

(a) tan - sec (b) cosec + cot

(c) cosec -cot (d) tan + sec

RRB JE - 02/06/2019 (Shift-I)

Ans : (b) $\frac{\sin}{1 \quad \cos}$

$= \frac{\sin \quad (1 \quad \cos \quad)}{(1 \quad \cos \quad)(1 \quad \cos \quad)}$

(Rationalizing the numerator and the denominator)

$= \frac{\sin \quad (1 \quad \cos \quad)}{1 \quad \cos^2} = \frac{\sin \quad 1 \quad \cos}{\sin^2}$

$= \frac{1 \quad \cos}{\sin} = \frac{1}{\sin} \quad \frac{\cos}{\sin} = \text{cosec} \quad + \cot$

25. $\frac{\sin A + \sin B}{\cos A - \cos B} + \frac{\cos A + \cos B}{\sin A - \sin B} = ?$

(a) sin A cos B (b) 0

(c) tan A tan B (d) cos A cos B

RRB Group-D – 17/09/2018 (Shift-I)

Ans : (b) Given that,

$\frac{\sin A + \sin B}{\cos A - \cos B} \quad \frac{\cos A + \cos B}{\sin A - \sin B}$

$\frac{\sin A - \sin B \quad \sin A - \sin B + \cos A - \cos B \quad \cos A - \cos B}{\cos A - \cos B \quad \sin A - \sin B}$

$\frac{\sin^2 A - \sin^2 B + \cos^2 A - \cos^2 B}{\cos A - \cos B \quad \sin A - \sin B}$

$\frac{\sin^2 A + \cos^2 A \quad - \quad \sin^2 B + \cos^2 B}{\cos A - \cos B \quad \sin A - \sin B}$

$\because \sin^2 \quad \cos^2 \quad 1$

$\frac{1 \quad 1}{\cos A - \cos B \quad \sin A - \sin B} = 0$

26. Complete the following–

ABC, $\cos \quad \frac{B \quad C}{2}$ **= ?**

(a) cos A (b) sin A/2

(c) sin A + B /2 (d) cot B

RRB Group-D – 29/10/2018 (Shift-III)

Ans : (b) $\because$ A + B + C = 180^0

B C 180 A

$\frac{B+C}{2} \quad \frac{180 - A}{2}$

$\cos \frac{B \quad C}{2} \quad \cos \frac{180^0 \quad A}{2}$

$\cos \quad \frac{B \quad C}{2} \quad \cos \quad 90^0 \quad \frac{A}{2}$

$\cos \quad \frac{B \quad C}{2} \quad \sin \frac{A}{2}$

27. In a triangle, right-angled at B, AB = 12 cm and BC = 5 cm. What will be the value of

(i) sinA cosA

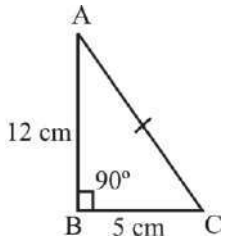
(ii) sinCcosC respectively ?

(a) $\frac{60}{169}, \frac{60}{169}$ (b) $\frac{25}{169}, \frac{60}{169}$

(c) $\frac{60}{169}, \frac{25}{169}$ (d) $\frac{26}{169}, \frac{25}{169}$

RRB NTPC 18.01.2021 (Shift-II) Stage Ist

Ans. (a): Given that,



From Pythagoras theorem

$AC^2 = AB^2 + BC^2$

$= 144 + 25$

$AC = \sqrt{169} = 13$

(i) $\sin A \times \cos A$ $\left(\because \sin \frac{\text{Perpendicular}}{\text{Hypotenuse}}, \cos \frac{\text{Base}}{\text{Hypotenuse}} \right)$

$= \frac{5}{13} \frac{12}{13} = \frac{60}{169}$

(ii) $\sin C \times \cos C$

$\frac{12}{13} \frac{5}{13} = \frac{60}{169}$

28. What is the value of the following expression?

$$\frac{\cos 3x + \cos x}{\sin 3x - \sin x}$$

(a) sin x (b) cot x

(c) cos x (d) tan x

RRB NTPC 31.01.2021 (Shift-II) Stage Ist

Ans. (b) : Given that,

$$\frac{\cos 3x \quad \cos x}{\sin 3x - \sin x}$$

We know that-

$$\cos \quad \cos \quad 2\cos \frac{}{2} \cdot \cos \frac{-}{2}$$

$$\sin \quad -\sin \quad 2\sin \frac{-}{2} \cdot \cos \frac{}{2}$$

$$\frac{2\cos \frac{3x \quad x}{2} \cdot \cos \frac{3x - x}{2}}{2\sin \frac{3x \quad x}{2} \cdot \cos \frac{3x \quad x}{2}} \quad \frac{2\cos 2x \cdot \cos x}{2\sin x \cdot \cos 2x}$$

$$\frac{\cos x}{\sin x} \quad \cot x$$

29. Simplify the following.

$$\sqrt{2 + \sqrt{2 + 2\cos 4\theta}}$$

(a) sin (b) cos

(c) 2 cos (d) cos 2

RRB NTPC 08.02.2021 (Shift-II) Stage I

Ans. (c) : $\sqrt{2 \quad \sqrt{2 \quad 2\cos 4}}$

$\{\cos 2 \quad 2\cos^2 \quad -1\}$

$\{2\cos^2 \quad 1 \quad \cos 2\}$

$\sqrt{2 + \sqrt{2 \ 1 + \cos 4\theta}}$

$\Rightarrow \sqrt{2 + \sqrt{2 \times 2\cos^2 2\theta}}$

$\Rightarrow \sqrt{2 + 2\cos 2\theta}$

$\Rightarrow \sqrt{2.2\cos^2 \theta}$

$2\cos$

30. If $\cot^2 = 1 + \cos^2 - \sin^2$, $0° < < 90°$ Then Find the value of $\tan^2 + \text{cosec}^2$.

(a) $\frac{3}{2}$ (b) $\frac{1}{2}$

(c) 3 (d) –1

RRB NTPC (Stage-2) 12/06/2022 (Shift-II)

Ans. (c) : $\cot^2 = 1 + \cos^2 - \sin^2$

$\frac{\cos^2}{\sin^2} \quad \cos^2 + \cos^2$

$\frac{\cos^2}{\sin^2} \quad 2\cos^2$

$\frac{1}{\sin^2} \quad 2$

$\text{cosec} = \sqrt{2}$

$= 45°$

So, $\tan^2 + \text{cosec}^2$

$= \tan^2 45° + \text{cosec}^2 45°$

$= 1 + \sqrt{2}^{\ 2}$

$= 1 + 2$

$= 3$

31. Find the value of $2\sec^2 A + 4\text{cosec}^2 A - 2\tan^2 A - 4\cot^2 A$:

(a) 4 (b) 2

(c) 8 (d) 6

RRB Group-D 22/08/2022 (Shift-I)

Ans. (d) : $2\sec^2 A + 4\text{cosec}^2 A - 2\tan^2 A - 4\cot^2 A$

$2\sec^2 A - 2\tan^2 A + 4\text{cosec}^2 A - 4\cot^2 A$

$2(\sec^2 A - \tan^2 A) + 4(\text{cosec}^2 A - \cot^2 A)$

$2 \times 1 + 4 \times 1$

$2 + 4$

6

32. Find the value of $\sin^2 + \cos^2 - (\sec^2 - \tan^2) + \tan \cos - \sin$

(a) $\sec^2$ (b) 4sin coss

(c) –1 (d) 0

RRB Group-D 13/09/2022 (Shift-III)

Ans. (d): $\sin^2 \quad + \cos^2 \quad - (\sec^2 \quad - \tan^2 \quad) + \tan \quad \cos \quad - \sin$

$= 1 - (1) + \frac{\sin}{\cos} \times \cos \theta - \sin \theta$

$= 0 + \sin \quad - \sin \qquad \{\because \sin^2 \quad \cos^2 \quad 1 \}$

$\{\sec^2 \quad 1 \quad \tan^2 \quad \}$

$= 0$

33. If $\sin^2 x + 3\cos^2 x = 2$, Deewj $(0^0 < x < 90^0)$ then find the value of cosec x

(a) $\frac{2\sqrt{3}}{3}$ (b) $\sqrt{3}$

(c) 2 (d) $\sqrt{2}$

RRB GROUP-D – 30/09/2022 (Shift-I)

Ans. (d) : $\sin^2 x + 3\cos^2 x = 2$

$\sin^2 x + \cos^2 x + 2\cos^2 x = 2$

$1 + 2\cos^2 x = 2$

$\cos^2 x \quad \frac{1}{2}$

$\cos x \quad \frac{1}{\sqrt{2}}$

$x = 45^\circ$

Hence cosecx = cosec $45^\circ = \sqrt{2}$

34. If $3\sin^2 \quad + 7\cos^2 \quad = 6$ and $0 < \quad \leq 90°$ then find the value of :

(a) 90° (b) 30°

(c) 60° (d) 45°

RRB GROUP - D – 29/09/2022 (Shift–II)

Ans. (b) : According to the question,

$3 \sin^2 \quad + 7 \cos^2 \quad = 6$

From the option (b)

$' \quad = 30^0'$

$3 \sin^2(30) + 7 \cos^2 30 = 6$

$3 \left(\frac{1}{2}\right)^2 \quad 7 \left(\frac{\sqrt{3}}{2}\right)^2 \quad 6$

$\frac{3}{4} \quad \frac{21}{4} \quad 6$

$\frac{24}{4} \quad 6$

$6 = 6$

L.H.S. = R.H.S.

Hence

35. If $p \sin^2 \quad + q \cos^2 \quad = r$ then find the value of $\cot^2$

(a) $\frac{p - r}{r - q}$ (b) $\frac{r - q}{r - p}$

(c) $\frac{r - q}{p - r}$ (d) $\frac{r - p}{r - q}$

RRB GROUP-D – 27/09/2022 (Shift-I)

Ans. (a) : $p \sin^2 \quad q \cos^2 \quad r$

$p \sin^2 \beta + q \quad 1 - \sin^2 \beta \quad = r$

$p \sin^2 \quad q \quad q \sin^2 \quad r$

$p \quad q \quad \sin^2 \quad r \quad q$

$\sin^2 \quad \frac{r \quad q}{p \quad q}$

$\cos^2 \quad 1 \quad \sin^2$

$1 \quad \frac{r \quad q}{p \quad q}$

$\frac{p \quad q \quad r \quad q}{p \quad q}$

$\frac{p \quad r}{p \quad q}$

$\cot^2 \quad \frac{\cos^2}{\sin^2} \quad \frac{\frac{p \quad r}{p \quad q}}{\frac{r \quad q}{p \quad q}}$

$\boxed{\cot^2 \quad \frac{p \quad r}{r \quad q}}$

36. If A is an acute angle then find the value of $\frac{1 \quad \tan^2 A}{1 \quad \cot^2 A}$:

(a) $\cos^2 A$ (b) $\tan^2 A$

(c) $\sin^2 A$ (d) $\sec^2 A$

RRB GROUP-D – 11/10/2022 (Shift-I)

Ans. (b) : $\frac{1 \quad \tan^2 A}{1 \quad \cot^2 A}$

$\because \left\{\tan A = \frac{\sin A}{\cos A}, \cot A = \frac{\cos A}{\sin A}\right\}$

$1 \quad \frac{\sin^2 A}{\cos^2 A} \qquad \because \sin^2 A \quad \cos^2 A \quad 1$

$1 \quad \frac{\cos^2 A}{\sin^2 A}$

$\frac{\cos^2 A \quad \sin^2 A}{\cos^2 A}$

$\frac{\sin^2 A \quad \cos^2 A}{\sin^2 A}$

$\frac{1}{\cos^2 A} \quad \frac{\sin^2 A}{1}$

$\frac{\sin^2 A}{\cos^2 A} = \tan^2 A$

37. Find the value of $2 - \frac{\sin^2 \alpha}{1 - \cos \alpha} + \frac{1 - \cos \alpha}{\sin \alpha} - \frac{\sin \alpha}{1 + \cos \alpha}$

(a) 1 – sin (b) 1 – cos

(c) 1 + sin (d) 1 + cos

RRB Group-D 26/08/2022 (Shift-III)

Ans. (b): Given

$$2 - \frac{\sin^2\alpha}{1-\cos\alpha} + \frac{1-\cos\alpha}{\sin\alpha} - \frac{\sin\alpha}{1+\cos\alpha}$$

$$= 2 - \left[\frac{1 \quad \cos^2}{1-\cos\alpha}\right] + \frac{1-\cos\alpha \quad 1+\cos\alpha \quad -\sin^2\alpha}{\sin\alpha \quad 1+\cos\alpha}$$

$$= 2 \quad 1 \quad \cos \quad \frac{1-\cos^2\alpha \quad -\sin^2\alpha}{\sin \quad 1 \quad \cos}$$

$$= 2 \quad 1 \quad \cos \quad \frac{\sin^2 \quad \sin^2}{\sin \quad 1 \quad \cos}$$

$$= 1 \quad \cos \quad 0 = 1 \quad \cos$$

38. Find the value of $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2$

(a) $5 + \text{cosec}^2 A - \sec^2 A$

(b) $5 + \text{cosec}^2 A + \sec^2 A$

(c) $5 + \sec A + \text{Cosec } A$

(d) $5 - \text{cosec}^2 A + \sec^2 A$

RRB Group-D 06/09/2022 (Shift-I)

Ans. (b) : $(\sin A + \text{cosec} A)^2 + (\cos A + \sec A)^2$

$= \sin^2 A + \text{cosec}^2 A + 2 + \cos^2 A + \sec^2 A + 2$

$= (\sin^2 A + \cos^2 A) + 4 + \text{cosec}^2 A + \sec^2 A$

$= 1+4 + \text{cosec}^2 A + \sec^2 A$

$= 5 + \text{cosec}^2 A + \sec^2 A$

39. If $\sec 4A = \text{cosec}(3A - 50^\circ)$ where 4A and 3A is an acute angle then find the value of $A + 75°$:

(a) 95° (b) 67°

(c) 78° (d) 105°

RRB Group-D 18/08/2022 (Shift-II)

Ans. (a) : $\sec 4A = \text{cosec}(3A - 50^\circ)$

$\text{cosec}(90^\circ - 4A) = \text{cosec}(3A - 50^\circ)$

$90^\circ - 4A = 3A - 50^\circ$

$90^\circ + 50^\circ = 3A + 4A$

$7A = 140^\circ$

$A = 20^\circ$

$A + 75^\circ = ?$

$20^\circ + 75^\circ$

95°

40. If $\cos^4 - \sin^4 = k$ then find the value of $\frac{1+k}{1-k}$

(a) $\cot^2$ (b) $\sin^2$

(c) $\tan^4$ (d) cosec^2

RRB Group-D 29/08/2022 (Shift-II)

Ans. (a) : $\cos^4 - \sin^4 = k$

$(\cos^2 - \sin^2)(\cos^2 + \sin^2) = k$

$\cos 2 \times 1 = k \quad \left[\because \cos^2 \quad \sin^2 \quad 1 \quad \cos^2\theta - \sin^2\theta = \cos 2\theta\right]$

$k = \cos 2$

$$\frac{1+k}{1-k} \quad \frac{1+\cos 2\theta}{1-\cos 2\theta}$$

$$\frac{\sin^2\theta + \cos^2\theta + \cos^2\theta - \sin^2\theta}{\sin^2\theta + \cos^2\theta + \cos^2\theta - \sin^2\theta}$$

$$= \frac{2\cos^2}{2\sin^2} = \cot^2\theta$$

41. If is an acute angle and $\text{cosec}\theta - \cot\theta^{\ 2} = \frac{1-\cos\theta}{A}$ then find the value of denominator A.

(a) $1 + \sin$

(b) cot

(c) $1 + \cos$

(d) cosec $- 1$

RRB GROUP-D – 17/08/2022 (Shift-III)

Ans. (c) : Given -

$$\text{cosec}\theta - \cot\theta^{\ 2} = \frac{1-\cos\theta}{A}$$

$$\left(\frac{1}{\sin} \quad \frac{\cos}{\sin}\right)^2 \quad \frac{1 \quad \cos}{A}$$

$$\frac{1-\cos\theta^{\ 2}}{\sin} \quad \frac{1-\cos\theta}{A}$$

$$\frac{1-\cos\theta \quad 1-\cos\theta}{\sin^2} \quad \frac{1 \quad \cos}{A}$$

$$\frac{1 \quad \cos}{\sin^2} \quad \frac{1}{A}$$

$$A \quad \frac{\sin^2}{1-\cos\theta} \quad \frac{1 \quad \cos^2}{1-\cos\theta}$$

$$\frac{1-\cos\theta \quad 1+\cos\theta}{1 \quad \cos} \qquad a^2 - b^2 = a + b \quad a - b$$

$A = 1 + \cos$

42. If $\tan = 1$ (is an acute angle) then the value of $2\sin \cos - \text{cosec}^2$ is:

(a) $1 - \sqrt{2}$ (b) 1

(c) -1 (d) -3

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (c) : Given,

$\tan \quad 1$

$\tan \quad = \tan 45^\circ$

45

$2\sin 0 \cos 0 - \text{cosec}^2 0 \quad 2\sin 45^\circ \cos 45^\circ - \text{cosec}^2 45^\circ$

$$= 2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} - \sqrt{2}^{\ 2}$$

$$2 \quad \frac{1}{2} \quad 2$$

$= 1 - 2$

$= -1$

43. If $\sqrt{3}\sin \quad \cos \quad 0$ (is an acute angle), then the value of $\cos^3 \quad \sqrt{3}\sin^3$ will be:

(a) $\frac{\sqrt{3}}{2}$ (b) -1

(c) $\frac{3}{8}$ (d) $\frac{\sqrt{3}}{4}$

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (d) : Given,

$\sqrt{3}\sin \quad \cos \quad 0 \qquad \sqrt{3}\sin \quad \cos$

$\sqrt{3} \quad \frac{\cos}{\sin}$

$\cot \quad \sqrt{3}$

30^0

$\cos^3\theta - \sqrt{3}\sin^3\theta - \cos^3 30^0 - \sqrt{3}\sin^3 30^0$

$\left(\frac{\sqrt{3}}{2}\right)^3 \quad \sqrt{3}\left(\frac{1}{2}\right)^3$

$\frac{3\sqrt{3} \quad \sqrt{3}}{8} \quad \frac{\sqrt{3}}{4}$

44. If tan + cot = 6, then find the value of $\tan^2$ + $\cot^2$.

(a) 34 (b) 54

(c) 44 (d) 24

RRB NTPC 31.01.2021 (Shift-II) Stage Ist

Ans. (a) : Given,

tan +cot = 6

On squaring both sides,

$(\tan +\cot)^2 = 6^2$

$6^2 = \tan^2\theta + \cot^2\theta + 2\tan\theta.\frac{1}{\tan}$

$\tan^2 \quad \cot^2 = 36-2 = 34$

45. If $\text{cosec}\,\theta \times \tan\theta = \frac{2}{\sqrt{3}}$ and is an acute angle then find the value of :

(a) 30º (b) 60º

(c) 90º (d) 45º

RRB NTPC (Stage-2) 16/06/2022 (Shift-II)

Ans. (a) : Given -

$\text{cosec} \times \tan = \frac{2}{\sqrt{3}}$

From the option (a) putting the value of = 30º

$\text{cosec}\,30° \times \tan 30° = \frac{2}{\sqrt{3}}$

$2 \times \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$

$\frac{2}{\sqrt{3}} = \frac{2}{\sqrt{3}}$

LHS = RHS

Hence,

46. When $\alpha = 30°$, then find the value of sin cos :

(a) $\frac{\sqrt{3}}{4}$ (b) $\frac{3}{4}$

(c) $\frac{\sqrt{3}}{3}$ (d) $\frac{\sqrt{3}}{2}$

RRB NTPC (Stage-2) 17/06/2022 (Shift-II)

Ans. (a) : Given

= 30°, then sin .cos = ?

$\sin 30°.\cos 30°$

$\frac{1}{2} \quad \frac{\sqrt{3}}{2}$

$\boxed{\frac{\sqrt{3}}{4}}$

47. Slove the following :

$\sin 60º + \tan 30º + \cos 45º$

(a) $\frac{3\sqrt{2} \quad 5\sqrt{3}}{4}$ (b) $\frac{5\sqrt{2} \quad 3\sqrt{3}}{4}$

(c) $\frac{3\sqrt{2} \quad 5\sqrt{3}}{6}$ (d) $\frac{5\sqrt{2} \quad 3\sqrt{3}}{6}$

RRB NTPC (Stage-2) 15/06/2022 (Shift-I)

Ans. (c) : $\sin 60º + \tan 30º + \cos 45º$

$\frac{\sqrt{3}}{2} \quad \frac{1}{\sqrt{3}} \quad \frac{1}{\sqrt{2}}$

$\frac{3\sqrt{2} \quad 2\sqrt{2} \quad 2\sqrt{3}}{2\sqrt{6}}$

$= \frac{2\sqrt{3} \quad 5\sqrt{2}}{2\sqrt{6}} \times \frac{2\sqrt{6}}{2\sqrt{6}}$

$\frac{4 \quad 3\sqrt{2} \quad 10 \quad 2\sqrt{3}}{4 \quad 6}$

$\frac{4 \quad 3\sqrt{2} \quad 5\sqrt{3}}{4 \quad 6}$

$\boxed{\frac{3\sqrt{2} \quad 5\sqrt{3}}{6}}$

48. Solve the following

$$\frac{\cos^2(45°+\theta) + \cos^2(45°-\theta)}{\text{cosec}^2 30°\sin^2 45° - \sec^2 60°}$$

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$

(c) $\frac{1}{6}$ (d) $\frac{1}{2}$

RRB NTPC (Stage-2) 12/06/2022 (Shift-I)

Ans. (b): $\dfrac{\cos^2 45° + \theta + \cos^2 45° - \theta}{\text{cosec}^2 30° \sin^2 45° - \sec^2 60°}$

$= \dfrac{\cos^2(45° + \theta) + \sin^2(45° + \theta)}{4 \quad \frac{1}{2} \quad 4}$

$\left[\because \cos^2 45° - \theta = \cos^2 90° - 45° - \theta \right.$
$\left. \sin^2 45 \right]$

$= \dfrac{1}{2 - 4} \quad \dfrac{1}{2}$

49. If $\sin^2$ - $\sin 30°$ = 0 and find the value of :

(a) 45° (b) 0°

(c) 90° (d) 60°

RRB NTPC (Stage-2) 15/06/2022 (Shift-III)

Ans. (a) : If $\sin^2 - \sin 30° = 0$

$\sin^2 = \sin 30°$

$\sin^2 = \dfrac{1}{2}$

$\sin = \dfrac{1}{\sqrt{2}}$

$\sin^{-1} \dfrac{1}{\sqrt{2}} = 45°$

50. Express sin 58° + cos 82° in terms of trigonometric ratios of angles between 0° and 45°.

(a) cos 32° + cos 8° (b) sin 32° + sin 8°

(c) cos 32° + sin 8° (d) sin 32° + cos 8°

RRB Group-D 29/08/2022 (Shift-II)

Ans. (c) : sin58° + cos82°

= sin(90° – 32°) + cos(90° – 8°)

= cos32° + sin8°

51. Find the value of sec33°cosec57° – cot57° tan33° + cot47°cot43°

(a) 0 (b) –1

(c) 2 (d) 1

RRB Group-D 13/09/2022 (Shift-II)

Ans. (c) :

sec33°cosec57° – cot57°tan33° + cot47°cot43°

= sec(90° – 57°) cosec57° – cot57° tan(90° – 57°) + cot (90° – 43°) cot43°

= $\text{cosec}^2 57° - \cot^2 57° + \tan 43° \cot 43°$

$= 1 + 1 \quad \left[\because \text{cosec}^2 \quad \cot^2 \quad 1 \right.$
$\left. \tan \quad \cot \quad 1 \right]$

= 2

52. Find the value of $\dfrac{\sin^2 54° + \sin^2 36°}{\tan^2 40° - \text{cosec}^2 50°}$

(a) –1 (b) 1

(c) 0 (d) 2

RRB Group-D 08/09/2022 (Shift-III)

Ans. (a) : $\dfrac{\sin^2 54° + \sin^2 36°}{\tan^2 40° - \text{cosec}^2 50°}$

$= \dfrac{\sin^2 90° - 36° + \sin^2 36°}{\tan^2 90° - 50° - \text{cosec}^2 50°}$

$= \dfrac{\cos^2 36 \quad \sin^2 36}{\cot^2 50 \quad \text{cosec}^2 50}$

$\dfrac{\cos^2 36 \quad \sin^2 36}{- \text{cosec}^2 50° - \cot^2 50°}$

$\dfrac{1}{1} \quad \left[\because \cos^2 \quad \sin^2 \quad 1 \right.$
$\left. \text{cosec}^2 \quad \cot^2 \quad 1 \right]$

= –1

53. Find the value of

$\dfrac{\cos^2 22° + \cos^2 68°}{2 \sin^2 22° + \sin^2 68°} \quad \sin^2 16° \quad \cos 16° \sin 74°$

(a) $\dfrac{3}{2}$ (b) 2

(c) $\dfrac{1}{2}$ (d) 0

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (c) :

$\dfrac{\cos^2 22 \quad \cos^2 68}{2(\sin^2 22 \quad \sin^2 68)} - \sin^2 16° - \cos 16° \sin 74°$

$\dfrac{\cos^2 22° + \cos^2(90° - 22°)}{2(\sin^2 22° + \sin^2(90° - 22°))}$

$- (\sin^2 16° + \cos 16°.\sin(90 - 16°)$

$\dfrac{\cos^2 22 \quad \sin^2 22}{2(\sin^2 22 \quad \cos^2 22)}$

$- (\sin^2 16° + \cos 16°.\cos 16°)$

$= \dfrac{1}{2 \quad 1} - (\sin^2 16° + \cos^2 16°)$

$= \dfrac{1}{2} \quad 1$

$= -\dfrac{1}{2}$

54. tan 100° + tan 125° + tan 100° tan 125° is equal to:

(a) 0 (b) –1

(c) 1/2 (d) 1

RRB NTPC 11.03.2021 (Shift-II) Stage Ist

Ans. (d) : tan 100° + tan 125° + tan 100° tan 125° = ?

$\tan(A+B) \quad \dfrac{\tan A \quad \tan B}{1 \quad \tan A \quad \tan B}$

$\tan(100 \quad 125°) \quad \dfrac{\tan 100° \quad \tan 125°}{1 \quad \tan 100° \quad \tan 125°}$

$\tan(225°)$ $\frac{\tan 100° \quad \tan 125°}{1 \quad \tan 100° \ \tan 125°}$

$\tan(180° \quad 45°)$ $\frac{\tan(100°) \quad \tan 125°}{1 \quad \tan 100 \ \tan 125}$

{tan (180+) = tan }

$\tan 45°$ $\frac{\tan 100° \quad \tan 125°}{1 \quad \tan 100 \tan 125°}$

1– tan 100º. tan 125º = tan 100º + tan 125º

1 = tan 100º + tan 125º+tan 100º tan 125º

55. In a triangle ABC that is right angled at C, A B . The value of sin A sin B + cosAcosB is:

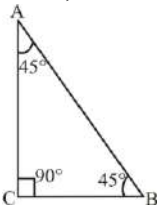
(a) $\frac{1}{2}$ (b) 0

(c) 1 (d) $\frac{1}{\sqrt{2}}$

RRB NTPC 01.03.2021 (Shift-I) Stage Ist

Ans. (c) : Given- ∵ C = 90° and A = B

then A = 45° , B = 45°



sinA sinB + cosA cosB

= sin45° sin45° + cos45° cos45°

$= \frac{1}{\sqrt{2}} \ \frac{1}{\sqrt{2}} \ \frac{1}{\sqrt{2}} \ \frac{1}{\sqrt{2}} = \frac{1}{2} \ \frac{1}{2} \ 1$

56. Find the value

$$\cot 19° \left(\cot 71° \cos^2 21° + \frac{1}{\tan 71° \sec^2 69°} \right)$$

(a) 1/2 (b) 1

(c) 0 (d) –1

RRB NTPC 01.03.2021 (Shift-I) Stage Ist

Ans. (b) :

$\cot 19° \left(\cot 71 \quad \cos^2 21 \quad \frac{1}{\tan 71 \quad \sec^2 69} \right)$

= cot19° $\tan 19° \cdot \cos^2 21° + \cot 71° \cdot \cos^2 69$

= cot19°.tan19° ($\cos^2 21° + \sin^2 21°$)

{∵ cot(90°–) = tan }

∵ $\cot \theta \cdot \tan \theta - 1$ and $\sin^2 \theta + \cos^2 \theta - 1$

= $\cos^2 21° + \sin^2 21° = 1$

57. If $\sqrt{\frac{1 - \cos 2\theta}{1 + \cos 2\theta}} = \frac{1}{\sqrt{3}}$, then the value of is:

(a) $\frac{2n}{6}$ (b) $\frac{n}{3}$

(c) $\frac{n}{6}$ (d) $\frac{n}{4}$

RRB NTPC 02.03.2021 (Shift-II) Stage Ist

Ans. (c) : $\sqrt{\frac{1 \quad \cos 2}{1 \quad \cos 2}} \quad \frac{1}{\sqrt{3}}$

On squaring both sides- $\frac{1 \quad \cos 2}{1 \quad \cos 2} \quad \frac{1}{3}$

$\frac{1 \quad 1 \quad 2\sin^2}{1 \quad 2\cos^2 \quad 1} \quad \frac{1}{3}$

$\frac{\sin^2}{\cos^2} \quad \frac{1}{3}$

$\tan^2 = \frac{1}{3}$

$\tan = \frac{1}{\sqrt{3}} = \tan 30°$

Value of $= n + \frac{}{6}$

58. sin 25º cos35º + cos 25º sin 35º = ?

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{\sqrt{2}}$

(c) 1 (d) $\frac{1}{2}$

RRB NTPC 02.03.2021 (Shift-I) Stage Ist

Ans. (a) sinA.cosB + cosA.sinB = sin (A + B)

$\sin 25° . \cos 35° + \cos 25° \sin 35° = \sin(25° + 35°)$

$= \sin 60°$

$= \frac{\sqrt{3}}{2}$

59. Find the value of $\cos 37° \sec 143° + \sin 34° \operatorname{cosec} 146°$

(a) –1 (b) 1

(c) $\frac{1}{2}$ (d) 0

RRB NTPC 08.02.2021 (Shift-I) Stage Ist

Ans. (d) : $\cos 37° \sec 143° + \sin 34° \operatorname{cosec} 146°$

$\frac{\cos 37°}{\cos 143°} + \frac{\sin 34°}{\sin 146°} = \frac{\cos 37°}{\cos \ 180° - 37°} + \frac{\sin 34°}{\sin \ 180° - 34°}$

$= \frac{\cos 37°}{\cos 37} + \frac{\sin 34°}{\sin 34} = -1 + 1 = 0$

60. Value of A for the equation:
tan A + tan 2A + tan 3A = tan A tan 2A tan 3A

(a) $\frac{}{3}, \frac{2}{3}$ (b) $\frac{5}{6}$

(c) only $\frac{}{3}$ (d) only $\frac{2}{3}$

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (a) : $\tan A + \tan 2A + \tan 3A - \tan A \tan 2A \tan 3A$

$\tan A + \tan 2A - \tan A \tan 2A \cdot \tan 3A - \tan 3A$

$\tan A \quad \tan 2A \quad \tan 3A \quad \tan A \tan 2A - 1$

$\frac{\tan A + \tan 2A}{1 - \tan A \tan 2A} = \tan 3A$

$\tan A + 2A = \tan 3A$

$2\tan 3A = 0$

$\tan 3A = 0$

$\tan 3A = \tan$

$3A =$

$A = -, \frac{2}{3}$

Hence the value of A is $-$ and $\frac{2}{3}$

61. Find the value of $\sin^2 5° + \sin^2 10° + \sin^2 80° + \sin^2 85°$.

(a) 0 (b) 1

(c) 2 (d) 3

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (c) :

$\sin^2 5° + \sin^2 10° + \sin^2 80° + \sin^2 85°$

$= \sin^2 5° + \sin^2 10° + \sin^2 (90° - 10°) + \sin^2 (90° - 5°)$

$= \sin^2 5° + \sin^2 10° + \cos^2 10° + \cos^2 5°$

$= (\sin^2 5° + \cos^2 5°) + \sin^2 10° + \cos^2 10°$

$= 1 + 1$ .....[$\because \sin^2 + \cos^2 = 1$]

$= 2$

62. Evaluate:

$3\tan 25° \tan 35° \tan 45° \tan 55° \tan 65°$

(a) 0 (b) 3

(c) 4 (d) $3\sqrt{3}$

RRB NTPC 03.03.2021 (Shift-II) Stage Ist

Ans. (b) :

$3\tan 25°. \tan 35°. \tan 45°. \tan 55°. \tan 65°$

$= 3\tan 25°. \tan 35°. \tan 45°. \tan(90° - 35°). \tan(90° - 25°)$

$= 3\tan 25°. \tan 35°. \tan 45°. \cot 35° \cot 25°$

$= 3.\tan 45° = 3 \times 1 = 3$

$\{\because \tan(90° -) = \cot ; \tan .\cot = 1 ; \tan 45° = 1\}$

63. Find the value of tan 1°. tan 2°. tan 3° ..... tan 89°

(a) $\sqrt{3}$ (b) 0

(c) 1 (d) $\frac{1}{\sqrt{3}}$

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (c) :

$\tan 1^0 \tan 2^0 \tan 3^0 \cdots\cdots \tan 87^0 \tan 88^0 \tan 89^0$

($\because \tan(90° -) = \cot$)

$\tan 1^0 \tan 2^0 \tan 3^0 \cdots\cdots \cot 3^0 \cot 2^0 \cot 1^0$

$= 1$ ($\because \tan .\cot = 1$)

64. What is the value of the following expression? (tan 2° tan 88°) (tan3° tan87°).... (tan43° tan47°) tan45°

(a) 0 (b) 1

(c) –1 (d)

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (b) : From the question,

(tan2° tan88°) (tan3° tan87°) **.....** (tan43° tan47°) tan45°

=tan2°.tan(90°–2°).tan3.tan(90°–3°) **.....** tan43° tan(90–43°)**.** tan 45°

= (tan2°.cot2°)(tan3°.cot3°) **.....** (tan43°. cot43°).tan45°

= 1×1 **.....** 1×1 [tanθ. cotθ =1]

= 1

65. Find the value of $\cos^2 (270° -) - \sin^2 (180° -) + \sin^2 \frac{\pi}{2} \sin^2 (270° -)$

(a) $\sin^2 ( )$ (b) $\cos^2 ( )$

(c) $\sin^2 \frac{}{2}$ (d) $\sin^2 ( ) - 1$

RRB NTPC 08.01.2021 (Shift-I) Stage Ist

Ans. (b) :

$\cos^2 (270° - \phi) - \sin^2 (180° - \phi) + \sin^2 \frac{}{2} \sin^2 (270° - \phi)$

$\{\because \cos(270° -) = -\sin ; \sin(180° -) = \sin ; \sin(270° -) = -\cos\}$

$(-\sin\phi)^2 - \sin^2\phi + 1. -\cos\phi^2$

$= \sin^2\phi - \sin^2\phi + \cos^2\phi$

$= \cos^2$

66. Value of $\cos 1° \cos 2° \cos 3° \ldots\ldots\ldots \cos 179°$ is :

(a) 0 (b) –1

(c) 1 (d) $\frac{1}{2}$

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (a) : $\cos 1° \cos 2° \cos 3° \ldots\ldots\ldots \cos 179°$

$= 0$ { $\because \cos 90° = 0$ }

67. Find the value of the expression [cosec (75° +) – sec (15° -) – tan (55° +) + cot (35° –)].

(a) 1 (b) 0

(c) –1 (d) $\frac{3}{2}$

RRB NTPC 18.01.2021 (Shift-I) Stage Ist

Ans. (b) :

$[\text{cosec}\ 75° - \theta - \sec 15° - \theta - \tan 55° - \theta + \cot 35° - \theta]$

= cosec {90° – (15°–)} – sec (15° –) – tan {90°–(35°–)} + cot (35° –)

= sec (15°–) – sec (15° –)–cot (35°–) + cot (35°–)

= 0

68. If

$6\sec^2 59° - \cot^2 31° + \frac{2}{3}\sin 90° - 3\tan^2 56° \tan^2 34° \frac{y}{3}$

then the value of y is:

(a) 3 (b) 1

(c) 4 (d) 2

RRB NTPC 08.01.2021 (Shift-II) Stage Ist

Ans. (d): $6\sec^2 59^\circ - \cot^2 31^\circ + \frac{2}{3}\sin 90^\circ - 3\tan^2 56^\circ \text{ y } \tan^2 34^\circ = \frac{y}{3}$

$6\sec^2 59^\circ - \tan^2 59^\circ + \frac{2}{3} \times 1 - 3\tan^2 56^\circ \text{ y } \cot^2 56^\circ = \frac{y}{3}$

$\{\because \tan(90 \quad) \quad \cot\}$

$\{\sec^2 \quad \tan^2 \quad 1\}$

$6 \quad 1 \quad \frac{2}{3} \quad 3y \quad \frac{y}{3}$

$\frac{20}{3} \quad \frac{10y}{3}$

$y \quad 2$

69. The value of $5\sin14^\circ \sec76^\circ + 3\cot15^\circ \cot75^\circ + 2\tan45^\circ$ is :

(a) 0 (b) 10

(c) 1 (d) 8

RRB NTPC 28.12.2020 (Shift-I) Stage Ist

Ans. (b) : $5\sin14^\circ \sec76^\circ + 3\cot15^\circ \cot75^\circ + 2\tan45^\circ$

$= 5\sin14^\circ \sec(90^\circ - 14^\circ) + 3\cot(90^\circ - 75^\circ)\cot75^\circ + 2\tan45^\circ$

$\left(\because \sin 90 \quad \cos \right)$

$\left(\cos 90 \quad \sin \right)$

$= 5\sin14^\circ \operatorname{cosec}14^\circ + 3\tan75^\circ \cot75^\circ + 2\tan45^\circ$

$= 5 \times 1 + 3 \times 1 + 2 \times 1 = 5 + 3 + 2 = 10$

70. Find the value of $\sin\frac{7\pi}{4}\sin\frac{\pi}{4}\sin\frac{3\pi}{4}\sin\frac{5\pi}{4}$

(a) $\frac{1}{4}$ (b) $\frac{1}{8}$

(c) $\frac{1}{16}$ (d) $\frac{3}{16}$

RRB JE - 22/05/2019 (Shift-I)

Ans : (a)

$\sin\frac{7\pi}{4}\sin\frac{\pi}{4}\sin\frac{3\pi}{4}\sin\frac{5\pi}{4}$

$= \sin\left(\pi + \frac{3\pi}{4}\right)\sin\frac{\pi}{4}\sin\frac{3\pi}{4}\sin\left(\pi + \frac{\pi}{4}\right)$

$= \left(-\sin\frac{3\pi}{4}\right)\sin\frac{\pi}{4}\sin\frac{3\pi}{4}\left(-\sin\frac{\pi}{4}\right)$

$= \sin\frac{3\pi}{4}\sin\frac{\pi}{4}\sin\frac{3\pi}{4}\sin\frac{\pi}{4}$

$= \sin\left(\pi - \frac{\pi}{4}\right)\sin\frac{\pi}{4}\sin\left(\pi - \frac{\pi}{4}\right)\sin\frac{\pi}{4}$

$= \sin\frac{\pi}{4}\sin\frac{\pi}{4}\sin\frac{\pi}{4}\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = \frac{1}{4}$

71. Simplify: $\sin780^0 \sin480^0 + \cos120^0 \sin30^0$

(a) 2/3 (b) 1/3

(c) 0 (d) 1/2

RRB JE - 24/05/2019 (Shift-I)

Ans: (d) $\sin780^0 \sin480^0 + \cos120^0 \sin30^0$

$= \sin(2\times360^\circ+60^\circ)\sin(360^\circ + 120^\circ) + \cos120^\circ \sin30^\circ$

$= \sin60^\circ \sin(120^\circ) + \cos120^\circ \sin30^\circ$

$= \sin60^\circ \sin(90^\circ + 30^\circ) + \cos(90^\circ + 30^\circ)\sin30^\circ$

$= \sin60^\circ \cos30^\circ - \sin30^\circ\sin30^\circ$

$= \frac{\sqrt{3}}{2} \quad \frac{\sqrt{3}}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{3}{4} \quad \frac{1}{4} \quad \frac{2}{4} \quad \frac{1}{2}$

72. Simplify:

$\cos5^0 + \cos24^0 + \cos175^0 + \cos204^0 + \cos300^0$

(a) 1/2 (b) 1

(c) -1/2 (d) 0

RRB JE - 25/05/2019 (Shift-I)

Ans : (a)

$\cos5^0 + \cos24^0 + \cos175^0 + \cos204^0 + \cos300^0$

$= \cos5^\circ + \cos24^\circ + \cos(180^\circ - 5^\circ) + \cos(180^\circ + 24^\circ) + \cos(270^\circ + 30^\circ)$

$= \cos5^\circ + \cos24^\circ - \cos5^\circ - \cos24^\circ + \sin30^\circ$

$= \sin30^\circ = \frac{1}{2}$

73. Find the value of $\tan10^\circ \tan15^\circ \tan80^\circ \tan75^\circ$

(a) 1/3 (b) 1

(c) 1/2 (d) 2/3

RRB JE - 25/05/2019 (Shift-II)

Ans : (b) $\tan10^\circ . \tan15^\circ . \tan80^\circ . \tan75^\circ$

$= \tan10^\circ . \tan15^\circ . \tan(90^\circ - 10^\circ)\tan(90^\circ - 15^\circ)$

$= \tan10^\circ . \tan15^\circ . \cot10^\circ . \cot15^\circ$

$= \tan10^\circ . \tan15^\circ \times \frac{1}{\tan10} \times \frac{1}{\tan15}$

$= 1$

74. Find the value of $\tan^2 60^\circ - 2\tan^2 45^\circ - \cot^2 30^\circ + 2\sin^2 30^\circ + 3/4\operatorname{cosec}^2 45^\circ$

(a) $\frac{\sqrt{3}}{2}$ (b) 0

(c) 2 (d) – 1

RRB JE - 31/05/2019 (Shift-I)

Ans : (b) $\tan^2 60^\circ - 2\tan^2 45^\circ - \cot^2 30^\circ + 2\sin^2 30^\circ + 3/4\operatorname{cosec}^2 45^\circ$

$(\sqrt{3})^2 - 2 \times 1 - (\sqrt{3})^2 + 2 \quad \frac{1}{2}^{\ 2} + \frac{3}{4} \times \sqrt{2}^{\ 2}$

$3 - 2 - 3 + 2\times \frac{1}{4} + \frac{3}{4} \times 2$

$3 - 5 + \frac{1}{2} \quad \frac{3}{2}$

$\frac{6 \quad 10 \quad 1 \quad 3}{2} = \frac{10 \quad 10}{2} \quad 0$

75. If $\sqrt{2}\sin(5x - 5)^\circ = \tan45^\circ$, then the value of x (in degrees) is:

(a) 16 (b) 12

(c) 14 (d) 10

RRB NTPC 09.02.2021 (Shift-II) Stage I

Ans. (d): $\sqrt{2}\sin 5x - 5^\circ \quad \tan 45^\circ$

$\sqrt{2}\sin(5x-5)^\circ = 1$

$\sin(5x-5)^\circ = \frac{1}{\sqrt{2}}$

$\sin(5x-5)^\circ = \sin 45^\circ$

$5x - 5^\circ \quad 45^\circ$

$5x \quad 50^\circ$

$x \quad 10^\circ$

76. If x = 3cosAcosB, y = 3cosAsinB and z = 3sinA, find the value of $x^2 + y^2 + z^2$

(a) 9 (b) 6

(c) 12 (d) 3

RRB NTPC 23.07.2021 (Shift-II) Stage Ist

Ans. (a) : Given-

$x \quad 3\cos A\cos B$

$y \quad 3\cos A\sin B$

$z \quad 3\sin A$

$x^2 \quad y^2 \quad z^2$

$= 9\cos^2 A\cos^2 B + 9\cos^2 A\sin^2 B + 9\sin^2 A$

$= 9\cos^2 A \quad \cos^2 B + \sin^2 B \quad + 9\sin^2 A$

$= 9\cos^2 A \times 1 + 9\sin^2 A \qquad \because \sin^2\theta + \cos^2\theta = 1$

$9\cos^2 A \quad \sin^2 A$

$9 \quad 1$

9

77. If $x\cos 45^\circ \sin 120^\circ + \sin 60^\circ = -x\sin 90^\circ + 1$, then the value of x is:

(a) $\frac{2+\sqrt{3}}{\sqrt{2}+\sqrt{3}}$ (b) $\frac{2-\sqrt{3}}{2\sqrt{2}+\sqrt{3}}$

(c) $\frac{2-\sqrt{3}}{\sqrt{2}+\sqrt{3}}$ (d) $\frac{2\sqrt{2}-\sqrt{6}}{2\sqrt{2}+\sqrt{3}}$

RRB NTPC 16.01.2021 (Shift-II) Stage Ist

Ans. (d) : $x\cos 45^\circ \sin 120^\circ + \sin 60^\circ = -x\sin 90^\circ + 1$

$x \times \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} = -x \times 1 + 1$

$\frac{\sqrt{3}}{2\sqrt{2}} \quad 1 \quad x = 1 - \frac{\sqrt{3}}{2}$

$\frac{\sqrt{3} \quad 2\sqrt{2}}{2\sqrt{2}} \quad x = \frac{2 \quad \sqrt{3}}{2}$

$x = \frac{2\sqrt{2} \quad \sqrt{6}}{2\sqrt{2} \quad \sqrt{3}}$

78. If $\sec = 5x$ and $\tan \quad \frac{5}{x}$, then the value of $10\left(x^2 \quad \frac{1}{x^2}\right)$ is

(a) $\frac{3}{5}$ (b) $\frac{1}{5}$

(c) $\frac{2}{5}$ (d) 2

RRB NTPC 04.01.2021 (Shift-II) Stage Ist

Ans. (c) : $\sec \quad 5x \quad \ldots(i)$

$\tan \quad 5/x \quad \ldots(ii)$

From equation (i) and equation (ii)-

$\sec^2 \quad - \tan^2 \quad = 25\left(x^2 - \frac{1}{x^2}\right)$

$1 \quad 25\left(x^2 \quad \frac{1}{x^2}\right)$

$\left(x^2 \quad \frac{1}{x^2}\right) \quad \frac{1}{25}$

$10\left(x^2 \quad \frac{1}{x^2}\right) \quad \frac{10}{25}$

$10\left(x^2 \quad \frac{1}{x^2}\right) \quad \frac{2}{5}$

79. If $x + \frac{1}{x} = 2\cos$, then what is the value of $x^2 + \frac{1}{x^2}$?

(a) cos 2 (b) sin 2

(c) 2cos 2 (d) 2sin 2

RRB NTPC 04.03.2021 (Shift-I) Stage Ist

Ans. (c) : $x \quad \frac{1}{x} = 2\cos$

On squaring both sides,

$x + \frac{1}{x}^2 = 2\cos\theta^2$

$x^2 + \frac{1}{x^2} + 2 = 4\cos^2\theta$

$x^2 \quad \frac{1}{x^2} \quad 4\cos^2 \quad 2$

$x^2 + \frac{1}{x^2} = 2 \quad 2\cos^2\theta - 1$

$x^2 \quad \frac{1}{x^2} \quad 2\cos 2$

80. If $x = r\sin A\cos C$, $y = r\sin A\sin C$ and $z = r\cos A$, then find the value of $x^2 + y^2 + z^2$

(a) $2r^2$ (b) 2r

(c) 0 (d) r^2

RRB NTPC 11.01.2021 (Shift-I) Stage Ist

Ans. (d): Given-

$x = r \sin A.\cos C$

$y = r \sin A.\sin C$

$z = r \cos A$

$x^2 + y^2 + z^2 = r^2\sin^2 A.\cos^2 C + r^2\sin^2 A.\sin^2 C + r^2\cos^2 A$

$= r^2 [\sin^2 A (\cos^2 C + \sin^2 C) + \cos^2 A]$

$= r^2 [\sin^2 A + \cos^2 A]$

$\{\because \sin^2 + \cos^2 = 1\}$

$x^2 + y^2 + z^2 = r^2$

81. $\cos(x - y) = \frac{\sqrt{3}}{2}$ **and** $\sin(x + y) = 1$**, where x and y are positive acute angles and x y, then x and y are:**

(a) 50º, 40º (b) 70º, 20º

(c) 60º, 30º (d) 80º, 10º

RRB NTPC 25.01.2021 (Shift-II) Stage Ist

Ans. (c) : $\cos(x - y) = \frac{\sqrt{3}}{2}$

$(x - y) = 30°$ .....(i)

$\sin(x + y) = 1$

$x + y = 90°$ .....(ii)

From equation (i) and equation (ii),

$x - y = 30°$

$x + y = 90°$

$2x = 120°$

$x = 60°$

On putting the value of x in equation (i)

$60° - y = 30°$

$y = 30°$

Hence, x = 60º, y = 30º

82. **If** $x = a\sin$ **, and** $y = b\tan$ **, then find the value of** $\frac{a^2}{x^2} \quad \frac{b^2}{y^2}$**.**

(a) 2 (b) -1

(c) 0 (d) 1

RRB NTPC 13.01.2021 (Shift-II) Stage Ist

Ans. (d) : $x = a\sin$, $y = b\tan$

$\frac{a}{x} \quad \frac{1}{\sin}, \frac{b}{y} \quad \frac{1}{\tan}$

then, $\frac{a^2}{x^2} \quad \frac{b^2}{y^2} \quad \frac{1}{\sin^2} \quad \frac{\cos^2}{\sin^2}$

$\frac{1 \quad \cos^2}{\sin^2} \quad \because \sin^2\theta + \cos^2\theta = 1$

$\frac{\sin^2}{\sin^2}$

$= 1$

83. **If** $\sin(A \quad B) \quad \frac{1}{2}$ **and** $\cos(A \quad B) \quad \frac{1}{2}$ **with** $0^0 < (A + B) \leq 90^0, A > B$ **then find the measure of A and B.**

(a) $35^\circ, 15^\circ$ (b) $40^\circ, 35^\circ$

(c) $25^\circ, 20^\circ$ (d) $45^\circ, 15^\circ$

RRB NTPC 01.02.2021 (Shift-I) Stage Ist

Ans. (d) :

$\sin(A - B) = \frac{1}{2}$ $\cos A + B = \frac{1}{2}$

$\sin A - B = \sin 30°$ $\cos A + B = \cos 60°$

$A - B = 30° \_\_ i$ $A + B = 60° \_\_\_\_ (ii)$

On adding equation (i) and equation (ii)

$A - B = 30°$

$A + B = 60°$

$2A = 90°$

$A = 45°$

On putting the value of A in equation (i)

$A - B = 30°$

$45° - B = 30°$

$45° - 30° = B$

$B \quad 15^\circ$

84. **If** $x = r \sin A \cos B$, $y = r \sin A \sin B$ **and** $z = r \cos A$**, then find the value of** $x^2 + y^2 + z^2$

(a) $r^2 (\cos^2 B + \cos^2 A)$ (b) $2r^2$

(c) $3/2\ r^2$ (d) r^2

RRB JE - 24/05/2019 (Shift-II)

Ans : (d) $x = r \sin A \cos B$

$y = r \sin A \sin B$

$z = r \cos A$

$x^2 + y^2 + z^2 = (r \sin A \cos B)^2 + (r \sin A \sin B)^2 + (r \cos A)^2$

$= r^2 \sin^2 A \cos^2 B + r^2 \sin^2 A \sin^2 B + r^2 \cos^2 A$

$= r^2 \sin^2 A (\cos^2 B + \sin^2 B) + r^2 \cos^2 A$

$= r^2 \sin^2 A + r^2 \cos^2 A \quad [\sin^2 B + \cos^2 B = 1]$

$= r^2 (\sin^2 A + \cos^2 A) = r^2$

85. **If** $x = a \sec\theta + b \tan\theta$ **and** $y = a \tan\theta + b \sec\theta$**, then find the value of** $x^2 - y^2$

(a) $a^2 \quad b^2$ (b) $\sqrt{a^2 \quad b^2}$

(c) a + b (d) $a^2 \quad b^2$

RRB RPF SI – 12/01/2019 (Shift-II)

Ans : (d)

$x = a \sec + b \tan$ and $y = a \tan + b \sec$

$x^2 - y^2 = ?$

$x^2 - y^2 = (a \sec + b \tan)^2 - (a \tan + b \sec)^2$

$= a^2 \sec^2 + b^2 \tan^2 + 2ab \sec \tan - a^2 \tan^2 - b^2\sec^2 - 2ab \sec \tan$

$= a^2 \sec^2 + b^2 \tan^2 - a^2 \tan^2 - b^2 \sec^2$

$= a^2 (\sec^2 - \tan^2) - b^2 (\sec^2 - \tan^2)$

$x^2 - y^2 = (a^2 - b^2) (\sec^2 - \tan^2)$

$x^2 - y^2 = a^2 - b^2 \quad \{\because \sec^2 - \tan^2 = 1\}$

86. **If** $0° <$ $90°$**, then what is the value of** , **where** $\cos^2\theta - 3\cos\theta + 2 = 2\sin^2\theta$

(a) 30° (b) 60°

(c) 90° (d) 45°

RRB RPF SI – 10/01/2019 (Shift-I)

Ans: (c) If 0°< 90°
then $\cos^2 - 3\cos + 2 = 2\sin^2$
$\cos^2 - 3\cos + 2 = 2(1-\cos^2)$
$\cos^2 - 3\cos + 2 = 2 - 2\cos^2$
$3\cos^2 = 3\cos$
$3\cos^2 - 3\cos = 0$
$\cos^2 - \cos = 0$
$\cos(\cos - 1) = 0$
If $\cos = 0° = \cos 90°$
then $= 90°$
If $\cos = 1 = \cos 0°$
$= 0°$

87. If $x = r\cos\cos$, $y = r\cos\sin$ and $z = r\sin$, then find the value of $x^2 - y^2 - z^2$
(a) y^2 (b) x^2
(c) r^2 (d) z^2

RRB Group-D – 26/10/2018 (Shift-II)

Ans : (c) Given-
$x = r\cos\cos$ .....(1)
$y = r\cos\sin$ ..... (2)
$z = r\sin$ .....(3)
On squaring and adding equation (i), (ii) and (iii)–

$$x^2 + y^2 + z^2 = r^2\cos^2\theta\cos^2\phi + r^2\cos^2\theta\sin^2\phi + r^2\sin^2\theta$$
$$= r^2\cos^2\theta\left[\cos^2\phi + \sin^2\phi\right] + r^2\sin^2\theta$$
$$= r^2\cos^2\theta + r^2\sin^2\theta \qquad \left[\because \sin^2\phi + \cos^2\phi = 1\right]$$
$$= r^2\sin^2\theta + \cos^2\theta$$
$$\boxed{x^2 - y^2 - z^2 - r^2}$$

88. If $3\sec^2 x - 2\tan^2 x = 6$ and $0^0 < x < 90^0$ then x = ?
(a) 60^0 (b) 45^0
(c) 30^0 (d) 90^0

RRB Group-D – 20/09/2018 (Shift-III)

Ans : (a) $3\sec^2 x - 2\tan^2 x = 6$
$3(1+\tan^2 x) - 2\tan^2 x = 6$ $[\sec^2 x = 1 + \tan^2 x]$
$3 + 3\tan^2 x - 2\tan^2 x = 6$
$\tan^2 x = 3$
$\tan x = \sqrt{3}$
$\tan x = \tan 60°$
$x = 60°$

89. If $2x = \sec A$ and $\frac{2}{x} = \tan A$, then find the value of $2\left(x^2 - \frac{1}{x^2}\right) = ?$
(a) 1 (b) 1/2
(c) 1/4 (d) 1/3

RRB Group-D – 10/10/2018 (Shift-III)

Ans : (b)
$2x = \sec A$ ..... (i)
$\frac{2}{x} = \tan A$ ..... (ii)

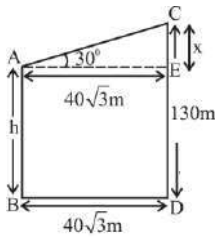
On squaring and subtracting both the equations,

$$4x^2 - \frac{4}{x^2} = \sec^2 A - \tan^2 A$$
$$\sec^2 A - \tan^2 A = 1$$
$$4x^2 - \frac{1}{x^2} = 1$$
$$2x^2 - \frac{1}{x^2} = \frac{1}{2}$$

90. The horizontal distance between two towers is $40\sqrt{3}$m. The angle of depression of the top of the first tower when seen from the top of the second tower is 30º. If the height of the second tower is 130m, find the height of the first tower.
(a) 85 m (b) 90 m
(c) 80 m (d) 95 m

RRB NTPC 30.12.2020 (Shift-II) Stage Ist

Ans. (b) :

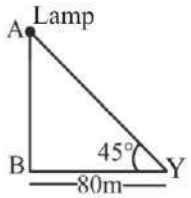


In ACE,
$$\tan 30° = \frac{x}{AE}$$
$$\tan 30° = \frac{x}{40\sqrt{3}}$$
$$x = 40\sqrt{3} \cdot \frac{1}{\sqrt{3}}$$
$$\boxed{x = 40m}$$
Hence $h = 130 - x\ m = 130 - 40$
$$\boxed{h = 90m}$$

91. From a point Y on a level ground, the angle of elevation of the top of a lamp post is 45^0. If the distance of point Y from the foot of the lamp post is 80 m, the height of the lamp post will be:
(a) 82 m (b) 70 m
(c) 80 m (d) 78 m

RRB NTPC 31.01.2021 (Shift-II) Stage Ist

Ans. (c)



Hence,

$\tan 45 = \frac{AB}{BY}$

AB = Height of lamp post and BY base.

$\tan 45 = \frac{AB}{80}$

$1 = \frac{AB}{80}$

$AB = 80$ m

Hence, the height of the lamp post will be 80m.

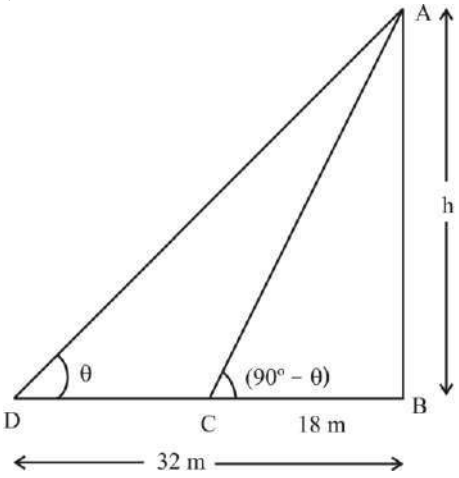
92. The angles of elevation of the top of a tower from two points on the ground 18 m and 32 m away from the foot of the tower are complementary. The height of the tower is:

(a) 32m (b) 36m

(c) 20m (d) 24m

RRB NTPC 09.01.2021 (Shift-II) Stage Ist

Ans. (d) :



Let AB = h be a tower of height whose distance from base B to points C and D are 18m and 32m respectively.

Let, ADB =

then ACB = 90° –

Now in right angled triangle ABC

$\tan(90° -) = \frac{AB}{BC}$

$\cot = \frac{h}{18}$ ... (1)

Similarly, in ABD,

$\tan = \frac{h}{32}$ ... (2)

On multiplying equation (1) and (2),

$\cot \tan = \frac{h}{18} \frac{h}{32}$

$1 = \frac{h^2}{576}$

$h^2 = 576$

$h = \sqrt{576}$

$h = 24$ m

Hence height of the tower = 24 m.

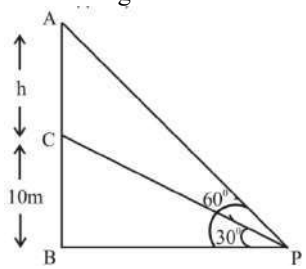
93. A window in a building is at a height of 10 meters from the ground. The angle of depression of a point P on the ground from the window is 30º. The angle of elevation of the top of the building from the point P is 60º. What is the height of the building?

(a) 30 meters (b) 35 meters

(c) 40 meters (d) 20 meters

RRB NTPC 10.01.2021 (Shift-II) Stage Ist

Ans. (a) : Building



x m

In BPC, $\tan 30° = \frac{BC}{BP} = \frac{10}{x}$

$\frac{1}{\sqrt{3}} = \frac{10}{x}$

$x = 10\sqrt{3}$ ... (1)

In ABP, $\tan 60° = \frac{AB}{BP}$

$\sqrt{3} = \frac{h + 10}{x}$

$h + 10 = \sqrt{3}x$

$h + 10 = \sqrt{3} \cdot 10\sqrt{3}$ (From equation 1)

$h + 10 = 30$

$h = 20$

Hence height of the building = h + 10 = 20 + 10 = 30 m

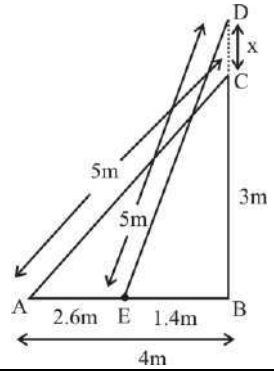
94. 5 m long ladder is leaning against a wall and it reaches the wall at a point 3 m high. If the foot of the ladder is moved 2.6 m towards the wall then the distance by which the top of the ladder slider slides upwards on the wall is:

(a) 1.08 m (b) 5.6 m

(c) 1.8 m (d) 4.8 m

RRB NTPC 09.01.2021 (Shift-II) Stage Ist

Ans. (c)



In right angled triangle BED

$ED^2 = EB^2 + DB^2$

$5^2 = 1.4^2 + (3 + x)^2$

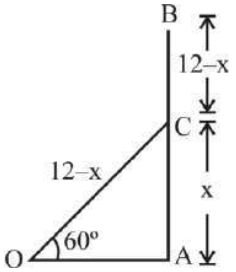
$25 = 1.96 + (3 + x)^2$

$23.04 = (3 + x)^2$

$3 + x = 4.8$

$x = 1.8$ m

95. A tree, 12 m height, is broken by the wind in such a way that its top touches the ground and makes an angle of 60º with the ground. At what height from the bottom of earth tree broken by the wind ?

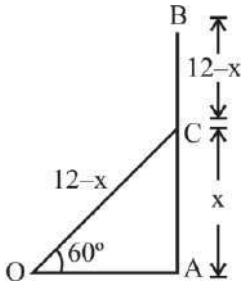


(a) $2\sqrt{3}(3 - \sqrt{3})$ m (b) $24\sqrt{3}$ m

(c) $24(\sqrt{3} - 1)$ m (d) $24\sqrt{2}(\sqrt{2} - 1)$ m

RRB NTPC 13.01.2021 (Shift-II) Stage Ist

Ans. (c) :



$\sin = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

$\sin 60^\circ = \frac{x}{12 - x}$

$\frac{\sqrt{3}}{2} = \frac{x}{12 - x}$

$2x = 12\sqrt{3} - \sqrt{3}x$

$x(\sqrt{3} + 2) = 12\sqrt{3}$

$x = \frac{12\sqrt{3}}{2 + \sqrt{3}} \times \frac{2 - \sqrt{3}}{2 - \sqrt{3}}$

$x = 24\sqrt{3} - 36$ m

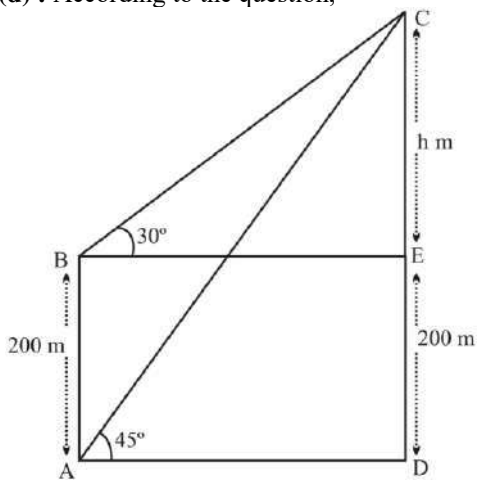
96. From the top and the bottom of 200 m high building, the angles of elevation of the top of a tower are 30º and 45º respectively. What is the height (in m) of the tower?

(a) $100\sqrt{3}(\sqrt{3} + 1)$ (b) $300(\sqrt{3} + 1)$

(c) $100(\sqrt{3} - 1)$ (d) $100\sqrt{3}(\sqrt{3} - 1)$

RRB NTPC 08.04.2021 (Shift-II) Stage Ist

Ans. (d) : According to the question,



From ACD,

$\tan 45^\circ = \frac{h + 200}{AD}$ [$\tan 45^\circ = 1$]

$AD = h + 200$

From BCE,

$\tan 30^\circ = \frac{h}{BE}$

$\tan 30^\circ = \frac{h}{h + 200}$ {$\because$ AD = BE = h + 200}

$\frac{1}{\sqrt{3}} = \frac{h}{h + 200}$

$h + 200 = \sqrt{3}h$

$200 = h(\sqrt{3} - 1)$

$h = \frac{200}{\sqrt{3} - 1}$

$h = \frac{200}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1}$

$= \frac{200(\sqrt{3} + 1)}{2}$

$h = 100(\sqrt{3} + 1)$

Hence height of the tower $= 100(\sqrt{3} + 1) + 200$

$= 100\sqrt{3} + 300$

$= 100\sqrt{3} + 1(\sqrt{3})$ m

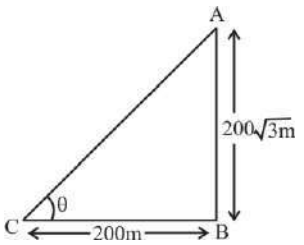
97. Find the angle of elevation of a $200\sqrt{3}$ m tower's top from a point 200 m away from its base.

(a) 45º (b) 60º

(c) 90º (d) 30º

RRB NTPC 03.02.2021 (Shift-II) Stage I

Ans. (b):



Given- Height of the tower = 200 $\sqrt{3}$ m
and distance from base of tower = 200 m
In ABC,

$\tan = \frac{AB}{BC}$

$= \frac{200\sqrt{3}}{200}$

$\tan = \sqrt{3}$

$\tan = \tan 60°$

$= 60°$

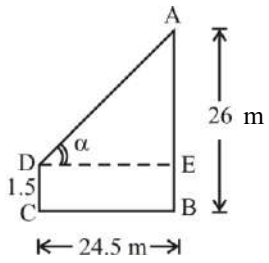
Hence the angle of elevation of a tower's top will be 60°.

98. An observer 1.5m tall is 24.5m away from a 26m high tower. The angle of elevation of the top of the tower from the eye of the observer is:

(a) 60º (b) 30º
(c) 75º (d) 45º

RRB NTPC 03.03.2021 (Shift-II) Stage Ist

Ans. (d) : Given,
Let the angle of elevation of the top of the tower from the eye of the observer be .
DC = Length of observer = 1.5 m
AB = Height of the tower = 26 m
BC = 24.5 m.



$\because$ AB = 26 m
AE = AB – BE
= 26 – 1.5 {$\because$ EB = DC = 1.5 m}
= 24.5 m
Now, in AED

$\tan \frac{AE}{DE}$

$\tan \frac{24.5}{24.5}$

$\tan 1$

$\tan \tan 45°$

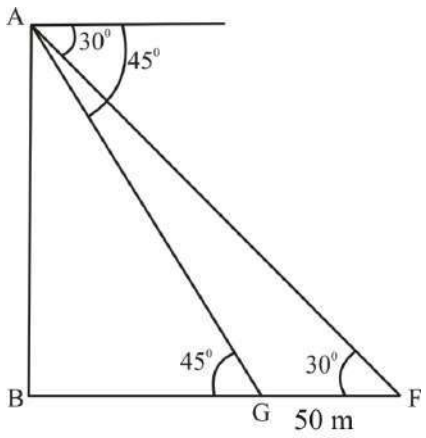
$45°$

99. The angles of depression of two houses of the same height from the top of a building are 45º and 30º towards the east. If the two houses are 50 m apart, what will be the height of the building in metres?

(a) $50(\sqrt{3}+1)$ (b) $45(\sqrt{3}-1)$
(c) $35(\sqrt{3}-1)$ (d) $25(\sqrt{3}+1)$

RRB NTPC 29.01.2021 (Shift-I) Stage Ist

Ans. (d) :



In ABG,

$\tan 45^0 \quad \frac{AB}{BG}$

$1 \quad \frac{AB}{BG}$

$BG \quad AB$

In ABF,

$\tan 30^0 \quad \frac{AB}{BG \quad GF}$

$\frac{1}{\sqrt{3}} \quad \frac{AB}{AB \quad 50}$

$AB \quad 50 \quad \sqrt{3}AB$

$AB \quad \frac{50}{\sqrt{3} \quad 1}$ m

$\frac{50}{\sqrt{3}-1} \quad \frac{\sqrt{3}+1}{\sqrt{3}+1} \quad \frac{50(\sqrt{3}+1)}{(\sqrt{3})^2-(1)^2} = \frac{50(\sqrt{3}+1)}{2}$

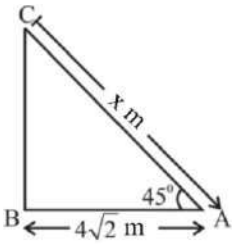
$25(\sqrt{3}+1)$

100. The angle of elevation of a ladder leaning against a wall is 45º. The foot of the ladder is $4\sqrt{2}$ metres away from wall. The length of the ladder is:

(a) 7 m (b) 8 m
(c) 5 m (d) 6 m

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (b):



Let the length of ladder be x meters.

$AB = 4\sqrt{2}$ m and $BAC = 45°$

$$\tan 45° = \frac{BC}{AB} \quad \frac{BC}{4\sqrt{2}}$$

$$1 = \frac{BC}{4\sqrt{2}} \Rightarrow BC = 4\sqrt{2}$$

From Phthagoras theorem,

$$AC^2 = BC^2 + AB^2$$

$$x^2 = \left(4\sqrt{2}\right)^2 \quad \left(4\sqrt{2}\right)^2$$

$$x^2 = 32 + 32$$

$$x^2 = 64$$

$$x = \sqrt{64} = 8 \text{ m}$$

Hence the length of ladder is 8m.

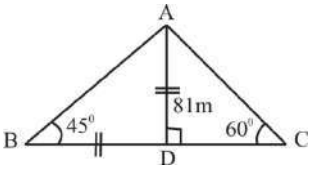
101. Two ships are sailing in the sea on the two sides of a light house. The angles of elevation of the top of the lighthouse as observed from the ships are 45º and 60º respectively. If the lighthouse is 81 m height, then the distance between two ships:

(a) $\frac{81}{\sqrt{3}}$ m (b) $\frac{\left[81\left(1+\sqrt{3}\right)\right]}{\sqrt{3}}$ m

(c) $\frac{1+\sqrt{3}}{\sqrt{3}}$ m (d) $\frac{1+\sqrt{3}}{81\sqrt{3}}$ m

RRB NTPC 16.01.2021 (Shift-II) Stage Ist

Ans. (b) : Let the height of light house be AD and the ships are sailing at point B and C respectively.



In ABD, $\tan 45° = \frac{81}{BD}$

$$1 = \frac{81}{BD}$$

$$BD = 81\text{m}$$

In ADC, $\tan 60° = \frac{81}{DC}$

$$DC = \frac{81}{\sqrt{3}}\text{m}$$

Hence distance between both the ships

$$(BC) = BD + DC = 81 + \frac{81}{\sqrt{3}} = \frac{81\sqrt{3} \quad 1}{\sqrt{3}} \text{ m}$$

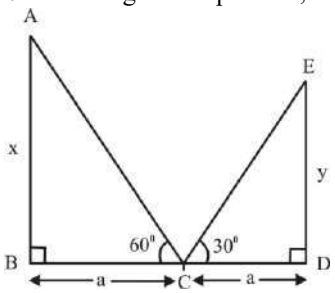
102. The top of two towers of heights x and y standing on level ground, subtend angles of 60º and 30º respectively at the midpoint of the line joining their feet. The value of x : y is

(a) 3 : 1 (b) 2 : 1

(c) 1: 3 (d) 1 : 2

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (a) : According to the question,



In ABC, $\tan 60^0 \quad \frac{x}{a} \quad \sqrt{3} \quad \frac{x}{a}$

$x \quad a\sqrt{3}$

In EDC

$\tan 30^0 \quad \frac{y}{a} \quad \frac{1}{\sqrt{3}} \quad \frac{y}{a}$

$y \quad \frac{a}{\sqrt{3}}$

$x : y = a\sqrt{3} : \frac{a}{\sqrt{3}}$

$x : y = 3 : 1$

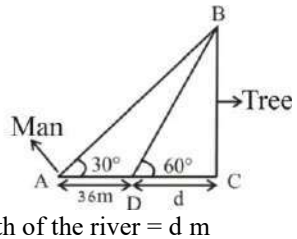
103. A man standing on the banks of a river observes that the angle subtended by a tree on the opposite bank is 60º. He walk 36 meters backward on the bank and observes the angle to be 30º. What is the breadth of the river?

(a) 20 meters (b) 18 meters

(c) 10 meters (d) 28 meters

RRB NTPC 08.01.2021 (Shift-I) Stage Ist

Ans. (b) :



Let breadth of the river = d m

In ABC,

$$\tan 30° = \frac{BC}{36 \quad d}$$

$$BC = \frac{36 \quad d}{\sqrt{3}} \text{ ------- (1)}$$

Again in BDC,

$\tan 60° = \frac{BC}{d}$

$\sqrt{3}d = BC$

From equation (1)-

$\sqrt{3}d = \frac{36 \quad d}{\sqrt{3}}$

$3d = 36+d$

$2d = 36$

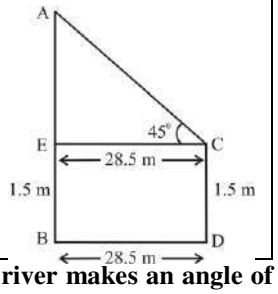
$d = 18m$

104. An observer 1.5 m tall is standing 28.5 m away at the same level as the foot of a tower. If angle of elevation of the observer watching the top of the tower is 45 degrees then what is the height of the tower?

(a) 30 m (b) 25 m
(c) 20 m (d) 35 m

RRB NTPC 16.01.2021 (Shift-I) Stage Ist

Ans. (a) : From the question,



In AEC-

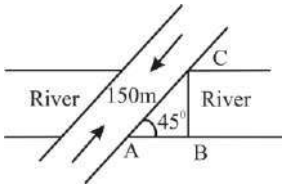
$\tan 45° = \frac{AE}{EC} = \frac{AE}{28.5}$

$AE = 28.5$ m

$AB = AE + EB = 28.5 + 1.5$

$AB = 30$ m

105. A bridge built across a river makes an angle of 45º with the river bank as shown in the given figure. If the length of the bridge is 150 m, then what is the width of the river?



(a) 70 m (b) $75\sqrt{2}$ m
(c) $63\sqrt{2}$ m (d) 65 m

RRB NTPC 11.01.2021 (Shift-I) Stage Ist

Ans. (b) : Let width of the river is x m.

$\because \sin \quad \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

$\sin 45° = \frac{x}{150}$

$\frac{1}{\sqrt{2}} \quad \frac{x}{150}$

$x = \frac{150}{\sqrt{2}} \quad \frac{\sqrt{2}}{\sqrt{2}}$

Hence $x = 75\sqrt{2}$ m

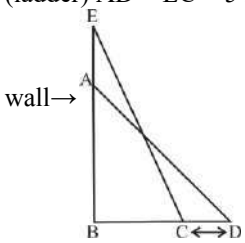
106. A 5 m long ladder is placed against a wall and reaches a height of 3 m on the wall. How for should ladder be taken towards the wall so that its end reaches a height of 4.8 m?

(a) 2.96 m (b) 1.4 m
(c) 2.2 m (d) 2.6 m

RRB NTPC 10.01.2021 (Shift-I) Stage Ist

Ans. (d) : AB = 3 m, BE = 4.8 m

(ladder) AD = EC = 5 m



In ABD, $BD = \sqrt{AD^2 \quad AB^2}$

$BD = \sqrt{5^2 \quad 3^2}$

$= \sqrt{25 \quad 9} = \sqrt{16} = 4$ m

In EBC, $BC \quad \sqrt{EC^2 \quad (EB)^2}$

$= \sqrt{5^2 \quad (4.8)^2}$

$= \sqrt{25 \quad 23.04} = \sqrt{1.96} = 1.4$ m

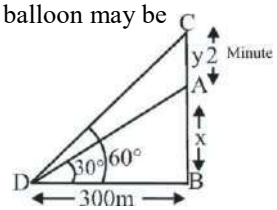
$CD = BD - BC = 4 - 1.4 = 2.6$ m

107. The angle of elevation of a hot air balloon going upward in vertical direction when viewed from a distance of 300 m from the point of flight, changes from 30º at 10:00 am to 60º at 10 : 02 am. Find the speed of the balloon in the vertical direction.

(a) 2 m/sec. (b) 2.18 m/sec.
(c) 3.4 m/sec. (d) 2.9 m/sec.

RRB JE - 22/05/2019 (Shift-III)

Ans : (d) Suppose position of balloon may be A to C in 2 minutes.



In ΔABD,

$\tan 30 \quad \frac{x}{300}$

$\frac{1}{\sqrt{3}} \quad \frac{x}{300}$

$x \quad \frac{300}{\sqrt{3}} \quad \frac{\sqrt{3}}{\sqrt{3}} \quad 100\sqrt{3}$ m

In ΔCBD, $\tan 60 \quad \frac{x \quad y}{300}$

$\sqrt{3} \quad \frac{x \quad y}{300}$

$x + y = 300\sqrt{3}$

$100\sqrt{3} \quad y \quad 300\sqrt{3}$

$y \quad 200\sqrt{3}$

Speed of balloons $= \frac{y}{t} \quad \frac{200\sqrt{3}}{2 \quad 60} \quad \frac{5}{3}\sqrt{3}$

$\frac{5 \quad 1.732}{3} = 5 \times 0.577 = 2.885 = 2.9$ m/sec

108. An aeroplane is flying at a steady altitude 'h'. At 10:00 am, it appears at an elevation angle of 30°. After 1 minute, it appears at an elevation angle of 60°. If the speed of the aeroplane is 960 km/h, find the value of 'h'.

(a) 15 km. (b) 13.86 km.
(c) 20 km. (d) 12.46 km.

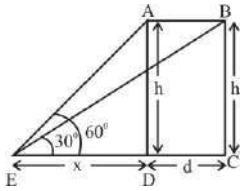
RRB JE - 26/05/2019 (Shift-I)

Ans : (b)

Speed = distance/time

$960 \quad \frac{CD}{1\,minute}$

$\frac{960 \quad 1}{60} \quad d \quad d \quad 16km$



From AED–

$\tan 60 \quad \frac{h}{x} \quad x\sqrt{3} \quad h$.....(i)

From BEC–

$\tan 30^0 = \frac{h}{x+d} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{16+x}$.....(ii)

From equation (i) and (ii)–

$\frac{1}{\sqrt{3}} \quad \frac{x\sqrt{3}}{16 \quad x}$

16 + x = 3x

2x = 16

x = 8 km

$h \quad x\sqrt{3} \quad 8\sqrt{3}$

h = 1.732 8 = 13.86 km

109. The elevation angles formed when looking at the top of the tree from two points located 'x' meters and 'y' meters from both the foot of the tree are , respectively. If + = 90°, then find the height of the tree.

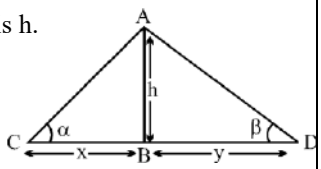
(a) $\frac{x \quad y^{2}}{2}$ (b) $\sqrt{xy}$

(c) $x\cos a \quad y\cos B$ (d) $(x \quad y)^2$

RRB JE - 31/05/2019 (Shift-II)

Ans : (b)

Suppose height of the tree is h.



+ = 90° ----(i)

In ABC,

$\tan \quad \frac{h}{x}$ ----(ii)

In ABD,

$\tan \quad \frac{h}{y}$

$\tan(90- \quad) = \frac{h}{y}$ {From equation (i)}

$\cot \quad \frac{h}{y}$ ----(iii)

From equation (ii) and (iii)-

$\tan \quad \cot \quad \frac{h}{x} \quad \frac{h}{y}$

$1 = \frac{h^{2}}{xy}$

$h \quad \sqrt{xy}$

110. The angle of depression of the foot of a building from the top of a tower of $32\sqrt{3}$ meters height is 60°. How far is the building from the tower?

(a) 32 meters (b) $16\sqrt{3}$ meters
(c) $32\sqrt{3}$ meters (d) 16 meters

RRB RPF SI – 06/01/2019 (Shift-II)

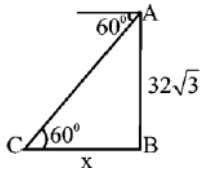
Ans. (a) : Height of the tower (AB) = $32\sqrt{3}$ m

Let the distance of the building from the tower be x meters.

Then $\tan 60^0 \quad \frac{AB}{CB}$

$\sqrt{3} \quad \frac{32\sqrt{3}}{x}$

x = 32 m



111. From the top of the stage the elevation angle of the top of the tower at a distance of $50\sqrt{3}$ meters is 30°. If the height of the tower is 60 meters; what will be the height of the stage?

(a) $20\sqrt{3}$ m (b) 10 m
(c) 40 m (d) $45\sqrt{3}$ m

RRB Group-D – 28/09/2018 (Shift-III)

Ans : (b) Let the height of the stage = y m

As per question—

$\tan 30 \quad \frac{x}{50\sqrt{3}}$

$\frac{1}{\sqrt{3}} \quad \frac{x}{50\sqrt{3}}$

$x = 50$ m

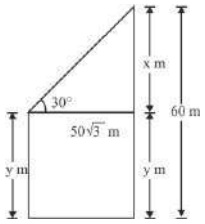
$\because x + y = 60$

$y = 60 - x$

$y = 60 - 50$

$y = 10$ m

So, height of the stage = 10 m

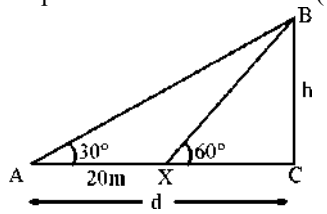


112. The angle of elevation of a point A from the top of a tower to the ground is 30°. When moving to the point X at 20 meters towards the foot of the tower, the elevation angle changes to 60°. What is the distance of the tower from point A?

(a) $5\sqrt{11}$ m (b) 30 m
(c) 5 m (d) 16m

RRB Group-D – 28/09/2018 (Shift-III)

Ans : (b) Let the height of the tower (CB) = h m
and distance of point A from the tower = d m
distance of point X from the tower = (d – 20)m



From the figure, $\tan 30 \quad \frac{h}{d}$

$$\frac{1}{\sqrt{3}} \quad \frac{h}{d}$$

$$h \quad \frac{d}{\sqrt{3}}$$

and

$$\tan 60^\circ = \frac{h}{(d - 20)} \Rightarrow \sqrt{3} = \frac{h}{(d - 20)}$$

On putting the value of 'h'

$$\sqrt{3} \quad \frac{d}{\sqrt{3}(d \quad 20)}$$

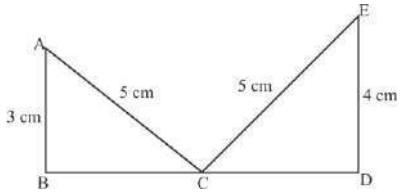
3 (d – 20) = d
3d – d = 60
2d = 60
d = 30
So distance of point A from the tower = 30 m.

113. A 5 meter long staircase with a stable base on the road can reach two windows 4 meter and 3 meter high on the other side of the road. What is the width of the road?

(a) 6.2 m (b) 6 m
(c) 7 m (d) 5.5 m

RRB Group-D – 11/10/2018 (Shift-II)

Ans : (c)



$$BD \quad \sqrt{BC^2} \quad \sqrt{CD^2}$$

$$- \sqrt{5^2 - 3^2} + \sqrt{5^2 - 4^2}$$

$$\sqrt{4^2} \quad \sqrt{3^2} \quad = 4 + 3 = 7 \text{ m}$$

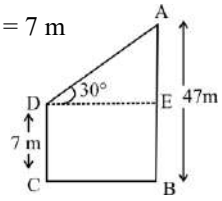
So width of the road = 4 + 3 = 7m

114. From the top of a platform of 7 meters height, the elevation angle of a tower which is 47 meters in height is 30°. How far is the tower located from the platform.

(a) $45\sqrt{3}$ m (b) 40 m
(c) $40\sqrt{3}$ m (d) $15\sqrt{3}$ m

RRB Group-D – 18/09/2018 (Shift-II)

Ans. (c):
∵ AB = height of tower = 47 m
CD = BE = height of platform = 7 m
AE = 47 – 7 = 40 m



from ADE,

$$\tan 30 \quad \frac{AE}{ED} \quad \frac{40}{DE}$$

∵ DE = BC
(Distance between platform to tower)

$$\frac{1}{\sqrt{3}} \quad \frac{40}{DE}$$

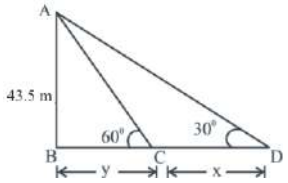
$$DE \quad 40\sqrt{3} \text{ m or } BC \quad 40\sqrt{3} \text{ m}$$

115. From the initial position of a woman standing on the ground floor of a 43.5 m tall tower, the angle of elevation of the top was 60º. She moves in a straight line from the position of the tower in such a way that the angle of elevation of the tower becomes 30º from its final position. Then what will be the changed distance?

(a) $\frac{29}{3}\sqrt{3}$ meter (b) $29\sqrt{3}$ meter
(c) $\frac{29}{2}\sqrt{3}$ meter (d) 29 meter

RRB Group-D – 20/09/2018 (Shift-I)

Ans. (b) : Let the initial distance of the woman from the tower = y m, distance after relocation = x
(AB) height of tower = 43.5 m



In ΔABC,

$$\tan 60 \quad \frac{AB}{BC}$$

$$\sqrt{3} \quad \frac{43.5}{y}$$

$$y \quad \frac{43.5}{\sqrt{3}}$$

$$\boxed{3y \quad 43.5\sqrt{3}} \quad \text{.....(i)}$$

In ΔABD,

$$\tan 30 \quad \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} \quad \frac{43.5}{x \quad y}$$

$$\boxed{x \quad y \quad 43.5\sqrt{3}} \quad \text{.....(ii)}$$

On putting the value $43.5\sqrt{3}$ in equation (ii)

x + y = 3y
x = 2y

$$y \quad \frac{x}{2}$$

Again putting the value of y in equation (i)

$3 \quad \frac{x}{2} \quad 43.5\sqrt{3}$

$x \quad \frac{43.5\sqrt{3} \quad 2}{3}$

$x \quad \frac{87\sqrt{3}}{3} \quad 29\sqrt{3}$ m

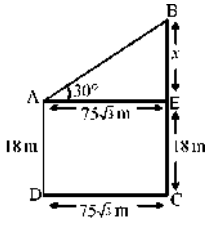
116. From the top of a platform 18 meters high, the elevation angle of the top of the tower is 30°. If the platform is located $75\sqrt{3}$ meters away from the tower, then what is the height of the tower?

(a) 93 m (b) $50\sqrt{3}$ m

(c) 75 m (d) $37.5\sqrt{3}$ m

RRB Group-D – 01/11/2018 (Shift-II)

Ans : (a)



In ABE,

$\tan 30 \quad \frac{x}{75\sqrt{3}}$

$\frac{1}{\sqrt{3}} \quad \frac{x}{75\sqrt{3}}$

x = 75m

So height of the tower = 18 + 75 = 93m

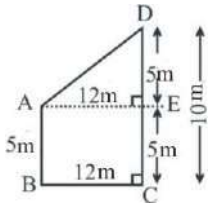
117. Two pillars of 5 meters and 10 meters stand straight on the ground. If the distance between their bottoms is 12 meters, find the distance between their vertices.

(a) 11 meters (b) 12 meters

(c) 13 meters (d) 14 meters

RRB NTPC 04.04.2016 Shift : 3

Ans : (c)



Let the distance between the vertices of the pillars = AD m

$AE \quad BC \quad 12$ m

$DE = CD - CE = 10 - 5$

DE = 5 m

From Pythagoras theorem in AED,

$AD^2 \quad AE^2 \quad DE^2 = 12^2 + 5^2 = 144 + 25$

$AD^2 \quad 169 \rightarrow AD \quad 13$ m

118. The shadow of a tower of $25\sqrt{3}$ height increases by 50 meters when the angle of depression by the sun is 60° to x°. Find the measure of x.

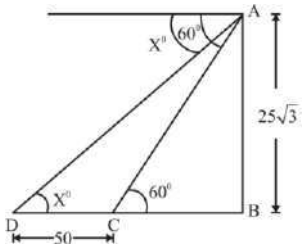
(a) 45^0 (b) 30^0

(c) 75^0 (d) 90^0

RRB NTPC 19.04.2016 Shift : 1

Ans : (b)

In ABC



$\tan 60^0 \quad \frac{25\sqrt{3}}{BC}$

$\sqrt{3} \quad \frac{25\sqrt{3}}{BC}$

BC = 25 …… (1)

Again in ABD,

$\tan x \quad \frac{25\sqrt{3}}{50 \quad BC}$

$\tan x = \frac{25\sqrt{3}}{50 \quad 25} = \frac{25\sqrt{3}}{75} = \frac{1}{\sqrt{3}}$

$\tan x = \tan 30^0$

$x = 30^0$

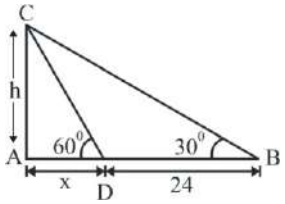
119. The length of the shadow of a pillar decreases by 24 meters. When the angle of elevation of the sun increases from 30° to 60°, the length of the pillar is.

(a) $10\sqrt{3}$ (b) $8\sqrt{3}$

(c) $16\sqrt{3}$ (d) $12\sqrt{3}$

RRB NTPC 18.04.2016 Shift : 2

Ans : (d)



In ABC,

$\tan 30^0 \quad \frac{h}{x \quad 24}$

$\frac{1}{\sqrt{3}} \quad \frac{h}{x \quad 24}$

$\sqrt{3}\,h \quad x \quad 24$ .....(I)

In ADC,

$\tan 60^0 \quad \frac{h}{x}$

$\sqrt{3} = \frac{h}{x}$

$h = \sqrt{3}x$ .....(II)

On putting the value of h in equation (I)

$\sqrt{3} = \sqrt{3}x - x = 24$

$3x = x + 24$

$2x = 24$

$x = 12$

In ADC,

$\tan 60^0 = \frac{h}{12}$

$\sqrt{3} = \frac{h}{12}$

$h = 12\sqrt{3}$ m

120. The angle of depression of two stones in the same direction from an aeroplane vertically above a straight road is 30° and 45° respectively. If the plane is flying at an altitude of 1.365 km, then what is the distance between the two stones?

(a) 1 km (b) 2 km

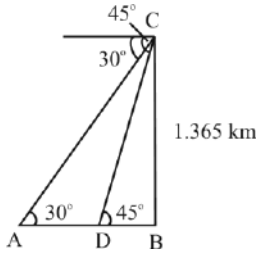
(c) 3 km (d) 4 km

RRB NTPC 16.04.2016 Shift : 2

Ans : (a) ∵ From DBC

$\tan 45^\circ = \frac{1.365}{DB}$

DB = 1.365 km



From ABC,

$\tan 30^\circ = \frac{1.365}{AB}$

$AB = 1.365\sqrt{3}$

∵ AD = AB – DB

$AD = 1.365\sqrt{3} - 1.365 = 1.365(\sqrt{3} - 1)$

$= 1.365 \times 0.73 = 0.99$ 1 km

So distance between the stones is 1 km.

121. From the top of a platform of 5 m height, the angle of elevation of a tower was 30°. If the tower was 45 m high, how far was the platform from the tower?

(a) 40 m (b) $40\sqrt{3}$ m

(c) $45\sqrt{3}$ m (d) $15\sqrt{3}$ m

RRB ALP & Tec. (21-08-18 Shift-II)

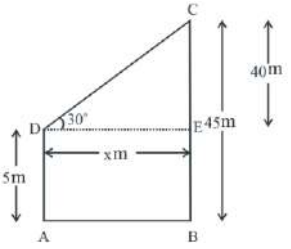
Ans : (b)

From DEC,

$\tan 30^0 = \frac{CE}{DE}$

$\tan 30^0 = \frac{40}{x}$ $\frac{1}{\sqrt{3}} = \frac{40}{x}$

$x = 40\sqrt{3}$ m



122. The angle of elevation of the top of a hill from the foot of the tower is 60 and the angle of elevation of the top of the tower from the foot of the hill is 30 . If the tower is 50m high, then what is the height of the hill?

(a) 100m (b) 120m

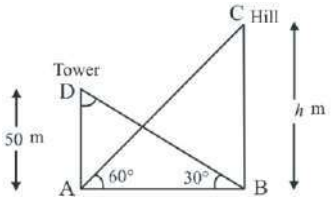
(c) 180m (d) 150m

RRB ALP & Tec. (14-08-18 Shift-I)

Ans : (d) In ABD

$\tan 30^\circ = \frac{50}{AB} \Rightarrow \frac{1}{\sqrt{3}} = \frac{50}{AB}$

$AB = 50\sqrt{3}$ m



In ABC,

$\tan 60 = \frac{h}{50\sqrt{3}}$

$h = 50\sqrt{3} \times \sqrt{3}$

h = 150 m

So the height of the hill is 150 meters.

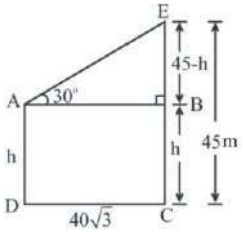
123. From the top of a platform, the angle of elevation of a tower was 30 . The tower was 45 m high and the horizontal distance between the platform and the tower was $40\sqrt{3}$ m. What was the height of the platform?

(a) 40 m (b) 5 m

(c) 45 m (d) $20\sqrt{3}$ m

RRB ALP & Tec. (14-08-18 Shift-II)

Ans : (b) Given the height of the tower (EC) = 45 meters



EAB = 30°

Horizontal distance (DC) = $40\sqrt{3}$ meters = AB

Let the height of the platform is h meters.

In ABE -

$\tan 30^\circ = \frac{EB}{AB}$

$\frac{1}{\sqrt{3}} = \frac{45 - h}{40\sqrt{3}}$

45–h = 40

h = 45–40

h = 5 meter

07 Set Theory

Sets

- A set is a well-defined collection of objects. These objects may be actually listed or may be specified by a rule. A set is usually denoted by the capital letters A, B, C, N, R, etc. Each object in a set is called an element or a member of the set and is denoted by the small letters a, b, c, etc.

➢ If x is an element of set A, then we write it as x A and read it as 'x belongs to A' and if y is not an element of set A, then we write it as y A and read it as 'y does not belong to A'.

Example :

If A = {2, 4, 6, 8}

then 4 A, 7 A, 8 A, 10 A

➢ The set of natural numbers, whole numbers, integers, rational numbers and real numbers are denoted by N, W, I, Q and R respectively.

Methods of Representation of Sets

- **Roster method (Listing method) :**

In this method all the elements are listed or tabulated. The elements are separated by commas and are enclosed within two braces (curly brackets).

Example :

The set A of all positive even integers less than 9 can be written as A = {2, 4, 6, 8}

- **Set-Builder method :**

In this method, the set is described by the characteristic property of its elements.

In general, if all the elements of set A satisfy some property P, then write A in set-builder notation as A = {x/x has property P} and read it as 'A is the set of all x such that x has the property P'.

Example :

Let B = {3, 4, 5, 6, 7, 8}

Using the set-builder method, B can be written as

B = {x / x N, 3 x 8}

Since B = {3, 4, 5, 6, 7, 8} can also be stated as the set of natural numbers from 3 to 8 including 3 and 8.

- **Some standard sets are as follows :**

N = set of all natural numbers

= {1, 2, 3, ...}

Z or I = set of all integers

= {..... – 3, – 2, – 1, 0, 1, 2, 3 ....}

Q = set of all rational numbers

$= \left\{ \frac{p}{q} / p, q \quad Z, q \quad 0 \right\}$

- **Subset :**

Set A is called a subset of set B, if every element of set A is also an element of set B i.e., if x A, then x B.

We denote this relation as A B and read it as 'A is a subset for B'. Its clear that

➢ Every set is a subset of itself i.e., A A .

➢ An empty set is a subset of every set.

Example :

If A = {2, 4, 6, 8} and B = {2, 4, 6, 8, 10, 12},

then A B, A is subset for B.

- **Superset :**

If A B, then B is called a superset of A, denoted by B A .

- **Proper subset :**

If every element of set A is an element of set B and B contains at least one element which is not in A, then A is said to be a proper subset of B and it is denoted as A B.

Example :

If A = {2, 3, 5, 6}, B = {1, 2, 3, 4, 5, 6, 7}

Here every element of set A i.e., 2, 3, 5, 6 is an element of set B. But B contains elements 1, 4, 7 which are not in A. Hence in the case we say that A is a proper subset of B and is denoted by A B.

Types of sets

- **Empty set :**

A set which does not contain any element is called an empty set and it is denoted by or {}. It is also called null set or void set.

Example :

A = {x / x N, 3 < x < 4}

B = {x/x is a positive integer < 1}.

☞ The set {0} and { } are not empty sets as they contain one element, namely 0 and respectively.

■ **Singleton set :**

A set which contains only one element is called a singleton set.

A = {5}, B = {3}, X = {x / x N, 1 < x < 3}

The set A = set of all integers which are neither positive nor negative is a singleton set since A = {0}

■ **Finite set :**

A set which contains countable number of elements is called a finite set.

Example :

A = {a, b, c}

B = {1, 2, 3, 4, 5}

C = {a, e, i, o, u}

■ **Infinite set :**

A set which contains uncountable number of elements is called an infinite set.

Example :

N = {1, 2, 3, 4 .....}

Z = {..... – 3, – 2, – 1, 0, 1, 2, 3 .....}

☞ An empty set is a finite set.

☞ N, W, I, Q and R are infinite sets.

■ **Equal sets :**

Two sets A and B are said to be equal if they have the same elements and we denote this as A = B.

From this definition if follows that "two sets A and B are equal if and only if A B and B A"

Example :

If A = {1, 2, 3, 4}, B = {2, 4, 1, 3}, then A = B.

■ **Equivalent sets :**

Two sets A and B are said to be equivalent, if they contain the same number of elements and we denote it as A B.

Example :

If A = {1, 2, 3, 4, 5}, B = {a, b, c, d, e}, then

n(a) = n(b)

A and B are equivalent sets.

☞ Equal sets are always equivalent but equivalent sets need not be equal.

■ **Universal set :**

A non-empty set of which all the sets under consideration are subsets, is called a universal set. It is usually denoted by X or U.

Example :

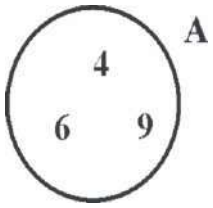
If A = {1, 2, 3, 4}, B = {2, 8, 13, 15} and C = {1, 2, 3, ..., 50} are sets under consideration, then the set N of all natural numbers can be taken as the universal set.

■ **Venn diagram :**

A set is represented by any closed figure such as circle, rectangle, triangle, etc. The diagrams representing sets are called venn diagrams.

Example :

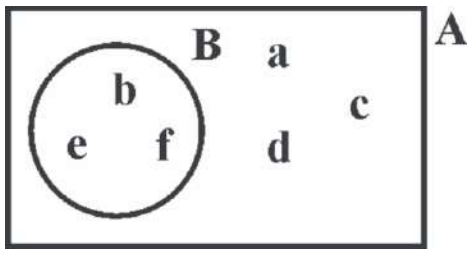
➢ A = {4, 6, 9}



➢ A = {a, b, c, d, e, f}

B = {b, e, f}

B A

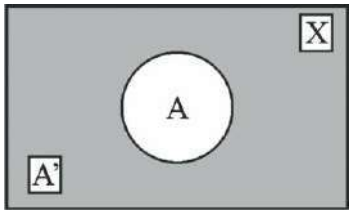


Operations on sets

■ **Complement of a set :**

Let A be a subset of a universal set X then the set of all those elements of X which do not belong to A is called the complement of set A and it is denoted by A' or A^c.

Thus, A' = {x / x X, x A}



The shaded region in the above figure represents A'.

Example :

Let X = {1, 2, 3, 4, 5, 6, 7, 8, 9} be an universal set and A = {1, 3, 5, 6, 8}.

Then A' = {2, 4, 7, 9}

■ **Properties :**

If X is the universal set and A, B X, then

➢ (A')' = A

➢ X ' =

➢ ' = X

➢ A A' =

➢ A A' = X

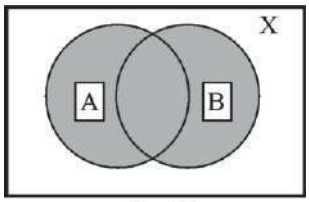
➢ If A B, then B' A' .

■ **Union of sets:**

If A and B are two sets, then the set of those elements which belong to A or to B to both A and B is called the union of the sets A and B and is denoted by A B.

i.e., A B = {x / x A or x B}

The shaded portion in the below venn diagram represents A B.



A ∪ B

Example :

➢ If A = {1, 2, 3, 4}, B = {2, 4, 6, 8}, then

A B = {1, 2, 3, 4, 6, 8}

➢ If A is the set of all odd integers and B is the set of all even integers, then A B is the set of all integers.

■ **Properties :**

If A, B, C are any three sets, then

➢ A = A (Identity law)

➢ A X = X (Law of universal)

➢ A B = B A (Commutative law)

➢ (A B) C = A (B C) (Associative law)

➢ A A = A (Idempotent law)

➢ If A B, then A B = B

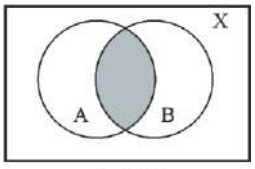
➢ A A B, B A B

■ **Intersection of sets :**

If A and B are two sets, then the set of those elements which belong to both A and B i.e., which are common to both A and B is called the intersection of the sets A and B and is denoted by A B.

Thus, A B = {x / x A and x B}

The shaded portion in the below venn diagram represents A B.



A ∩ B

Example :

If A = {1, 2, 3, 4, 5}, B = {1, 3, 5, 7, 9}, then

A B = {1, 3, 5}

■ **Properties:**

If A, B, C are any three sets, then

➢ A =

➢ A X = A

➢ A B = B A (Commutative law)

➢ (A B) C = A (B C) (Associative law)

➢ A A = A (Idempotent law)

➢ If A B, then A B = A

➢ A B A, A B B

■ **Disjoint sets :**

Two sets A and B are said to be disjoint, if they have no element in common i.e., A B = .

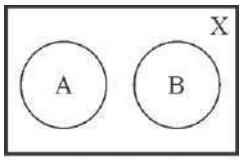
Example :

If A = {2, 4, 6} and B = {3, 5, 7}, then

A B =

A and B are disjoint sets.

The venn diagram of the disjoint sets A and B is shown below :



A ∩ B = ϕ

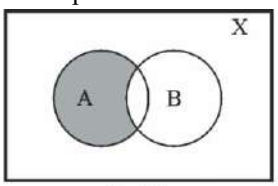
■ **Difference of sets :**

If A and B are two sets then the set of all the elements of A which are not in B is called difference of sets A and B and is denoted by A – B.

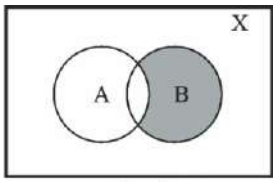
Thus, A – B = {x / x A and x B}

Similarly, B – A = {x / x A and x B}

In the below venn diagrams shaded region represents A – B and B – A.



A – B



B – A

➢ A – B = A B'

➢ B – A = B A'

Example :

If A = {1, 2, 3, 4, 5, 6}, B = {2, 4, 6, 8}, then

A – B = {1, 3, 5} and B – A = {8}.

■ **Distributive Properties of union and intersection**

If a, b, c R, then

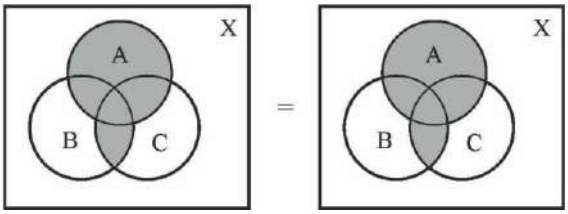
a × (b + c) = (a × b) + (a × c)

This is known as distributive property of multiplication over addition. In set theory, the operation of union and intersection of sets are both distributive over each sets, then :

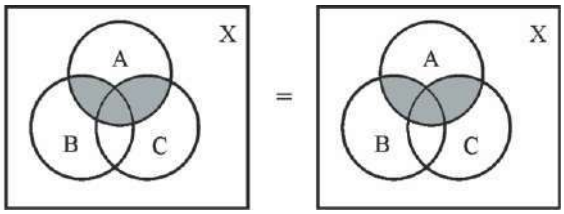
➢ A (B C) = (A B) (A C)

➢ A (B C) = (A B) (A C)

We verify these distributive laws using Venn diagram shown below. The shaded portion in each figure shows the set obtained by performing the operation given below the figure.

i. 

A (B C) (A B) (A C)

ii. 

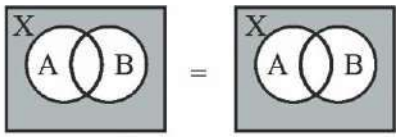
A (B C) (A B) (A C)

■ **De-Morgan's laws :**

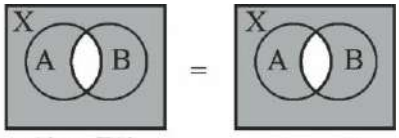
If A and B are two subsets of a universal set X, then

- (A B)' = A' B'
- (A B)' = A' B'
- A – (B C) = (A – B) (A – C)
- A – (B C) = (A – B) (A – C)

We verify these laws using Venn diagrams shown below. The shaded portion in each figure shows the set obtained by performing the operation below the figure :

i. 

$(A \cup B)'$ $A' \cap B'$

ii. 

$(A \cap B)'$ $A' \cup B'$

■ **Number of elements in a set**

Let A be a set. Then the total number of elements in it is denoted by n(a).

Example :

Let A = {8, 9, 10, 11, 12}

n(a) = 5

The number of elements in the empty set is zero.

i.e., n( ) = 0

■ **Results :**

For given sets A, B, C

- n(A B) = n(a) + n(b) – n(A B)
- When A and B are disjoint sets, then n(A B) = n(a) + n(b)
- n(A B') n(A B) = n(a)
- n(A' B') n(A B) = n(b)
- n(A B C) = n(a) + n(b) + n(c) – n(A B) – n (B C) – n(A C) + n(A B C)

■ **Power set :**

The set of all subsets of set A is called the power set of A and it is denoted by P(a).

Example :

If A = {a, b, c}, then

P(a) = { , {a}, {b}, {c}, {a, b}, {b, c}, {a, c}, {a, b, c}}

☞ If A contains n elements, then the power set of A i.e., P(a) contains 2^n elements.

■ **Proper Sub set :**

A is a proper subset of B if all elements of A are present in B, but atleast one element of B is not in A.

- If P(A) = n (number of elements) then number of proper subsets of A are $2^n - 1$.

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. If U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, and B = {2, 4, 6, 8}, then the number of elements in the set B' is :

(a) 5 (b) 8 (c) 4 (d) 9

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) : ∵ n(B') = n(U) – n(B) = 9 – 4 = 5

2. A and B are two independent events. If P(A) = 0.4 and P (B) = 0.6, then the P(A or B) is equal to :

(a) 0.78 (b) 0.66

(c) 0.68 (d) 0.76

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (d) : P(A) = 0.4, P(B) = 0.6

A and B are two independent events

P A B P A .P B

P A B 0.4 0.6

= 0.24

P A ∪ B – P A + P B – P A ∩ B

= 0.4 + 0.6 – 0.24

= 1 – 0.24

= 0.76

3. In a school there are 26 teachers who teach mathematics or physics. Of these, 14 teach mathematics and 6 teach both physics and mathematics. How many teach physics?

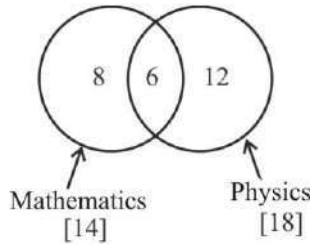
(a) 12 (b) 8

(c) 10 (d) 14

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (a) : According to questions,

From the Venn diagram,



Physics teacher only = 26 – 14

= 12

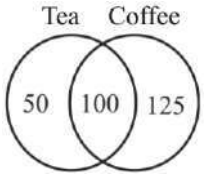
4. In a survey of 350 students in a college, 150 students were found to be taking tea and 225 taking coffee, 100 were taking both tea and coffee. Find how many students were taking neither tea nor coffee?

(a) 85 (b) 75

(c) 65 (d) 55

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (b) : According to the question-



Number of student were taking neither tea nor coffee

= 350 – (50+100+125)

= 350 – 275

= 75

5. If A = {3, 5, 7, 9, 11}, B = {7, 9, 11, 13}, C = {11, 13, 15}find A (B C).

(a) {7, 9, 11} (b) {3, 7, 9, 11}

(c) {5, 7, 9, 11} (d) {3, 5, 7, 9, 11}

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (a) : Given,

A = {3, 5, 7, 9, 11}

B = {7, 9, 11, 13}

C = { 11, 13, 15}

According to the question,

A B C

A 7,9,11,13 11,13,15

A 7,9,11,13,15

3,5,7,9,11 7,9,11,13,15

= (7, 9, 11)

6. In a class of 37 students, 25 like to play cricket and 16 like to play football. Also, each students likes to play at least one of the two games. How many students like to play both cricket and football?

(a) 4 (b) 5

(c) 3 (d) 6

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (a) : Total students n A B 37

The student those are like to play Cricket n A 25

The student those are like to play Football n B 16

The student those are like to play cricket and football n A B

n A B n A + n B − n A B

37 25 + 16 − n A B

n A B 41 37

= 4 students

7. If X = {a, b, c, d} and Y = {f, b, d, g}, find X Y.

(a) {b, d} (b) {g, f}

(c) {a, c} (d) {a, b, c, d, g, f}

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (a) : Given that, X a, b, c, d

Y f, b, d, g

X Y − a, b, c, d f, b, d, g

b, d

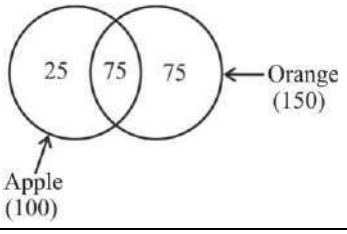
8. In a survey of 260 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.

(a) 85 (b) 75

(c) 65 (d) 95

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (a) : According to question



Students who drink apple, orange or both juices
$= 25 + 75 + 75 = 175$
Students who drink neither apple nor orange juice
$= 260 - 175 = 85$

9. If C = { 2, 4, 6, 8, 10, 12, 14, 16 }, and D = {5, 10, 15, 20 }, then the number of elements in the set D - C is:

(a) 8 (b) 3
(c) 4 (d) 7

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (b) : D – C means, the element of D which is not in C.
D – C = {5, 10, 15, 20 } – { 2, 4, 6, 8, 10, 12, 14, 16 }
= {5, 15, 20}
So, number of elements = 3

10. If A and B are two sets such that n(a) = 4, n(b) = 3 then maximum of n(A B) is –

(a) 0 (b) 1
(c) 4 (d) 3

RRB 2016

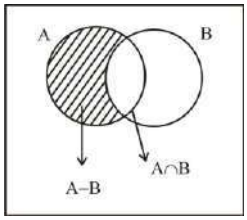
Ans. (d) : 3
For two sets A and B; maximum (n(A B))
= min{n(a), n(b)}
= min {4, 3} = 3

11. For any two sets A and B, A– (A – B) equals

(a) A – B (b) B
(c) A B (d) A B

UP TGT 2021

Ans. (d) :



Hence, A – (A – B) = A B

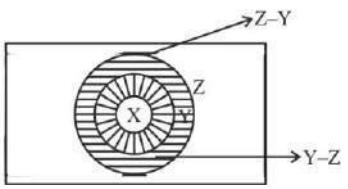
12. If X, Y, Z are any three sets such that $X \subseteq Y \subseteq Z$, then Z – (Y – X) =

(a) $X \cup (Z - Y)$ (b) $X - (Z \cup Y)$
(c) $X \cup (Y - Z)$ (d) $X - (Z - Y)$

UKPSC Lecturer (Mains) 2020

Ans. (a) : From the venn diagram, clearly

$Z - Y - X - X \cup Z - Y$



13. A market research group conducted a survey of 1000 consumers and reported that 720 consumers liked product A and 450 liked product B. The number of consumers that have liked both products is:

(a) 150 (b) 170
(c) 160 (d) 180

UKPSC Lecturer (Mains) 2020

Ans. (b) : Let A be the set of consumers who liked product A and B be set of consumers who liked product B. Then, A B is the set of consumers who liked at least one of products A and B and A B is the set of consumers who liked both the products. Now, we have

$n\ A \cup B\ = n\ A\ + n\ B\ - n\ A \cap B$

$1000 = 720 + 450 - n\ A \cap B$

$n\ A\ B\ 170$

14. The number of subsets of the set A = {0,1,2,3}, containing element 1 is :

(a) 2 (b) 8
(c) 16 (d) 24

UKPSC Lecturer (Mains) 2020

Ans. (b) : Subsets of $0,1,2,3$ containing element 1 are

$1\ ,\ 0,1\ ,\ 1,2\ ,\ 1,3\ ,\ 0,1,2\ ,\ 0,1,3\ ,\ 1,2,3\ ,\ 0,1,2,3$

So, there are 8 subsets of $0,1,2,3$ containing element 1.

15. In an examination 80% students passed in English and 85% students passed in mathematics. If 73% students passed in both these subjects, then what percent of students failed in both the subjects?

(a) 20% (b) 8%
(c) 15% (d) 27%

RRB 2019

Ans. (b) : Let E be the percent of students who passed English examination and M be the percent of student who passed Mathematics examination. Then E^c and M^c denote the percent of students who failed in English and Mathematics examination respectively.
Now, we have

$$P(E\ M) = P(E) + P(M) - P(E\ M)$$
$$= 80+85-73$$
$$= 92\%$$

and hence percent of students who failed in both the subjects is given by

$$P(E^c\ M^c) = P(E\ M)^c = 8\%$$

16. Let A and B be two sets such that n(a) = 20, n(A B) = 42 and n(A B) = 4, then the value of n(b) is

(a) 16 (b) 20
(c) 26 (d) 30

UKPSC GIC 2018

Ans. (c) : We have

$n(A \cup B) = n(a) + n(b) - n(A \cap B)$

$n(b) = n(A \cup B) + n(A \cap B) - n(a)$

$= 42 + 4 - 20$

$= 26$

17. If A and B are two given sets, then $A \cap (A \cup B)^C$ is:

(a) A (b) B
(c) $A \cap B^C$ (d) $A^C \cap B$

UKPSC GIC 2018

Ans. (c) : $A \cap (A \cup B)^C$

$A \cap (A^C \cap B^C)$ (De Morgan's Law)

$(A \cap A^C) \cap (A \cap B^C)$ (Distributive Law)

$(A \cap B^C)$

$(A \cap B^C)$

18. If A is an open set and B is a closed set, then B – A is–

(a) Open set
(b) Closed set
(c) Both open and closed set
(d) None of these

RRB 2016

Ans : (b) B-A is the set of elements which are only in B and not in A i.e. B-A = {x B and x A}

If B is a closed set then B contains all of its limit points.

If A is an open set then B-A still contains all of its limit points and therefore B–A is closed set.

19. In a class of 25 students. 12 have taken mathematics, 8 have taken mathematics and computer science. The number of students who have taken computer science but NOT mathematics is:

(a) 8 (b) 13
(c) 4 (d) 17

RRB 2019

Ans : (b) Let M represent students taken mathematics and C represent students taken computer science.

then $n(M) = 12$, $n(M \cap C) = 8$ and $n(M \cup C) = 25$

$\because$ $n(M \cup C) = n(M) + n(c) - n(M \cap C)$

$25 = 12 + n(c) - 8$

$n(c) = 21$

So, number of students who have taken computer science but not mathematics

$= n(c) - n(M \cap C)$

$= 21 - 8 = 13$

20. In a group of 70 persons, 37 like coffee, 52 like tea and each person likes at least one of the two drinks. How many like coffee but NOT tea?

(a) 16 (b) 13
(c) 17 (d) 18

RRB 2019

Ans : (d) Let C represents persons who like coffee & T represents persons who like tea.

then $n(c) = 37$, $n(T) = 52$

total persons $= n(C \cup T) = 70$

persons who likes both $= n(C \cap T) = x$

then

$n(C \cup T) = n(c) + n(T) - n(C \cap T)$

$70 = 37 + 52 - x$

$x = 89 - 70 = 19$

So, number of persons who likes coffee but not tea

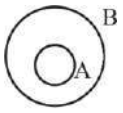
$= n(c) - n(C \cap T) = 37 - 19 = 18$

21. If A B, then

(a) A – B = A (b) A – B = B
(c) A B = A (d) A – B =

RRB 2004

Ans : (d) Set A is called a subset of set B, if every element of set A is also an element of set B.



$A \subseteq B$

Given that, A B

Hence, A B

22. Let A = {a, b, c}; B = {a, b}; C = {b}; D = {a, c} then :

(a) A – D = B – C (b) B = D
(c) D A – C (d) D A

RRB 2004

Ans : (c) A–D = {a,b,c} –{a,c} = {b}

B–C = {a,b} –{b} = {a}

$\therefore A - D \neq B - C$

Again B D $\because$ B a, b and D a, c

$\because A - C - \{a, b, c\} - \{b\} - \{a, c\} \subseteq \{a, c\}$

D A C but $\{a, c\} \subset \{a, b, c\} \Rightarrow$ D $\subset$ A

23. In a class of 25 students, 12 students have taken Mathematics; 8 have taken Mathematics but not Economics. The number of students who have taken both Mathematics and Economics are (assuming each student have taken at least one subject) :

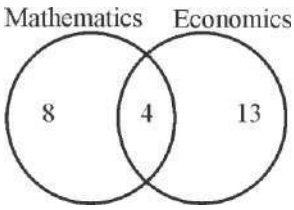
(a) 12 (b) 4
(c) 20 (d) 13

RRB 2004

Ans : (b) Total number of students = 25

Number of students who have taken mathematics = 12

From venn diagram,



Required number of students = 4

24. In a survey of 55 students, it is found that 30 students read newspaper A, 20 read newspaper B and 7 read both the newspapers. The number of students who read none of the newspapers is:

(a) 7 (b) 12
(c) 13 (d) 23

RRB 2018

Ans : (b) Total number of students = 55

then n(a) = 30

n (b) = 20

n (A B) = 7

then number of students who read both the newspapers i.e.,

n(A B) = n(a)+n(b)–n(A B)

= 30+20–7 = 43

Number of students who read none of the news papers

= 55–43 = 12

25. If A and B are subsets of the set of integers such that A x : 4 x 10 and B x : 3 x 9 , then A ∩ B equals:

(a) A (b) A–B
(c) B–A (d) B

RRB 2018

Ans : (d) Given A x : 4 x 10

A 4, 3, 2, 1, 0, 1, 2.....,10

and B x : 3 x 9

B 2, 1, 0, 1, 2.....,8

Clearly B A

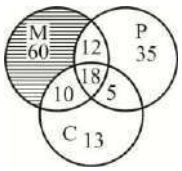
So, $A \cap B = B$

26. A class has 175 Students. The number of students studying one or more of the subjects in this class is as below: Mathematics 100, Physics 70, Chemistry 46, Mathematics and Physics 30, Mathematics and Chemistry 28, Physics and Chemistry 23, Mathematics, Physics and Chemistry 18. The number of students enrolled in Mathematics alone is:

(a) 13 (b) 35
(c) 60 (d) 32

RRB 2018

Ans : (c) Let M represents Mathematics, P represents Physics and C represents Chemistry in the venn-diagram.



The number of students who study Mathematics only is the shaded region.

So, Number of students studying Mathematics only= 60

or = n(M) –n (M P) –n (M C)+n(M P C)=60

27. If A and B are two sets containing 2 elements and 4 elements respectively, then number of subsets of A B having 3 or more elements is:

(a) 211 (b) 219
(c) 220 (d) 256

RRB 2018

Ans : (b) Given that n(a)=2, n(b)=4

then n(A B)= 2 4 = 8

Then number of subsets of (A B) hearing 3 or more elements $= {}^8C_3 + {}^8C_4 + {}^8C_5 + {}^8C_6 + {}^8C_7 + {}^8C_8$

= 56+70+56+28+8+1 = 219

28. If $A = 4^n - 3n - 1, n \in N$ and $B = 9(n-1), n \in N$ then which of the following is true?

(a) A B
(b) B A
(c) A B = A
(d) None of the above

RRB 2016

Ans : (a) $A = 4^n - 3n - 1, n \subset N$

n = 1, 2, 3, ...

A = {0, 9, 54, ...}

B = {9(n-1), n N}

n = 1, 2, 3 .....

B = {0, 9, 18, 27 .....}

then A B

29. Let x and y be real numbers and

$X = \left\{(x,y) \middle| y = \frac{1}{x}, x \neq 0\right\}, Y = \{(x,y) | y = -x\}$

be two sets then–

(a) X Y X

(b) X Y Y

(c) X Y

(d) X Y X

DSSSB TGT (SECTION-B) 28 DEC 2014

DSSSB PGT (SECTION-B) 28 DEC 2014

Ans. (c) Given that,

$X = \left\{(x,y) \middle| y = \frac{1}{x}, x \neq 0\right\},$

Then for x = 1, 2, 3, ...

$X \quad (1,1),(2,1/2),(3,1/3),.....$

& $Y = \{(x,y) : y = -x\}$

Then $Y = (1,-1),(2,-2),(3,-3).....$

Clearly second coordinate of the ordered pairs of X & Y are different.

So, their intersection is empty

Hence

X Y

30. If $A = \{a,b,c\}, B = \{b,c,d\}$ and C $\{a,d,c\}$ then $(A \quad B) \quad (B \quad C)$ is equal to –

(a) {(a,c), (a,d), (b,d)}

(b) {(c,a), (d,a)}

(c) {(a,b), (c,d)}

(d) {(a,c), (a,d)}

DSSSB TGT (SECTION-B) 28 DEC 2014

Ans. (d)

Sets are $A = \{a,b,c\}, B = \{b,c,d\}$ & $C = \{a,d,c\}$

then $A - B = \{a\}$ & $B \cap C = \{c,d\}$

therefore $(A - B) \times (B \cap C) = \{a\} \times \{c,d\}$

$\{(a,c),(a,d)\}$

31. For any two sets A and B, the value of the set $A \quad (A \quad B)^c$ is–

(a) A^c (b) B^c

(c) (d) B

DSSSB TGT (SECTION-B) 28 DEC 2014

Ans. (c) By De-Morgan's low

$(A \quad B)^c \quad A^c \quad B^c$

$\therefore A \cap (A \cup B)^c = A \cap (A^c \cap B^c)$

$= (A \cap A^c) \cap (A \cap B^c)$

$= \phi \cap (A \cap B^c) = \phi$

32. If $\{1,2,3,4,5,6\}$ and $A \quad \{1,3,6\}$, $B \quad \{5,6\}$ then $A \quad B'$ will be :

(a) {1, 2, 3, 4, 5} (b) {2, 4}

(c) {6} (d) {2, 4, 5}

RRB 2001

Ans : (a) If $\{1,2,3,4,5,6\}$

then, $A \cap B = \{1,3,6\} \cap \{5,6\} = \{6\}$

$\therefore A \cap B' = \cup - A \cap B$

$\Rightarrow \{1,2,3,4,5,6\} - \{6\} \quad \{1,2,3,4,5\}$

33. If A = {1, 2, 3, 4}, B = {1, 3, 5, 8} and C = {3, 4, 5} then $A \quad B \quad C$ will be :

(a) {1, 2, 3, 4, 5} (b) {1, 3, 5}

(c) {1, 2, 4, 5} (d) {1, 3, 4, 5}

RRB 2001

Ans : (a) $\because B \cap C = \{1,3,5,8\} \cap \{3,4,5\}$

= {3, 5}

$\therefore A \cup B \cap C = \{1,2,3,4\} \cup \{3,5\} = \{1,2,3,4,5\}$

34. Let A, B and C be three sets then(A–B) (A–C) is equal to :

(a) A (B C) (b) A (B–C)

(c) A (B–C) (d) A–(B C)

RRB 2010

Ans : (d) $x \subset A - (B \cap C) \Leftrightarrow x \subset A$ and $x \quad (B \quad C)$

$x \quad A$ and $(x \quad B$ or $x \quad C)$

$(x \quad A$ and $x \quad B)$ or

$(x \quad A$ and $x \quad C)$

$x \quad (A \quad B)$ or $x \quad (A \quad C)$

$\Leftrightarrow x \subset (A - B) \cup (A - C)$

$A - (B \cap C) = (A - B) \cup (A - C)$

or

By De-Morgan's law,

A – (B C) = (A – B) (A – C)

35. If the set A has p elements and set B has q elements, then the number of elements in A×B is

(a) p+q (b) p+q+1

(c) pq (d) p^2q^2

RRB 2010

Ans : (c) The Cartesian product A × B
= {(a, b) : a A, b B}
has pq elements.

36. Let A, B, C be three sets, then (A – B) (A – C) is equal to :

(a) $A \quad (B \quad C)$ **(b)** $A \quad (B \quad C)$

(c) $A \quad (B \quad C)$ **(d)** $A \quad (B \quad C)$

RRB 2009

Ans : (d) Let $x \quad A \quad (B \quad C)$

$x \quad A$ and $x \quad (B \quad C)$

x A and (x B and x c)

x (A – B) and $x \quad (A \quad C)$

$x \subset (A - B) \cap (A - C)$

$A - (B \cup C) \subseteq (A - B) \cap (A - C)$ .....(i)

Similarly, $x \subset (A - B) \cap (A - C)$

$x \quad (A \quad B)$ and $x \quad (A \quad C)$

(x A and x B) and (x A and x C)

x A and x (B C)

x A – (B C)

$(A - B) \cap (A - C) \subseteq A - (B \cup C)$ ……(ii)

From equation (i) and (ii)

$(A - B) \cap (A - C) = A - (B \cup C)$

or

By De-Morgan's law,

A – (B C) = (A – B) (A – C)

37. In a city, 20% of the population travel by car, 50% travel by bus and 10% travel by both car and bus. Then persons travelling by car or bus is

(a) 80% (b) 40%

(c) 60% (d) 70%

RRB 2009

Ans : (c) Let A represent car and B represent bus then n(a)= 20%, n(b) = 50% and n(A B)= 10% By the formula

A Car B Bus

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$- 20 + 50 - 10 - 60\%$

Hence the number of persons travelling by car or bus is = 60%

38. A,B,C are subsets of a universal set S then $A - C \quad \cup (B - C) =$

(a) $A \quad B \quad C$

(b) $A \quad C \quad B$

(c) $A \quad B \quad C$

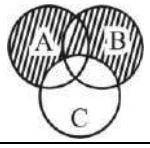
(d) None of these

RRB 2003

Ans : (a) From Diagram

(A–C) (B–C)

= (A B) –C



39. $A \quad B \quad B \quad A$ **is equal to :**

(a) $A \quad B$ (b) $A \quad B$

(c) $A \quad B \quad A \quad B$ (d) None of these

RRB 2003

Ans : (c) From Diagram

(A–B) (B–A)

= (A B)–(A B)

40. Let A and B be two sets having 5 common elements. Then number of elements common to A B and B A is :

(a) 2^5 (b) 5^2

(c) 0 (d) None of these

RRB 2000

Ans : (b) ∵ A and B be two sets having 5 common elements

A B = 5

Then, number of elements common to A × B and B × A = 5 5 = 5^2

41. If A={2,6}, B={10,9} and C={1,9} then the value of A (B C) is :

(a) {(2,1) (2,9), (2,10), (6,1, (6,9), (8,6), (6, 10)}

(b) {(2,0), (2,1), (6,0)}

(c) {(3,4), (3,1)}

(d) {(3,1), (3,4)}

RRB 2000

Ans : (a) If A={2,6}, B={10,9} and C= {1,9}

then, B ∪ C 1,9,10

A (B C) ={2,6} {1,9,10}

= {(2,1), (2,9), (2,10), (6,1), (6,9), (6,10)}

42. If A={1} and B={1,2,3} then (A B) is:

(a) {(1,1), (1,2), (1,3)}

(b) {(1,2), (3,1), (2,1)}

(c) {(2,1), (1,1), (3,1)}
(d) None of these

RRB 2000

Ans : (a) If A={1} and B={1,2,3}
then, A B= {(1,1),(1,2), (1,3)}

43. If x={a,b,c,d} and y={4,5,6,7} the x y is:
(a) {a,b,c,3,7} (b) {a,b,4,5}
(c) {a,b,c,d, 4,5,6,7} (d) None of these

RRB 2000

Ans : (c) If x={a,b,c,d} and y={4,5,6,7}
(x y) = {a, b, c, d, 4, 5, 6, 7}

44. If A= {1,2,3,4,5}, then the number of subsets of A which contain element 2 but not 4, is
(a) 2 (b) 4
(c) 6 (d) 8

RRB 2016

Ans : (d) Given that A = {1,2,3,4,5}
Subsets of A which contains 1 but not 4
{2}, {2,1}, {2,3}, {2,5}, {2,1,3}, {2,1,5}, {2,3,5} and {2,1,3,5}
Hence total number of subset = 8

45. If $A = \left\{ x \middle| \frac{x}{2} \in 0 \le x \le 10, \le x \le 10 \right\}$,

B {x | x **is prime number of one digit} and**

$C = \left\{ x \middle| \frac{x}{3} \in N, x \le 12 \right\}$ **then** A (B C) **is equal to**

(a) {2,6} (b) {3,6}
(c) {2,6,12} (d) {3,6,12}

RRB 2015

Ans. (a)

Given that $A = \left\{ x : \frac{x}{2} \in o \le x \le 10 \right\}$

A 0, 2, 4, 6, 8, 10

B x : x is prime number of one digit

B 2, 3, 5, 7

and $C = \left\{ x : \frac{x}{3} \in N, x \le 12 \right\}$

C 3, 6, 9, 12

B C 2, 3, 5, 6, 7, 9, 12

$\Rightarrow A \cap (B \cup C) - 2, 6$

46. If A and B are two sets, then A-(A-B) is equal to–
(a) A B (b) A B
(c) A (d) B

RRB 2011

Ans : (b) let A = a, b, c and B = c, d, e

then A – B – a, b A ∩ B – c

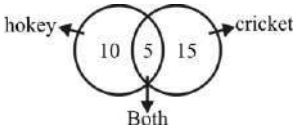
and A – (A – B) = c = A ∩ B

$\Rightarrow \boxed{A - (A - B) = A \cap B}$

47. In a class of 50 students, 20 play cricket, 15 play hockey and 5 students play both the games. The number of students who play neither of the two games is–
(a) 0 (b) 20
(c) 30 (d) 10

KVS DEC 2017

Ans. (b) Total number of students = 50



The number of student play neither of the two game
= 50 – 30 = 20.

48. If A and B are two sets and A' denotes the complement of A, the A (A B)' is equal to–
(a) A (b) B
(c) (d) A B

KVS DEC 2017

Ans. (c) Let U = { 1, 2, 3, 4, 5, 6 }
A = { 1, 2, 3}, B = {3,5}
then, A B = { 1, 2, 3, 5 }
(A B)' ={6}
So, that A (A B)' =

49. If Z denotes the set of integers and A, B, C are its subsets given by:
A = {x Z : x is divisible by 2}
B = {x Z : x is divisible by 4}
C = {x Z : x is divisible by 6}
then the set A B C is:
(a) {x Z : x is divisible by 4}
(b) {x Z : x is divisible by 12}
(c) {x Z : x is divisible by 24}
(d) the empty set

UP PCS (Pre) 1998/ 2000

Ans. (b) The L.C.M. of, 2, 4, 6 = 12 the {x z : x is divisible by 12}

50. The set of natural numbers is not closed for the following operation :

(a) addition (b) multiplication

(c) subtraction (d) squaring

(GIC) Lecturer exam, 2015

Ans. (c) The set of natural number is not closed w.r.t. the subtraction operation.

For If a, b, N then a–b not necessarily belongs to N.

51. Let X and Y be two sets such that X and Y have n elements in common. The number of elements common X Y and Y X is :

(a) n (b) n^2

(c) 2n (d) n^3

UP PCS (Pre) 1999

Ans. (b) Let, X = {1, 2}, Y={1, 2, 3} n = 2

X Y= {(1, 1)(1, 2)(1, 3)(2, 1)(2, 2)(2, 3)}

Y X = {(1, 1)(1, 2)(2, 1)(2, 2)(3, 1)(3, 2)}

Common elements = {(1, 1)(1, 2)(2, 1)(2, 2)

Hence, no. of common elements = n^2

52. The number of proper subsets of a set containing n elements is :

(a) n (b) 2^n

(c) 2^{n-1} (d) $2^n - 1$

UP PCS (Pre) 2000

Ans. (d) Number of required elements = $2^n - 1$

53. If the complement of the set A be A', then A B ' is equal to :

(a) A B (b) A' B'

(c) A' B' (d) B'/A'

UP PCS (Pre) 2000

RRB 2003

Ans. (b) By De-Morgan's law, A B ' A' B'

54. A finite set has :

(a) one limit

(b) No limit point

(c) many limit points

(d) none of the above

UP PCS (Pre) 2002

Ans. (b) A finite set has no limit point.

55. If A = {1,2} and B = {a,b,c}, P(A) P(B) is–

(a) a null set

(b) a singletion

(c) a pair set

(d) none of the above

UP PCS (Pre) 2004

Ans. (a) A = {1, 2}, B = {a, b, c}

P(A) P(B) ?

P(A) { } {1} {2} {1, 2}

P(B) { } {a} {b} {c} {a, b} {a, c} {b, c} {a, b, c}

P(A) P(B) {ϕ} $\Rightarrow$ A null set

56. The number of non-empty subsets of the set (1, 2, 3, 4) is:

(a) 14 (b) 15

(c) 16 (d) 17

UP PCS (Pre) 2005

Ans. (b) No. of non-empty subsets = $2^n - 1 = 2^4 - 1 = 16 - 1 = 15$

57. If the sets, A, B and A B have 4, 7 and 9 elements respectively, then the number of elements in A B is:

(a) 2 (b) 3

(c) 4 (d) 1

UP PCS (Pre) 2005

Ans. (a) Given n(a)= 4, n(b)= 7 n(A B)=9

By the formula

n(A B) = n(a)+n(b)–n(A B)

9= 4+7–n(A B)

n A B 2

58. If A, B, C are three sets then A (B C) is equal to:

(a) (A B) (A C) (b) (A B) (A C)

(c) (A B) (A C) (d) (A B) (A C)

UP PCS (Pre) 2006

RRB 2013

Ans : (c) Let A = {1,2}, B={2,3}, C={1,2,5}

then (B C) = {1,2,3,5}

A (B C) = {(1,1), (1,2), (1,3), (1,5), (2,1), (2,2) ,(2,3), (2,5)

So that, A B 1,2 , 1,3 , 2,2 , 2,3

A C 1,1 , 1,2 , 1,5 , 2,1 , 2,2 , 2,5

A B A C 1,1 , 1,2 , 1,3 , 1,5 , 2,1 , 2,2 , 2,3 , 2,5

Thus, $A \times B \cup C = A \times B \cup A \times C$

59. For three sets A, B and C the correct statement is

(a) A B=A C B=C

(b) A B=A C B=C

(c) A B=A C and A B=A C B=C

(d) A–B=A–C B=C

UP PCS (Pre) 2009

RRB 2013

Ans. (c) A B=A C and A B=A C B=C

60. P and Q are the two sets, then $(P - Q) \cup (Q - P) \cup (P \cap Q)$ will be :

(a) P (b) Q

(c) P Q (d) P Q

RRB 2013

Ans : (d) Let, P a,b,c,d and Q b,c,d,e

$\therefore$ $P - Q - a,b,c,d - b,c,d,e - a$

$Q - P - b,c,d,e - a,b,c,d - e$

P Q b,c,d

$P - Q \cup Q - P - a,e$

$\Rightarrow$ $P - Q \cup Q - P \cup P \cap Q$

a,b,c,d,e

P Q

and $P \cup Q - a,b,c,d \cup b,c,d,e$

P Q a,b,c,d,e

again, $(P \quad Q) \cup (Q \quad P) \cup (P \cap Q) = a \cup e \cup b,c,d$

a,b,c,d,e

P Q

61. The number of subsets of a set having n elements is :

(a) n^2 (b) 2^n

(c) n (d) n+1

RRB **2013**

SECTION B PGT TIER-I 31.11.2014

SECTION B TGT TIER-I 31.11.2014

Ans : (b) The number of subsets of a set having n elements is 2^n

For example– A = {1, 2}

then, ϕ 1 , 2 , 1,2 $\subseteq$ A

Number of subsets = $2^2 = 4$

62. If P, Q and R three sets, then which of the following is correct?

(a) $P \cup Q \cap R - P \cup Q \cap P \cap R$

(b) $P \cap Q \cup R - P \cap Q \cap P \cup R$

(c) $P \cup Q \cap R - P \cup Q \cap P \cup R$

(d) $P \cap Q \cup R - P \cap Q \cap P \cap R$ **b**

RRB 2013

Ans : (c) If P, Q and R three sets

Let, $x \subset P \cup Q \cap R \Rightarrow x \subset P$ or x Q R

x P or (x Q and x R)

(x P or x Q) and (x P or x R)

x P Q and x P R

$\Rightarrow x \subset P \cup Q \cap P \cup R$

$\because x \subset P \cup Q \cap R \Rightarrow x \subset P \cup Q \cap P \cup R$

$P \cup Q \cap R \subseteq P \cup Q \cap P \cup R$ .....(i)

Similarly $P \cup Q \cap P \cup R \subseteq P \cup Q \cap R$ .....(ii)

From equation (i) and (ii)

$P \cup Q \cap R = P \cup Q \cap P \cup R$

63. Subsets of set {0} :

(a) (b) , 0

(c) 0 (d) , 0 , 0,

RRB 2013

Ans : (b) 0 a singleton set

subsets of set 0 = , 0

64. If A B = A C, A B = A C, then

(a) B = C (b) A = B

(c) A = C (d) None of these

RRB 2010

Ans : (a) If $A \cup B \quad A \cup C$ and $A \cap B \quad A \cap C$ B C

65. If A = {1,3,5,7} B={4,5,7,9} and C={1,3,4,9,11}, then (A B) C=

(a) {1,3,4,7,9,11} **(b) {3,4,9,11}**

(c) {7} **(d) None of these**

RRB 2010

Ans : (d) $A \cup B - 1,3,5,7 \cup 4,5,7,9,$

1,3,4,5,7,9

$\therefore (A \cup B) \cap C - 1,3,4,5,7,9, \cap 1,3,4,9,11$

1,3,4,9

66. If A = x : x 5, x N , B x : x 10 and C = x : 2 < x < 6, x N then A B C will be:

(a) {1, 3} (b) {2, 3}
(c) {1, 2} (d) {1, 4}

RRB 2009

Ans : (c) Given that,

$A = \{x : x \leq 5, x \in N\} = \{1, 2, 3, 4, 5\}$

$B = \{x : x \leq 10, x \in N\} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$C = \{x : 2 < x < 6, x \in N\} = \{3, 4, 5\}$

$A - (B \cap C) = \{1, 2, 3, 4, 5\} - \{3, 4, 5\}$

$\because B \cap C = \{3, 4, 5\}$

$= \{1, 2\}$

67. If A and B are two sets then which of the following is correct ?

(a) $A \subset B$ (b) $A \subset B$ $A = B$

(c) $A \subset B$ A or B (d) $A \subset B$ $B \subset A$

RRB 2009

Ans : (c) If A and B are two sets

then,

$n(A \cup B) \geq n(A)$, $n(B) \geq n(A)$, $n(B) \geq n(B)$ are not possible

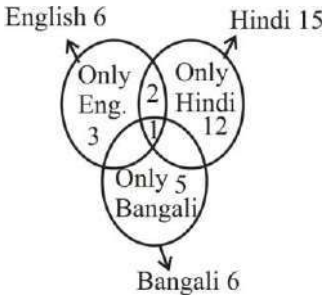
but $n(A) = n(B)$ $n(A)$ or $n(B)$ or can be equal.

68. In a group of class 6 students can speak English, 15 students can speak Hindi and 6 can speak Bengali. Nobody can speak any other language. If 2 students in the class can speak two languages and one person can speak all the three languages, then how many students are there in the class?

(a) 22 (b) 24
(c) 23 (d) 21

RRB NTPC 05.03.2021 (Shift-I) Stage Ist

Ans. (c)



Total number of students in class = 3 + 2 + 12 + 5 + 1
= 23

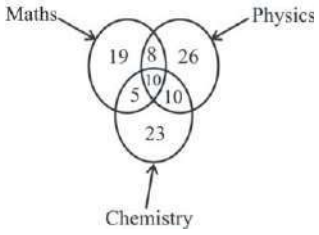
69. In a mid-term exam of class 11, 42% students failed in Mathematics, 54% students failed in Physics and 48% students failed in Chemistry. Only 10% students failed in all the three subjects. 20% students failed in both Physics and Chemistry, 15% students failed in both Chemistry and Mathematics, and 18% students failed in both Physics and Mathematics. What is the percentage of those students who failed in two subjects only?

(a) 33% (b) 43%
(c) 53% (d) 23%

RRB NTPC 18.01.2021 (Shift-II) Stage Ist

Ans. (d) : Total number of students = 100%

Venn-diagram of failure students is as follows



Percentage of students who failed in two subject = (8+5+10)% = 23%

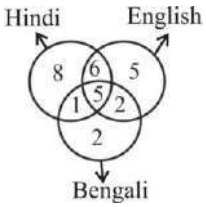
70. In an event, 18 people speak English, 20 persons may speak Hindi. 10 people may speak Bengali. 11 people may speak Hindi and English both, 6 people may speak Hindi & Bengali both, 7 peoples may speak Bengali and English 5 persons may speak all languages.

How many people are in group?

(a) 33 (b) 60
(c) 29 (d) 48

RRB NTPC 26.07.2021 (Shift-II) Stage Ist

Ans. (c) :



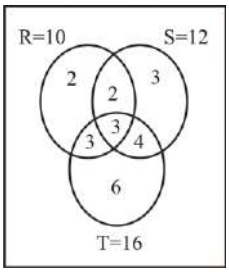
Total number of people in the group
= 8 + 6 + 5 + 1 + 5 + 2 + 2 = 29

71. R, S and T represent people who like roses, sunflowers and tulips respectively. The number of people is R = 10, S = 12 and T = 16. Three people are such that they like roses, sunflowers and tulip. Two of them like roses and sunflower. Three people like roses and tulips and 4 people like sunflowers and tulip. Then what is the number of people who like only rose?

(a) 6 (b) 2
(c) 12 (d) 14

RRB NTPC 31.01.2021 (Shift-I) Stage Ist

Ans. (b): According to the question,



It is clear from the diagram that the number of people who like only rose=2

72. In a class 25 students like Maths and History, 25 students like only Hindi, 30 students like only English, 20 students like English and Hindi both, 15 students like only History and 15 students like only Maths. 15 students like all 4 subjects. How many total students are there in the class?

(a) 130 (b) 145
(c) 125 (d) 140

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (b) : Total number of students
= 25 + 25 + 30 + 20 + 15 + 15 + 15 = 145

73. In a class of 130 students. 15 students like Maths and History. 25 students like only Hindi. 30 students like only English, 20 students like English and Hindi both, 15 students like only History and 15 students like only Maths. Some students like all 4 subjects. If the total number of students who like English is 60, Hindi is 55, Maths and history is 40 then how many students like all 4 subjects?

(a) 25 (b) 35
(c) 10 (d) 15

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

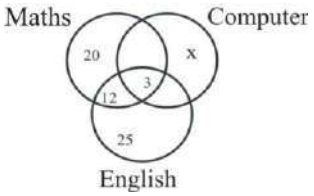
Ans. (c) : As per the question –
Students who like only Mathematics and History = 15
Students who like only English and Hindi = 20
Students who like only Hindi = 25
Students who like only English = 30
Students who like only Mathematics = 15
Students who like only History = 15
Total students who like English = 60
Total students who like Hindi = 55
Total students who like Mathematics and History = 40
From the above,
Students who like all three subjects with English
= 60 – (30 + 20) = 10
Students who like all three subject with Hindi
= 55 – (20 + 25) = 10
Number of students who like two more subjects with Maths and History = 40 – (15 + 15) = 10
Hence number of students who like all four subjects = 10

74. In a class of 65 students, 20 students like only Maths, 25 students like only English and 15 students like both English and Maths. 8 students like Computer and 3 students like all three subjects. There are no students who like Computer and English. Also, there are no students who like Maths and Computer. How many students like only Computer?

(a) 3 (b) 11
(c) 5 (d) 2

RRB NTPC 17.01.2021 (Shift-II) Stage Ist

Ans. (c) Let, number of people who like Computer be x.



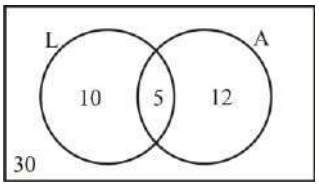
$\because$ 20+25+12+3+x = 65
60+x = 65
x = 65–60
x = 5
Hence, there are 5 students who like only Computer.

75. L and A are classmates as well as good friends. In a class of 30 students, L has 10 unique friends and 5 friends who are common to A. A has a total of 17 friends in the class. How many students are friends with neither L nor A?

(a) 5 (b) 2
(c) 4 (d) 3

RRB NTPC 16.01.2021 (Shift-II) Stage Ist

Ans. (d) : As per the question,



From above diagram,
Number of students who are neither friends of L nor friends of A.
= 30 – (10 + 5 + 12)
=30 – 27
= 3

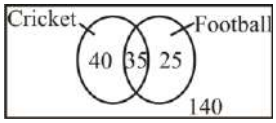
76. Please read the following information carefully and answer the given question. In a group of 140 people, 75 people like to watch cricket and 60 people like to watch football. 35 people like to watch both the games. How many people like to watch at least one sports?

(a) 100 (b) 110

(c) 95 (d) 90

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (a) : According to the question-



So, those people who like to watch at least one game

$= 40 + 35 + 25$

$= 100$

77. In a college, there are 3600 students, out of which 82% are football players, 7% are kabaddi players, 4% are chess players and the remaining are cricket players. The number of cricket players is:

(a) 252 (b) 126

(c) 136 (d) 152

RRB NTPC 02.03.2021 (Shift-I) Stage Ist

Ans. (a) :

Total number of students in the college = 3600

Number of football players = $3600 \quad \frac{82}{100} = 2952$

Number of kabaddi players = $3600 \times \frac{7}{100} = 252$

Number of chess players = $3600 \times \frac{4}{100} = 144$

Number of cricket players = 3600–(2952+252+144)

= 3600 – 3348 = 252

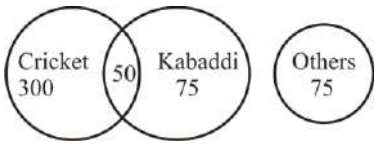
78. Out of 500 students in a college, 350 play cricket, 125 play kabaddi, 75 neither play cricket nor play kabaddi. Find the percentage of the number of the students who play both kabaddi and cricket.

(a) 20% (b) 15%

(c) 12% (d) 10%

RRB NTPC 15.02.2021 (Shift-II) Stage Ist

Ans. (d)



Students playing both cricket and kabaddi = 50

Total number of students = 500

Hence, percentage of students who play both games

$= \frac{50}{500} \quad 100 \quad \boxed{10\%}$

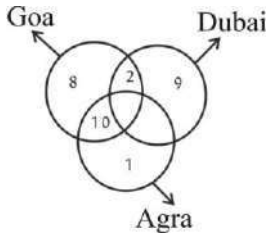
79. In a group of people, 8 persons like only Goa and 9 persons like only Dubai. There is only one person who likes only Agra, 10 person like both Goa and Agra while 2 persons like both Dubai and Goa. There is no such person who likes both Agra and Dubai and there is no one in the group who likes all three. How many total persons are there in the group

(a) 42 (b) 30

(c) 39 (d) 31

RRB NTPC 17.01.2021 (Shift-II) Stage Ist

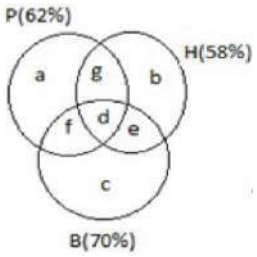
Ans. (b)



Hence from the above diagram the total number of persons in the group = 8 + 2 + 9 + 10 + 1

= 30

80. Study the given Venn diagram and answer the question that follows.



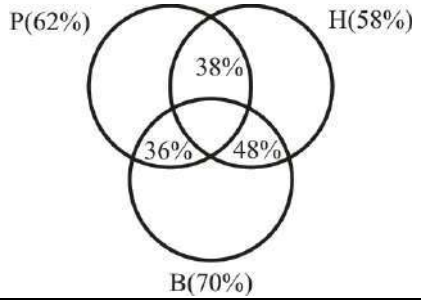
There are 7500 officers in a Stage. Among them, 62% officer punctual (P), 58% officers are honest (H) and 70% officers are brave (B). 38% officers are punctual (P) and honest (H), 48% are honest (H) and brave (B) and 36% are punctual (P) and brave (B). What percentage of officers are punctual (P), honest (H) and brave (B) = ?

(a) 90% (b) 22%

(c) 68% (d) 32%

RRB NTPC 13.01.2021 (Shift-I) Stage Ist

Ans. (d) :



$\Rightarrow n(P \cup H \cup B)$

$= n(P) + n(H) - n(B) - [n(P \cap H) - n(H \cap B) - n(B \cap P)] + n(P \cap H \cap B)$

$100\% = 62\%+58\%+70\%-(38+48+36)\% + n(P \cap H \cap B)$

$100\% = 190-122+n(P \cap H \cap B)$

$\therefore\ n(P \cap H \cap B)= 100\% - 68\% = 32\%$

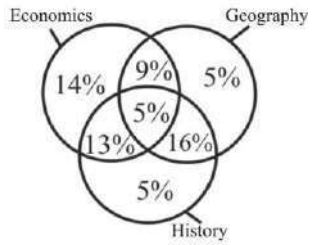
81. In an examination, 41% of students failed in Economics, 35% of students failed in Geography and 39% of students failed in History, 5% of students failed in all the three subjects, 14% of students failed in Economics and Geography, 21% of students failed in Geography and History and 18% of students failed in History and Economics. Find the percentage of students who failed in only Economics.

(a) 16 % (b) 12 %

(c) 10 % (d) 14 %

RRB NTPC 08.01.2021 (Shift-I) Stage Ist

Ans. (d) **:**



Percentage of students who failed only in Economics = 14%

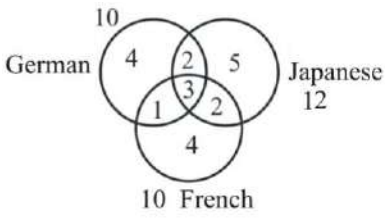
82. There are 21 persons and there languages – French, German and Japanese. 10 persons speak German, 12 persons speak Japanese, and 10 persons speak French. 4 can speak only French and 5 can speak only Japanese. 4 can speak French as well as German. 3 persons can speak all language. How many persons speak Japanese and German?

(a) 3 (b) 2

(c) 4 (d) 1

RRB NTPC 18.01.2021 (Shift-I) Stage Ist

Ans. (b) :



From the above Venn diagram number of people speaking both Japanese and German language = 2.

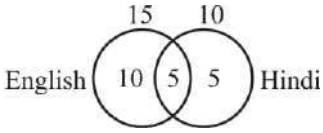
83. In a group of students, 15 opt for English, 10 opt for Hindi. Five students are studying both languages. How many students are studying only English.

(a) 25 (b) 10

(c) 5 (d) 15

RRB NTPC 18.01.2021 (Shift-I) Stage Ist

Ans. (b) :



Therefore, 10 students are studying only English.

84. 14 people buy item A while 13 people buy item B. Two people buy both items. How many people are there in all?

(a) 27 (b) 29

(c) 26 (d) 25

RRB NTPC 18.01.2021 (Shift-I) Stage Ist

Ans. (d) : Let total number of people = x

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$x = 14 + 13 - 2$

$x = 27 - 2$

$x = 25$

So, the total number of people will be 25.

85. In an examination, 35% students failed in one subject and 42% failed in the other subject, among these 30% failed in both the subjects. If total number of students is 2500 then how many students passed only in one subject?

(a) 425 (b) 1750

(c) 1050 (d) 750

RRB NTPC 12.01.2021 (Shift-I) Stage I[st]

Ans. (a) : Failed in only one subject means percentage of students passed in

$= (42 - 30) + (35 - 30)$

$= 12 + 5$

$= 17\ \%$

Hence number of students $2500 \quad \frac{17}{100}$

$= 425$

86. In a group of 60 students, 65% mentioned their gender as 'Male' and 30% mentioned their gender as 'Female'. How many students have not mentioned their gender?

(a) 2 (b) 3

(c) 5 (d) 4

RRB NTPC 11.01.2021 (Shift-I) Stage Ist

Ans. (b) Total number of students = 60

According to the question,

$$\text{Number of Males} = 60 \quad \frac{65}{100} = 39$$

$$\text{Now, Number of Females} = 60 \quad \frac{30}{100} = 18$$

Number of students who have not mentioned their gender = 60 – (39+18)

= 60 – 57 = 3

87. Last year, there were three Sections in a competitive exam. Out of them 33 students cleared the cut-off in Section A, 34 students cleared the cut-off in Section B and 32 students cleared the cut-off in Section C. 10 Students cleared the cut-off in Section A and Section B, 9 cleared the cut-off in Section B and Section C and 8 cleared the cut-off in Section A and Section C. The number of students who cleared only one Section was equal and was 21 for each Section. How many students cleared all the three Sections?

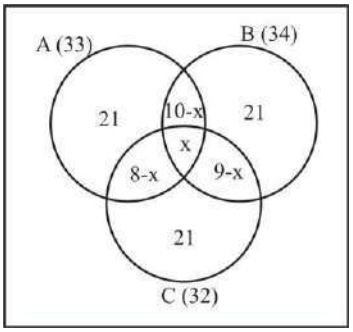
(a) 9 (b) 8

(c) 6 (d) 7

RRB NTPC 07.01.2021 (Shift-I) Stage Ist

Ans. (c): Suppose number of students cleared all the three Section be x.

According to the question,



Hence, from Section A

$21 + (10 - x) + x + (8 - x) = 33$

$39 - x = 33$

$x = 6$

Hence, number of students who cleared the all three Section is 6.

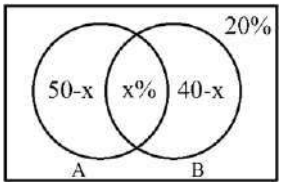
88. A survey conducted in one area found that 50% of people read 'A' newspaper, 40% of people read 'B' newspaper, 20% of people read neither newspaper A nor newspaper B. If the number of people who read both newspapers is 500. Then how many people were surveyed?

(a) 7000 (b) 4500

(c) 5000 (d) 3000

RRB RPF SI – 13/01/2019 (Shift-III)

Ans : (c)



From the Venn diagram,

$50 - x + x + 40 - x + 20 = 100$

$110 - x = 100$

$x = 10\%$

10% = 500

100% = 5000

So total number of people is 5000 in the survey.

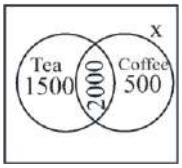
89. The number of students in a college is 5000. 3500 students like coffee, 2500 students like tea and 2000 students like both tea and coffee. How many students don't like either of these two drinks?

(a) 1500 (b) 1000

(c) 500 (d) 2000

RRB RPF Constable – 22/01/2019 (Shift-III)

Ans. (b) Let the number of students who do not like both the drinks = x



5000 = 2000 + 1500 + 500 + x

x = 5000 – 4000

x = 1000

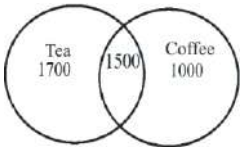
90. In a town with a population of 5000, 3200 people take tea, 2500 people take coffee and 1500 people take both tea and coffee. How many of them neither take tea nor coffee?

(a) 800 (b) 770

(c) 900 (d) 1800

RRB Group-D – 15/10/2018 (Shift-I)

Ans : (a)



The number of people who take only tea

= 3200 – 1500 = 1700

The number of people who take only coffee

= 2500 – 1500 = 1000

Number of people neither take tea nor coffee

= 5000 – (1700 + 1000 + 1500)

= 5000 – 4200 = 800

So, 800 people neither take tea nor coffee.

08 Statistics

(Measurement of Central Tendency, Measures of Dispersion : Range, Mean deviation, Variance and standard Deviation of Ungrouped/ grouped data)

■ The branch of mathematics in which we study about the collection, organization, analysis, interpretation and presentation of data or information.

Kind of statistical average (Measures of central Tendency)

■ **Mathematical Average :**

1. Arithmetic average or mean
2. Geometric mean
3. Harmonic mean
4. Quadratic mean

■ **Average of Position**

1. Median 2. Mode 3. Partition value

■ **Mathematical Average**

A. Arithmetic average or mean

Arithmetic mean or average –: The arithmetic mean or average is the ratio of sum of all observations to the total number of observations.

There are two types of arithmetic mean –:

(i) Simple arithmetic mean or average

(ii) Weighted arithmetic mean or average

(i) Simple arithmetic mean or average–

$$\text{Mean} \quad \frac{\text{Sum of all observations}}{\text{Total no. of observations}}$$

$$X \quad \frac{X}{N}$$

Ex. 1 : Calculate Arithmetic mean of following marks in economics obtained by 10 students in a monthly test?

Roll No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Marks :	**30**	**28**	**32**	**12**	**18**	**20**	**25**	**15**	**26**	**14**

Solution :

Roll No.	Mark (X)
1	30
2	28
3	32
4	12
5	18
6	20
7	25
8	15
9	26
10	14
N = 10	$\sum X$ 220

$$X \quad \frac{X}{N}$$

$$X \quad \frac{220}{10}$$

$$X \quad 22 \text{ Marks}$$

■ **Short cut Method**

Assumed mean :

Assumed mean method finds the actual mean of the data by first assuming a mean value. The term "mean" refers to the average value of a set of data, which is derived by dividing the total number of counts by all the data. The mean, or total average, is easily determined by adding all the numbers together, then dividing by the entire number of numbers. The mean value is a set of data is a determined average that lies halfway between the highest and lowest values.

$$X \quad A \quad \frac{dx}{N}$$

Ex. 2 : Calculate Arithmetic mean of following marks in economics obtained by 10 students in a monthly test?

Roll No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Marks :	**30**	**28**	**32**	**12**	**18**	**20**	**25**	**15**	**26**	**14**

Shortcut method-

Roll no.	**Score (X)**	**dx (x A)**
1	30	30–20 +10
2	28	28–20 +8
3	32	32–20 +12
4	12	12–20 –8
5	18	18–20 –2
6	**A = 20**	20–20 = 0
7	25	25–20 = 5
8	15	15–20 = –5
9	26	26–20 = +6
10	14	14–20 = –6
N = 10		**dx = + 20**

$$X = A + \frac{dx}{N} \qquad (A = \text{Assumed value})$$

$$X \quad 20 \quad \frac{20}{10}$$

$$X \quad 20 \quad 2$$

$$X \quad 22 \text{ Marks}$$

■ **If** $x_1, x_2, x_3 \ldots\ldots\ldots\ldots x_n$ are the value of variable x and $f_1, f_2, f_3 \ldots\ldots\ldots\ldots f_n$ are the respective frequencies.

Mean $\dfrac{f_1x_1 + f_2x_2 + \ldots\ldots\ldots\ldots + f_nx_n}{f_1 \quad f_2 \ldots\ldots\ldots f_n}$

$$\text{A.M.} \quad \frac{f_1x_1 + f_2x_2 + \ldots\ldots\ldots\ldots + f_nx_n}{f_1 \quad f_2 \ldots\ldots\ldots f_n}$$

$$\text{A.M.} \quad \frac{f_ix_i}{N}$$

$$X \quad \frac{f_ix_i}{N}$$

Ex. 3 : Calculate Arithmetic mean from the following data :

Size :	**4**	**5**	**6**	**7**	**8**
Frequency :	**5**	**8**	**10**	**10**	**7**

Sol. :

Size (X)	f	f(x)
4	5	4 5 = 20
5	8	5 8 = 40
6	10	6 10 = 60
7	10	7 10 = 70
8	7	8 7 = 56
	N = 40	**f(x) = 246**

$$\bar{X} \quad \frac{\sum f(x)}{N}$$

$$\bar{X} \quad \frac{246}{40} \quad 6.15$$

Ex. 4 : Calculate Arithmetic mean from the following data :

Size :	**4**	**5**	**6**	**7**	**8**
Frequency :	**5**	**8**	**10**	**10**	**7**

Sol. :

By short cut method :

Size (X)	f	dx (A = 6)	fdx
4	5	4 – 6 – 2	5 (–2) = –10
5	8	5 – 6 – 1	8 (–1) = –8
A = 6	10	6 – 6 0	10 0 = 0
7	10	7 – 6 + 1	10 1 = 10
8	7	8 – 6 + 2	7 2 = 14
	N = 40		**fdx = + 6**

$$\bar{X} \quad A \quad \frac{fdx}{N}$$

$$\bar{X} \quad 6 \quad \frac{6}{40} \quad 6 \quad 0.15$$

$$\bar{X} \quad 6.15$$

Ex. 5: Calculate Arithmetic mean from the following series?

Wages (Rs.)	0-10	10-20	20-30	30-40	40-50
No. of workers	8	12	20	6	4

Sol. :

Wages (Rs.)	Mean (X)	No. of workers (f)	fx
0-10	$\frac{0 \quad 10}{2}$ 5	8	40
10-20	$\frac{10 \quad 20}{2}$ 15	12	180
20-30	$\frac{20 \quad 30}{2}$ 25	20	500
30-40	$\frac{30 \quad 40}{2}$ 35	6	210
40-50	$\frac{40 \quad 50}{2}$ 45	4	180
		N = 50	**fx = 1110**

$$X \quad \frac{fx}{N}$$

$$X \quad \frac{1110}{50}$$

$$X \quad 22.2₹$$

Ex. 6: Calculate Arithmetic mean from the following series?

Wages (Rs.)	0-10	10-20	20-30	30-40	40-50
No. of workers	8	12	20	6	4

Sol. : Short cut formula :

dx = (X-A)

Wages (Rs.)	Mean (X)	No. of workers (f)	A = 25 dx = (X–A)	fdx
0–10	$\frac{0 \quad 10}{2}$ 5	8	5–25 = –20	(–20) 8 = –160
10–20	$\frac{10 \quad 20}{2}$ 15	12	15–25= –10	10 12= – 120
20–30	$\frac{20 \quad 30}{2}$ 25	20	25–25 = 0	20 0 = 0
30–40	$\frac{30 \quad 40}{2}$ 35	6	35–25=+10	+10 6 = 60
40–50	$\frac{40 \quad 45}{2}$ 45	4	45–25 = 20	+20 4 = 80
		N = 50		**fdx= –140**

$$\bar{X} \quad A \quad \frac{fdx}{N}$$

$$\bar{X} \quad 25 \quad \frac{140}{50}$$

$$\bar{X} = 25 - \frac{140}{50} \Rightarrow 25 - 2.8$$

$$\bar{X} \quad 22.2$$

Step Deviation formula –: If the data values are large, a step deviation method is used to obtain the solution. The formula is provided by mean.

$$\bar{X} \quad A \quad \frac{fd'x}{N} \quad i$$

Ex. 7 :Calculate Arithmetic mean from the following series?

Wages (Rs.)	0-10	10-20	20-30	30-40	40-50
No. of workers	8	12	20	6	4

Sol. :

(Step deviation Method)

Wages (Rs.)	Mean (X)	No. of workers (f)	Deviation A=25 dx=x-A	Step deviation $d'x \quad \frac{dx}{i}$	fd'x
0-10	5	8	–20	–2	–16
10-20	15	12	–10	–1	–12
20-30	A =25	20	0	0	0
30-40	35	6	+10	+1	6
40-50	45	4	+20	+2	8
		N=50			fd'x= –14

$$\bar{X} = A + \frac{fd'x}{N} \times i \qquad i \quad \text{interval}$$

$$25 \quad \frac{14}{50} \quad 10$$

Where, A = 25,

Common multiple (i) =10 22.2

$$= 25 + \frac{14}{5} \Rightarrow 25 - 2.8 = 22.2$$

➢ **Unequal Intervals**

Ex. 8 : Calculate mean from the following data :

Class	f	Class	f
0-3	6	10-15	12
3-6	14	15-25	10
6-10	25	25-50	3

Solution :

Class	M.V. (X)	f	f(x)
0-3	1.5	6	9.0
3-6	4.5	14	63.0
6-10	8.0	25	200.0
10-15	12.5	12	150.0
15-25	20	10	200.0
25-50	37.5	3	112.5
		N=70	fx=734.5

$$\bar{X} = \frac{fx}{N} = \frac{734.5}{70} = 10.49$$

➢ **Location of Missing Size or frequency :**

Ex. 9: Find out missing frequency in the following take, if mean in 30 :

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	6	10	?	13

Solution :

Let the missing frequency = y :

Class	M.V. (X) Mean value	f	f(x)
0-10	5	5	25
10-20	15	6	90
20-30	25	10	250
30-40	35	y	35y
40-50	45	13	585
		N=34+y	f(x)= 950+35y

$$\bar{X} \quad \frac{fx}{N}$$

$$30 \quad \frac{950 \quad 35y}{34 \quad y}$$

$$30 \quad \frac{950 \quad 35y}{34 \quad y}$$

$$1020 \quad 30y \quad 950 \quad 35y$$

$$35y - 30y \quad 1020 - 950$$

$$5y \quad 70$$

$$\boxed{y \quad 14}$$

Missing frequency = 14

Ex. 10 : If mean is 41, find out the missing size from the following :

Class	20	30	?	50	60	70
No of students	8	12	20	10	6	4

Solution :

Size/Class (X)	f	fx
20	8	160
30	12	360
A	20	20A
50	10	500
60	6	360
70	4	280
	N = 60	fx = 1660 + 20A

$$\bar{X} \quad \frac{fx}{N}$$

$$41 \quad \frac{1660 \quad 20A}{60}$$

$$2460 \quad 1660 \quad 20A$$

$$20A \quad 2460 \quad 1660$$

$$20A \quad 800$$

$$\boxed{A \quad 40}$$ Missing term · 40

(ii) Weighted Arithmetic mean–

If each number (x) is assigned a corresponding positive weight (w), the weighted arithmetic mean is defined as the sum of their products (wx) divided by the sum of their weights.

Weighted arithmetic mean

$$\frac{x_1w_1 + x_2w_2 + x_3x_3 \ldots\ldots\ldots + x_nw_n}{w_1 \quad w_2 \quad \ldots\ldots\ldots w_n}$$

$$\bar{X}_w \quad \frac{\sum Xw}{\sum w}$$

$$\text{Weighted Arithmetic mean} \quad \frac{wx}{w}$$

Ex. 11: A candidate obtained the following percentages in B.A. Examination-English 60, Hindi 70, Mathematics 75, Economics 50 and Sociology 55, find weighted Arithmetic mean or marks if weights of these subjects are 1, 2, 1, 3 and 3 respectively.

Solution :

Subject	Percentage (X)	Weight (w)	WX
English	60	1	60
Hindi	70	2	140
Mathematics	75	1	75
Economics	50	3	150
Sociology	55	3	165
		w = 10	wx = 590

$$\bar{X}_w \quad \frac{wx}{w}$$

$$\frac{590}{10} \quad 59$$

Ex. 12 : Complete the weighted Arithmetic mean of the Index number from the data given below :

Group	Index No.	Weight
Food	125	7
Clothing	130	5
Fuel and light	140	4
House Rent	170	1
Miscellaneous	180	3

Solution :

Calculation of weighted Arithmetic mean :

Group	Index No. (X)	(Weight)	WX
Food	125	7	875
Clothing	130	5	650
Fuel and light	140	4	560
House Rent	170	1	170
Miscellaneous	180	3	540
		W = 20	Xw 2795

$$\bar{X}_w \quad \frac{Xw}{w}$$

$$\bar{X}_w \quad \frac{2795}{20} \quad 139.75$$

B. Geometric Mean

In mathematics, the geometric mean (GM) is the average value or mean which signifies the central tendency of the set of numbers by finding the product of their values. Basically, we multiply the numbers altogether and take the n^{th} root of the multiplied numbers, where n is the total number of data values.

Geometric mean is the n^{th} root of the product of n values of a series)

Geometric mean of a and b (GM) $\sqrt{a \quad b}$

Geometric mean of a, b and c (GM) $\sqrt[3]{a \quad b \quad c}$

Geometric mean of a, b, c.....n (GM)

$$\sqrt[n]{a \quad b \quad c.....n^{th} \text{ term}}$$

Points to be kept in mind –:

(1) The value of any term should not be zero otherwise the product will be zero and the geometric mean will be zero.

(2) In case the terms are negative, the geometric mean can be an imaginary number.

(3) In the case of two or three numbers, the square root or cube root can be easily calculated, but when there are more number than this, the mathematical operation becomes complicated and logarithms and anti-logarithms have to be used.

$$GM \quad \text{Antilog}\left[\frac{\log a \quad \log b \quad \ldots\ldots\log n}{N}\right]$$

$$GM \quad \text{Antilog} \quad \frac{\log X}{N}$$

Special uses of Geometric mean –:

The specific use of geometric mean is to find the average of percentage growth, rates and ratios.

In case of population growth, price rise, rate of development, compound interest, depreciation on reducing balance etc., the average is calculated by geometric mean.

Ex. Find out G.M. of the following?

(a) 4, 9 (b) 3, 8, 9 (c) 4, 16

Solve :

(a) $4,9 \quad GM \quad \sqrt{4 \quad 9}$

$\sqrt{36}$

6

(b) $3,8,9 \quad GM \quad \sqrt[3]{3 \quad 8 \quad 9}$

$\sqrt[3]{216}$

6

(c) $4,16,GM \quad \sqrt{4 \quad 16}$

$\sqrt{64} \quad 8$

C. Harmonic mean

If the number of terms in a series is divided by the sum of the reciprocals of those terms, then the quotient obtained will be the harmonic mean of that series.

OR

Harmonic Mean of a series is the Reciprocal of the arithmetic average of the reciprocals of the values of its various terms.

If x_1, x_2, x_3 ..... x_n are the individual items up to n terms, then,

Harmonic mean,

$$HM = \frac{n}{[1/x_1 + 1/x_2 + 1/x_3 + \ldots\ldots 1/x_n]}$$

- Harmonic mean of a and b = $\frac{2ab}{a\ b}$
- Harmonic mean of a, b and c = $\frac{3abc}{ab\ \ bc\ \ ca}$
- Harmonic mean of a, b, c and d

$$= \frac{4abcd}{abc\ \ bcd\ \ cda\ \ dab}$$

- Harmonic mean of a, b, c, d and e =

$$\frac{5abcde}{abcd + bcde + cdea + deab + eabc}$$

Ex. : Find the harmonic mean of 20, 15, 10, 5, 6 :

Solve : $HM \quad \frac{1}{\left(\frac{1}{20}\ \frac{1}{15}\ \frac{1}{10}\ \frac{1}{5}\ \frac{1}{6}\right)}{5}$

$$\frac{5}{\left(\frac{1}{20}\ \frac{1}{15}\ \frac{1}{10}\ \frac{1}{5}\ \frac{1}{6}\right)}$$

$$= \frac{5}{\frac{3\ \ 4\ \ 6\ \ 12\ \ 10}{60}} \rightarrow \frac{5\ \ 60}{35}$$

$$\frac{5\ \ 60}{35}$$

$$\frac{60}{7} \quad 8.57$$

$$HM \quad Reci \quad \frac{ReciX}{N}$$

Where, [Reci Reciprocal]

Specific uses of Harmonic Mean–

- Average speed
- Price - earnings ratio
- When there is a necessity to give greater weight to the smaller items.

D. Relation between Arithmetic Mean, Geometric mean and Harmonic mean

1. If all the terms in a series have the same values then the arithmetic mean, geometric mean and harmonic mean values will be equal -

$$\boxed{AM \quad GM \quad HM}$$

Ex. : Let, taking two terms which value 8 and 8 :

$$AM \quad \frac{8\ \ 8}{2} \quad \frac{16}{2} \quad \frac{8}{=}$$

$$GM \quad \sqrt[2]{8\ \ 8} \quad 8$$

$$HM \quad \frac{2}{\frac{1}{8}\ \frac{1}{8}} \quad \frac{2}{\frac{2}{8}} \quad \frac{8}{=}$$

2. If all the terms in a series have not the same values the -

$$\boxed{AM \quad GM \quad HM}$$

If both relation taking together,

$$\boxed{AM \quad GM \quad HM}$$

☞ **Let, taking two terms which value 4 and 16 :**

$$A.M. \quad \frac{4\ \ 16}{2} \quad \frac{20}{2} \quad 10$$

$$G.M. - \sqrt[2]{4 \times 16} \Rightarrow \sqrt[2]{64} \Rightarrow 8$$

$$H.M. \quad \frac{2}{\frac{1}{4}\ \frac{1}{16}}$$

$$\frac{2}{\frac{4\ \ 1}{16}} \quad \frac{16\ \ 2}{5} \quad \frac{32}{5} \quad \frac{6.4}{=}$$

Hence, $\boxed{AM \quad GM \quad HM}$

3. If there are two terms, then their geometric mean is equal to the square root of the product of their arithmetic mean and harmonic mean-

$$\boxed{GM \quad \sqrt{AM \quad HM}}$$

☞ **AM of 4, 16** $= \frac{4\ \ 16}{2} \Rightarrow \frac{20}{2} = 10$

GM 4, 16 $\sqrt[2]{4\ \ 16} \quad 8$

HM of 4,16 $\frac{2}{\frac{1}{4}\ \frac{1}{16}}$

$$\frac{2}{\frac{4\ \ 1}{16}} \quad \frac{2\ \ 16}{5}$$

$$\frac{32}{5} \quad 6.4$$

$\because \quad GM \quad \sqrt{AM \quad HM}$

$$\sqrt{10\ \ 6.4}$$

$$\sqrt{64} \quad 8$$

E. Median

The median is defined as the middle value of a sorted list of numbers. The middle number is found by ordering the numbers. The numbers are ordered in ascending order. Once the numbers are ordered, the middle number is called the median of the given data set.

Individual series : Based on the definition, the formula to find the median of the dataset is given by :

- If the given number of observations/data is odd, then the formula to calculate the median is :

  $\text{Median} = \frac{n+1}{2}^{th} \text{ term}$

- If the given number of observations is even, then the formula to find the median is given by :

  $\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{th} \text{term} \quad \left(\frac{n}{2}+1\right)^{th} \text{term}\right]$

Discrete Series– In this, there is no need to arrange the items in ascending or descending order to find the median because in the discrete series the commutative frequencies are determined which themselves are in ascending or descending order.

- First determine the cumulative frequency (cf).
- Find the median term by using given formula–

  $\text{Median, M} = \frac{n+1}{2}^{th} \text{ term}$

- Finally, the median is the value of the term which cumulative frequency in $\frac{n+1}{2}^{th}$ term .

Calculation of Median for continuous series–

- First determine the cumulative frequency (cf).
- To find the median term, find the middle class $\frac{n}{2}^{th}$ term and not $\frac{n+1}{2}^{th}$ term .
- Because the value of $\frac{n}{2}^{th}$ term in a continuous series is the median.
- Finally we use the following formula :

$$Median\ M = l + \frac{\frac{1}{2}N - cf}{f} \times h$$

Where, l = lower limit of the median class
N = total of all the frequencies
cf= cumulative frequency of the class preceding the median class
f= frequency of the median class
h = interval of the median class.

Ex. 1 : Determine Median from the following data?
20, 25, 23, 25, 27, 40, 23, 15, 25

Solutions : The values can be sorted in ascending order as follows :

Number	Value
1	15
1	20
3	23
5	25
6	25
7	25
8	27
9	40

$\text{Median} \quad \frac{N+1}{2}^{th} \text{ term} \qquad (\text{Odd})$

$\frac{9+1}{2}^{th} \text{ term}$

$= \frac{10}{2}^{th} \text{ term} \Rightarrow \quad 5\text{th term}$

$\boxed{5^{th} \text{ term} \quad 25}$

Ex. 2 : Calculate Median from the marks obtained by 10 students?

Roll No. :	**1**	**2**	**3**	**4**	**5**	**6**
	7	**8**	**9**	**10**		
Marks :	**25**	**28**	**29**	**45**	**42**	**30**
	35	**33**	**32**	**32**		

Solution :

The values can be sorted in ascending order as follows :

25, 28, 29, 30, 32, 33
33, 35, 42, 45

$\text{Median} = \frac{1}{2}\left[\frac{n}{2}^{th}\text{term} + \frac{n}{2}+1\ ^{th}\text{term}\right]$

$= \frac{1}{2}\left[\frac{10}{2}\text{term} + \frac{10}{2}+1 \quad \text{term}\right]$

$\frac{1}{2}\ 5\text{ term} \quad 6\text{ term}$

$= \frac{1}{2}\ 32+33 \Rightarrow \frac{1}{2}\ 65 \Rightarrow 32.5$

Ex. 3 :

Salary :	**10**	**11**	**12**	**13**	**14**
	15	**16**	**17**	**18**	
No. of employees :	**2**	**5**	**6**	**8**	**10**
	12	**7**	**4**	**1**	

Solution :

Salary	No. of employees (f)	Cumulative frequency
10	2	2
11	5	7
12	6	13
13	8	21
14	**10**	**31**
15	12	43
16	7	50
17	4	54
18	1	55

$$\text{Median No.} \quad \frac{N+1}{2}^{th} \text{ term}$$

$$= \frac{55+1}{2}^{th} \text{ term} \Rightarrow 28^{th} \text{ term}$$

The 28^{th} term is present in cumulative frequency 31, so the value in front of it will be 14 median.

Ex. 4 : Calculate Median from the following table?

X :	**7**	**5**	**6**	**8**	**10**	**9**
f :	**3**	**4**	**7**	**2**	**5**	**8**

Solution :

By arranging the value of X in ascending order :

X	f	cf
5	4	4
6	7	11
7	3	14
8	**2**	**16**
9	8	24
10	7	29

$$\text{Median No} \quad \frac{N+1}{2}^{th} \text{ term}$$

$$- \frac{29+1}{2}^{th} \text{ term} \Rightarrow 15^{th} \text{ term}$$

The 25^{th} term is present in cumulative frequency 16. Hence, median = 8.

Ex. 5 : Find out Median from the following data :

Interval :	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**
Frequency (f) :	**3**	**5**	**8**	**5**	**3**

Solution :

Interval	Frequency (f)	cf
0 –10	3	3
10 – 20	5	8 = F
20 – 30	**8 = f**	**16**
30 – 40	5	21
40 – 50	3	24

N = 24

The 12th term is present in cf 16. Therefore the interval in front of it will be the interval 20-30.

$$\text{Median} = \ell + \frac{\frac{N}{2} - F}{f} \times h$$

Trick

$$20 \quad \frac{30}{2} \quad 25$$

$$20 \quad \frac{\frac{24}{2} - 8}{8} \quad 10$$

$$= 20 + \frac{4}{8} \times 10 \quad = 20 + 5 = 25$$

Ex. 6 : The median of observation 10, 12, 13, 16, (X+1) (X+3), 32, 36, 40, 45 arranged in ascending order is 22 find the value of X.

Solution :

Observations are :

10, 12, 13, 16, (x+1), (x+3), 32, 36, 40, 45 Total No. of observations = 10

$$\text{Median} = \frac{1}{2}\left[\frac{n}{2}\text{th term} + \frac{n}{2}+1 \text{ th term}\right]$$

$$= \frac{1}{2}\left[\frac{10^{th}}{2}\text{term} + \frac{10}{2}+1^{th} \text{ term}\right]$$

$$\text{Median} = \frac{1}{2} \text{ 5th term} + 6\text{th term}$$

$$22 = \frac{1}{2}(X+1)+(X+3)$$

$$22 \quad \frac{1}{2} \quad 2x \quad 4$$

$$22 \quad X \quad 2$$

$$\boxed{X \quad 20}$$

Ex. 7 : Find the median from the given data :

Marks	**: 6-10**	**11-15**	**16-20**	**21-25**	**26-30**
No. of Students :	**20**	**30**	**50**	**40**	**10**

Solution :

Note : To find the median in an inclusive series it is necessary to first convert in to an sequential series, so that the correct minimum limit for "a" can be written in the formula.

Class Interval	f	c.f.	Median No. $\frac{M}{2}$ th term
6-10	20	20	$\frac{150}{2}$ th term
11-15	30	50F	75 th term.
16-20	50f	100	
21-25	40	140	
26-30	10	150	

$$\text{Median} \quad \ell \quad \frac{\frac{N}{2} - F}{f} \quad h$$

$$= 16 + \frac{\frac{150}{2} \quad 50}{50} \times 4$$

$$= 16 + \frac{25}{50} \times 4 \Rightarrow 16 + 2 = 18$$

Zero frequency in continuous series– If any or some frequency in a continuous series is zero and the number of median falls in the cumulative frequencies in front of those frequency or frequencies, then the class intervals with zero frequency are eliminated and half of the class intervals or classes to be eliminated are added to the top of bottom sections.

Ex. 1 : Find the median from the given data :

Class	f	Class	f
0-5	3	20-25	0
5-10	4	25-30	14
10-15	6	30-35	6
15-20	12	35-40	5

Solution :

Class	f	cf	
0-5	3	3	M.No. $\frac{50}{2}$ 25
5-10	4	7	
10-15	6	**13 F**	
15-20	**12 f**	25	
20-25	0	25	
25-30	14	39	
30-35	6	45	
35-40	5	50	

$$M \quad \ell \quad \frac{\frac{N}{2} \quad F}{f} \quad h$$

$$\Rightarrow 15 + \frac{\frac{50}{2} \quad 13}{12} \times 5$$

$$\Rightarrow 15 + \frac{25 \quad 13}{12} \times 5$$

$$15 \quad \frac{12}{12} \quad 5$$

$$15 \quad 5$$

$$20$$

F. Mode

The word "mode" is derived from the French language "La-Mode" which means fashion and customs.

"The value of variable which has the maximum frequency in called the mode."

Ex. : Find out mode from the following data of sizes of shoes sold at a shop in one day.
5, 9, 8, 7, 10, 5, 7, 6, 7, 1, 6, 2, 3,4

Solution :

First of all we will sort them out of convenience–
1, 2, 3, 4, 5, 6, 7, 7, 7, 8, 9, 10
From the observation the frequency of 7 = 3 (times).
Hence, Z = 7

Ex. : Calculate Mode from the following data :

Salary (Rs.)	**: 200**	**225**	**250**	**275**	**300**	**325**
Frequency (f)	**: 4**	**6**	**12**	**18**	**7**	**3**

Solution :

Maximum frequency = 275 (18 times)
Mode (Z) = 275.

Continuous Series :

$$Z = l_1 + \frac{f_1 \quad f_0}{2f_1 \quad f_0 \quad f_2} \times h$$

Z = Mode
l_1 = Lower limit
f_1 = Frequency of mode class
f_0 = Frequency immediately preceding from mode class
f_2 = Frequency immediately following mode class
h = Class height

Ex. : Find the mode from the given observation :

Score	**: 0-10**	**10-20**	**20-30**	**3040**	**40-50**
No. of students	**: 5**	**7**	**15**	**25**	**8**

Solution :

Score	No. of students (f)
0-10	5
10-20	7
20-30	15 f_0
30-40	25 f_1
40-50	8 f_2

$$Z - l_1 + \frac{f_1 \quad f_0}{2f_1 \quad f_0 \quad f_2} \times h$$

$$\Rightarrow \quad Z - 30 + \frac{25 \quad 15}{2 \quad 25 \quad 15 \quad 8} \times 10$$

$$\Rightarrow \quad Z = 30 + \frac{10}{50 \quad 23} \times 10$$

$$Z = 30 + \frac{10}{27} \times 10 \Rightarrow 30 + \frac{100}{27}$$

$$30 \quad 3.70$$

$$33.70$$

G. Empirical Relation between Mean, Median and Mode)

Mode = 3 (Median) – 2 (Mean)

Ex. : Mean = 12, Median = 16.5, Mode = ?

Sol. : Mode = 3 Median - 2 mean
Mode = 3 16.5 - 2 12
Mode = 49.5 - 24 = 25.5

Ex. : Mode = 16, Median = 21, Mean = ?

Sol. : Mode = 3 Median - 2 mean
16 = 3 21 - 2 mean

$$\text{Mean} = \frac{63 \quad 16}{2}$$

$$\text{Mean} = \frac{47}{2} = 23.5$$

Ex. : Mean = 20, Mode = 18, Median = ?

Sol. : Mean-Mode = 3 (Mean-Median)

20-18 = 3 (20 – median)

2 = 60 – 3 median

3 median = 60-2

$$\text{median} = \frac{58}{3} = 19.33$$

Measurment of Dispersion

Dispersion– The literal meaning of dispersal is 'scattering' or 'scatteredness'. Dispersion is used in two meanings.

(A) First meaning– Dispersion means the expansion or expansion of the limits of the marginal terms of a category, that is, dispersion reveals the difference in the limits within which the terms of the category are found.

(B) Second meaning– Dispersion means the mean of deviations taken from the mean of the series.

Variance– Variance is also a value based on standard deviation. In common language, variance means the square of standard deviation i.e.

$$\text{Variance } V = (Sd)^2$$

$$SD = \sqrt{\text{Variance}}$$

Variance is also called second moment of dispersion.

- If variance has to be calculated from a data series, then the formula for standard deviation is used without using the square root.
- Mean deviation is called average deviation or first moment of dispersion.

Variance : The square of the standard deviation is called the variance and may be denoted by ^{2}.

$$V = (sd)^2 \qquad V = \sigma^2$$

$$\sqrt{\text{Variance}}$$

$$\text{Coefficient of variance} = \frac{}{m} 100$$

Measures of Dispersion

The main methods of measuring dispersion are as follow :

(A) Methods of limits or positional measures of Dispersion :
- (1) Range
- (2) Inter Quartile Range
- (3) Percentile Range

(B) Methods of mean deviations or calculation measures of dispersion
- (4) Quartile deviation
- (5) Mean Deviation
- (6) Standard Deviation
- (7) Other measures

(C) Graphic method
- (8) Lorenz curve

(i) Range

This is the simplest measure of dispersion. As a definition, "expansion means the difference between the limiting values of a data series", that is, the difference between the largest and smallest value of a data series is called expansion.

$$\text{Range} = X_{max} - X_{min}$$

or

$$R = L - S$$

$$\left[\because \begin{matrix} X_{max} = L = \text{Largest value in the series} \\ X_{min} = S = \text{Smallest value in the series} \end{matrix}\right]$$

Measurement relative to range :

$$\text{Coefficient of Range} = \frac{L - S}{L + S}$$

Q. : Calculate the Range and coefficient of Range of Mr. Praveen Gupta's monthly earning for a year.

Month	Income	Month	Income
Jan	239	July	260
Feb	250	Aug	261
Mar	251	Sep	262
April	251	Oct	262
May	257	Nov	263
June	258	Dec	275

Solution :

$$\text{Range} = L - S$$

$$275 - 239$$

$$36 \text{ Rs.}$$

$$\text{Coefficient of Range} = \frac{L - S}{L + S} = \frac{275 - 239}{275 + 239}$$

$$\frac{36}{514} = 0.07$$

Q. : Following are the marks obtained by 10 students of a class in statistics :

Roll No. : 1 2 3 4 5 6 7 8 9 10

Marks : 46 32 17 41 4 20 6 9 30 35

Calculate Range and coefficient of Range.

Solution :

$$\text{Range} = L - S$$

$$46 - 4$$

$$42 \text{ Ans.}$$

$$\text{Coefficient of Range} = \frac{L - S}{L + S} = \frac{46 - 4}{46 + 4}$$

$$\frac{42}{50} = 0.84$$

Q. : Find the range and coefficient from the following.

-12 -5 0 5 12

Solution :

$$\text{Range} \quad L \quad S$$

$$12 \quad 12$$

$$12 \quad 12 \quad 24$$

$$\text{Coefficient of Range} \quad \frac{L \quad S}{L \quad S}$$

$$\frac{12 \quad 12}{12 \quad 12}$$

$$\frac{24}{0}$$

Q. : Find the Absolute and Relative measure of Range in the following distribution?

(a) X - 4, 5, 7, 10, 12, 14
f - 10 13 12 17 13 12

$$\text{Range} \quad L \quad S$$

$$14 \quad 4$$

$$\text{Coefficient of Range} \quad \frac{L \quad S}{L \quad S}$$

$$\frac{14 \quad 4}{14 \quad 4}$$

$$\frac{10}{18} \quad 0.556$$

Note : Frequency has no effect on determining the range.

(b) Monthly income :100-120 120-140 140-160 160-180 180-200
Number of workers : 40 60 80 50 20

Solve :

$$\text{Range} = L - S \qquad \text{Coefficient of Range} = \frac{L \quad S}{L \quad S}$$

$$200 - 100$$

$$= 100 \qquad = \frac{200 - 100}{200 \quad 100}$$

$$\frac{100}{300} \quad 0.33$$

➢ Expansion in a continuous series can also be calculate on the basis of mid values of class difference. From this point of view, the smaller mean value of the above data series will be 110 of the larger mean value will be 190

$$\text{Range} = L - S \qquad \text{Coeft of Range} = \frac{L \quad S}{L \quad S}$$

$$= 190 - 110 \qquad = \frac{190 \quad 110}{190 \quad 110}$$

$$80 \text{ Ans.} \qquad \frac{80}{300}$$

$$0.267 \text{ Ans.}$$

Q. : Calculate the Range and coefficient from the following :

Age (Year) : 15-19 20-24 25-29 30-34 35-39
No. of persons : 8 10 17 8 7

Solution : The presented question is in the inclusive category, hence it will have to be reflected in the exclusive category. By doing this, the first class interval will be 14.5-19.5 and the last calls interval will be 34.5-39. 5. on the basis, the longest value is L (39.5) of smallest value is 14.5

Age	No. of person	
14.5-19.5	8	
19.5-24.5	10	L = 39.5
24.5-29.5	17	S = 14.5
29.5-34.5	8	Range = 39.5-14.5
34.5-39.5	7	= 25.0 Year

$$\text{Coefficient of Range} \quad \frac{L \quad S}{L \quad S}$$

$$\frac{39.5 \quad 14.5}{39.5 \quad 14.5}$$

$$\frac{25.0}{54.0} \quad \frac{25}{54} \quad 0.463 \text{ Ans.}$$

Q : From the following data calculate the Range of Income of middle 50% workers and coefficient income :

Income : 0-10 10-20 20-30 30-40 40-50 50-60 60-70
No. of persons : 7 12 18 25 20 13 5

Solution :

Income : 0-10 10-20 20-30 30-40 40-50 50-60 60-70
No. of persons : 7 12 18 25 20 13 5

Income	f	cf	
0-10	7	7	$Q_1 No \quad \frac{100}{4} \quad 25th$
10-20	12	19	$25th\ term\ is\ verse\ in\ cf\ 37$
20-30	18	37	Q_1 ←
30-40	25	62	$Q_1 \quad l \quad \frac{\frac{1}{4}N \quad F}{f} \quad h$
40-50	20	82	Q_3 ←
50-60	13	95	$20 \quad \frac{\frac{100}{4} \quad 19}{18} \quad 10$
60-70	5	100	

$$Q_1 = 20 + \frac{25 \quad 19}{18} \times 10$$

$$Q_1 \quad 20 \quad \frac{6}{18} \quad 10$$

$$Q_1 \quad 20 \quad \frac{10}{3}$$

$$20 \quad 3.33$$

$$\boxed{Q_1 \quad 23.33}$$

$$Q_3 No \quad \frac{3 \quad 100}{4} \quad 75th$$

$$Q_3 \quad l \quad \frac{\frac{3}{4}N \quad F}{f} \quad h$$

$$= 40 + \frac{\frac{3}{4} \quad 100 \quad 62}{20} \times 10$$

$$40 \quad \frac{75 \quad 62}{20} \quad 10$$

$$40 \quad \frac{13}{2}$$

$$40 \quad 6.5$$

$$\boxed{Q_3 \quad 46.5}$$

$$\text{Range of middle 50\%} \quad Q_3 \quad Q_1$$

$$46.5 \quad 23.33$$

$$23.17$$

$$\text{Coefficient of Range} = \frac{46.5 \quad 23.33}{46.5 \quad 23.33} \Rightarrow \frac{23.17}{69.83}$$

$$0.3318 \text{ Ans.}$$

Q. : The coefficient of range of the weights of 10 students from the following data:
41, 20, 15, 65, 73, 84, 53, 35, 71, 55 is

(a) 1.433 (b) 0.696
(c) 0.675 (d) 1

Ans : (b) The coefficient of Range $\frac{L \quad S}{L \quad S}$

{where L = largest value in series, S = smallest value in series}

$\because$ L = 84, S = 15

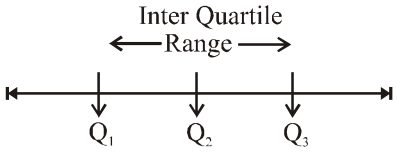
The coefficient of Range

$$= \frac{84 \quad 15}{84 \quad 15} = \frac{69}{99} = \frac{23}{33} = 0.696$$

(ii) Inter-Quartile Range :

Inter quartile is calculated on the basis of first quartile (Q_1) of third Quartile (Q_3) of the data series

Inter Quartile



$$\boxed{\text{I.Q.Range} \quad Q_3 \quad Q_1}$$

(iii) Percentile Range :

Percentile range can also be used to determine dispersion.

For this, first of all 90th percentile (P_{90}) and 10th percentile (P_{10}) are calculated

After this the formula is used

$$\boxed{PR = P_{90} - P_{10}} \qquad PR \Rightarrow \text{Percentile Range}$$

- From the point of view of calculation, decimal expansion can be writer as

$$\boxed{DR \quad D_9 \quad D_1}$$

- Percentile range (expansion) is considered as the best (from other expansion) because–
  (i) this range is not affected by the extreme value of data series
  (ii) it is based on the middle 80% value of the range.

Q. : From the following data calculate inter-quartile range and percentile range :

Salary (Less than) : 10 20 30 40 50 60 70
No. of workers : 5 8 15 20 30 33 35

Solution :

	Class Internal	f	cf
P_{10}	0-10	5	5
	10-20	3	8
Q_1	20-30	7	15
	30-40	5	20
Q_3	40-50	10	30
P_{90}	50-60	3	33
	60-70	2	35

$$Q_1 \text{ No} \quad \frac{35}{4}$$

$$8.75$$

$$Q_1 \quad l \quad \frac{\frac{N}{4} \quad F}{f} \quad h$$

$$Q_1 \quad 20 \quad \frac{\frac{35}{4} \quad 8}{7} \quad 10$$

$$= 20 + \frac{8.75 \quad 8}{7} \times 10$$

$$20 \quad \frac{0.75}{7} \quad 10$$

$$Q_1 \quad 20 \quad 1.07$$

$$\boxed{Q_1 \quad 21.07}$$

$$Q_3 \text{ No} \quad \frac{3}{4}(35) \quad 26.25$$

$$Q_3 \quad l \quad \frac{\frac{3}{4}N \quad F}{f} \quad h$$

$$40 \quad \frac{\frac{3}{4} \quad 35 \quad 20}{10} \quad 10$$

$$40 \quad 3 \quad 8.75 \quad 20$$

$$40 \quad 26.25 \quad 20$$

$$40 \quad 6.25$$

$$46.25$$

Inter Quartile Range $Q_3 \quad Q_1$

IQ Range $Q_3 \quad Q_1$

$46.25 \quad 21.07$

IQ Range 25.18 Ans.

P_{10} No $\frac{10 \quad 35}{100} \quad 3.5^{th}$

$$P_{10} = l + \frac{\frac{10}{100} N \quad F}{f} \times h$$

$$= 0 + \frac{\left(\frac{10}{100} \quad 35 \quad 0\right)}{5} \times 10$$

$\frac{3.5}{5} \quad 10 \quad 7$

$P_{90} \quad \frac{90}{100} \quad 35$

$\frac{315}{10} \quad 31.5$

$$P_{90} = \ell + \frac{\frac{90\,N}{100} \quad F}{f} \times h$$

$$= 50 + \frac{\frac{90}{100} \quad 35 \quad 30}{3} \times 10$$

$= 50 + \frac{31.5 \quad 30}{3} \times 10$

$50 \quad \frac{1.5}{3} \quad 10$

$50 \quad 5$

$P_{90} \quad 55$

Percentile Range (PR) $P_{90} \quad P_{10}$

$55 \quad 7$

48

PR 48

Q. : For a symmetrical distribution, Q_1 and Q_3 are 20 and 40 respectively. The value of 50th percentile will be

(a) 20 (b) 30

(c) 40 (d) 50

Ans : (b) P_{50} (50^{th} Percentile) = Median

Median Or $P_{50} = \frac{Q_3 \quad Q_1}{2}$

$= \frac{40 \quad 20}{2} \quad \frac{60}{2} = 30$

(iv) Quartile Deviation–

In the method of measuring range (expansion), Importance given to only extreme values. To overcome shortcoming quartile deviation was developed.

Explaining the quartile deviation, Mills said that the quartile deviation is half of the mutual expansion of the two quartiles

Quartile deviation (Q.D.) $\frac{Q_3 \quad Q_1}{2}$

Coefficient of Q.D. $\frac{Q_3 \quad Q_1}{Q_3 \quad Q_1}$

Q. : Coefficient of dispersion based upon quartile deviation is :

(a) $\frac{Q_1 \quad Q_3}{Q_1 \quad Q_3}$ (b) $\frac{Q_3 \quad Q_1}{Q_3 \quad Q_1}$

(c) $\frac{Q_1 \quad Q_3}{Q_1 \quad Q_3}$ (d) $\frac{Q_1 \quad Q_3}{Q_3 \quad Q_1}$

Ans : (b) Quartile deviation = $\frac{Q_3 \quad Q_1}{Q_3 \quad Q_1}$

Q. : For a symmetric distribution $Q_1 = 20$ and $Q_3 = 40$ The median of the data is

(a) 30 (b) 20

(c) 10 (d) 40

Ans : (a) Median symmetric Distribution

$\frac{Q_3 \quad Q_1}{2}$

$\frac{40 \quad 20}{2}$

$\frac{60}{2} \quad 30$

Q. : The first, second and third quantities of a frequency distribution are 10, 25 and 40 respectively. The quartile deviation given by–

(a) 8.75 (b) 25

(c) $\frac{3}{5}$ (d) 1.25

Ans : (c) Quartile Deviation $\frac{Q_3 \quad Q_1}{2}$

Co-efficient of Quartile Deviation

$\frac{Q_3 \quad Q_1}{Q_3 \quad Q_1}$

$\Rightarrow \quad \frac{40 \quad 10}{40 \quad 10} = \frac{30}{50}$

$\frac{3}{5}$

Q. : For a symmetrical distribution, if $Q_1 = 11$ and $Q_3 = 17$, then the median is–

(a) 4 (b) 11

(c) 14 (d) 17

Ans : (c) $\because 2M = Q_1 + Q_3$

$2M = 11+17$

$2M = 28$

$M = 14$

(v) Mean deviation–

Mean deviation is also called 'average deviation or first moment of dispersion.

Mean deviation means the mean of deviation of values extracted from any measure of central tendency in the data series or any statistical mean (mean, median or mode)

The mathematical signs of plus(+) or minus(–) are neglected while taking deviation.

According to Mills:– "The average of the deviations taken from the arithmetic mean or median of a series is called mean deviation.

"The mean deviation of a series of magnitude is the Arithmetic mean of their deviations from an average value either mean or median. If the values x_1, x_2----x_n of a variable x have frequencies f_1, f_2-----f_n respectively, then the mean deviation (M.D.), also known as the average deviation of the distribution is defined by

$$MD = \frac{1}{N} \left| f_i x_i - m \right|$$

$$\text{Coefficient of } MD = \frac{MD}{\bar{X}}$$

Q. : Calculate mean deviation & its coefficient from mean for the following prices :
210, 220, 225, 225, 225, 235, 240, 250, 270, 280

Solution :

Price (X)	Mean deviation |dx|
210	|210-238| = 28
220	|220-238| = 18
225	|225-238| = 13
225	|225-238| = 13
225	|225-238| = 13
235	|235-238| = 3
240	|240-238| = 2
250	|250-238| = 12
270	|270-238| = 32
280	|280-238| = 42

N=10, x=2380 dx=176

$$\bar{X} = \frac{x}{N} = \frac{2380}{10} = 238$$

$$\text{Mean deviation} = \frac{176}{10}$$

$$\boxed{MD = 17.6}$$

$$\text{Coefficient of } MD = \frac{MD}{\bar{X}} = \frac{17.6}{238} = 0.074 \text{ Ans.}$$

Q. : Calculate the deviation of the following values and find the coefficient of deviation.
2, 4, 7, 8 9

Solve :

X	|dx|
2	|2-6|=4
4	|4-6|=2
7	|7-6|=1
8	|8-6| = 2
9	|9-6| = 3
x=30	dx=12

$$\text{Mean deviation (MD)} = \frac{dx}{N}$$

$$\frac{12}{5}$$

$$2.40 \text{ Ans.}$$

Coefficient

N = 5 Coefficient of MD

$$\bar{X} = \frac{x}{N} = \frac{30}{5} = 6 \qquad = \frac{MD}{\bar{x}}$$

$$\frac{2.40}{6} \quad 0.4 \text{ Ans.}$$

Assumed Mean method/Short trick method

$$M_{dx} = \frac{\Sigma dx + \bar{X} - A\bar{X} \quad \Sigma fb - \Sigma fa}{n}$$

Where dx = Sum of absolute deviation taken from the assumed mean

$\bar{X}$ = Real mean

$A\bar{X}$ = Assumed mean which is used to calculate deviation

fb = Number of values below the true mean

fa = Number of values above the true mean

From assumed mean

Let assumed mean = 7

X	|dx|(7) mean
2	|2-7|=5
4	|4-7|=3
7	|7-7|=0
8	|8-7| = 1
9	|9-7| = 2
x=30	dx=11

$$N \quad 5 \qquad MD = \frac{\Sigma dx + \bar{X} - A\bar{X} \quad \Sigma fb - \Sigma fa}{n}$$

$$\bar{X} = \frac{x}{5} = \frac{11 \quad 6 \quad 7 \quad 2 \quad 3}{5}$$

$$\bar{X} = \frac{30}{5} = 6 \qquad = \frac{11 \quad 1 \quad 1}{5}$$

$$\frac{11 \quad 1}{5} \quad \frac{12}{5} \quad 2.4$$

Note : The mean deviation can also be determined by the deviations calculated using the assumed method. This method especially adopted when the actual mean is in fractional

number (keep in mind that the assumed mean should be close to the actual mean.)

Q. : Calculate the mean Deviation from the mean and coefficient of mean Deviation of the following distribution :

X	**:**	**10**	**15**	**20**	**30**	**40**	**50**
f	**:**	**8**	**12**	**15**	**10**	**3**	**2**

Solution :

X	f	fx	$d_{\bar{X}}$	fdx
10	8	80	|10-21.6|=11.6	92.8
15	12	180	6.6	79.2
20	15	300	1.6	24.0
30	10	300	8.4	84.0
40	3	120	18.4	55.2
50	2	100	28.4	56.8
	N=50	fx=1080		392.00

$$\bar{X} = \frac{fx}{N} = \frac{1080}{50} = \underline{\underline{21.6}}$$

$$MD = \frac{fdx}{N} = \frac{392}{50} = \underline{\underline{7.84}}$$

$$\text{Coefficient of MD} \quad \frac{MD}{\text{Mean}} \quad \frac{7.84}{21.6}$$

$$\underline{\underline{0.362}} \ \underline{\underline{\text{Ans.}}}$$

Q. : Mean deviation of numbers 3, 4, 5, 6, 7 is–

(a) 1 (b) 1.2

(c) 5 (d) 25

Ans : (b)

x	deviation from mean (5)
3	2
4	1
5	0
6	1
7	2
	6

Mean deviation $\frac{d}{n} \quad \frac{6}{5} \quad 1.2$

(vi) Standard Deviation

Standard deviation means the square root of the arithmetic mean of the squares of the deviations taken from the mean in a data series.

Real mean method–

$$SD(\ ) \quad \sqrt{\frac{d^2}{N}} \qquad SD(\ ) \quad \sqrt{\frac{fd^2}{N}}$$

Short cut method/Assumed mean method :

$$SD(\ ) \quad \sqrt{\frac{d^2x}{N} \quad \frac{dx}{N}^2}$$

Direct method :

$$SD(\ ) \quad \sqrt{\frac{x^2}{N} \quad \frac{x}{N}^2}$$

$$SD(\ ) \quad \sqrt{\frac{x^2}{N} \quad \bar{X}^2}$$

Q. : Calculate the standard deviation values are 5, 10, 25, 30, 50?

Solve : (1)st method

Real mean method

X	$d(x-\bar{X})$	d^2
5	-19	361
10	-14	196
25	+1	1
30	+6	36
50	+26	676

N=5, x=120 1270

$$\bar{X} \quad \frac{120}{5} \quad 24$$

$$\sqrt{\frac{d^2}{n}}$$

$$\sqrt{\frac{1270}{5}}$$

$$\sqrt{254} \quad 15.937$$

IInd (Method)

By assumed mean method

Let, Assumed value (A) = 25

X	d(x- A)	d^2
5	-20	400
10	-15	225
25	0	0
30	5	25
50	25	625

N=5 d=-5 $d^2 = \underline{1275}$

$$\sqrt{\frac{d^2}{N} \quad \frac{d}{n}^2}$$

$$\sqrt{\frac{1275}{5} \quad \frac{5}{5}^2}$$

$$\sqrt{255 \quad 1}$$

$$\sqrt{254}$$

$$\underline{\underline{15.937}} \ \underline{\underline{\text{Ans.}}}$$

Direct method:

X	X^2	
5	25	
10	100	(Here the deviation can
25	625	be considered to be
30	900	taken from zero)

50 2500

120 4150

N = 5

$$\sqrt{\frac{x^2}{N} - \left(\frac{X}{N}\right)^2}$$

$$\sqrt{\frac{4150}{5} - \left(\frac{120}{5}\right)^2}$$

$$\sqrt{830 - 576}$$

$$\sqrt{830 - 576} \quad \sqrt{254}$$

$$\boxed{15.937} \quad \text{Ans.}$$

Step deviation method :

$$\boxed{\sqrt{\frac{fd^2}{N} - \left(\frac{fd}{N}\right)^2}}$$

Q. : Calculate standard deviation of the following data :

Size :	6	7	8	9	10	11	12
frequency :	3	6	9	13	8	5	4

Solution :

Real mean method

x	f	fx	d = (x- $\bar{X}$)	d^2	fd^2
6	3	18	-3	9	27
7	6	42	-2	4	24
8	9	72	-1	1	9
9	13	117	0	0	0
10	8	80	+1	1	8
11	5	55	+2	4	20
12	4	48	+3	9	36

N=48 fx=432 fd^2=124

$$\bar{X} \quad \frac{fx}{N} \quad \frac{432}{48}$$

9

$$\sigma - \sqrt{\frac{fd^2}{N} - \left(\frac{fd}{N}\right)^2} \quad \sqrt{\frac{124}{48} - \left(\frac{172}{48} - \frac{48}{48}\right)^2} \quad \sqrt{3.58 - 1}$$

$$\sqrt{2.58} \quad 1.61$$

By assumed mean method: A = Assumed mean

A = 8

X	f	d = (x-A)	fd	d^2	fd^2
6	3	-2	-6	4	12
7	6	-1	-6	1	6
8	9	0	0	0	0
9	13	+1	13	1	13
10	8	+2	16	4	32
11	5	+3	15	9	45
12	4	+4	16	16	64

n = 48 fd = 48 fd^2=172

$$\sqrt{\frac{fd^2}{N} - \left(\frac{fd}{N}\right)^2}$$

$$= \sqrt{\frac{172}{48} - \left(\frac{48}{48}\right)^2} \quad = \sqrt{3.58 - 1}$$

$$\sqrt{2.58} \quad 1.61$$

Direct method :

X	f	fx	fx^2
6	3	18	3 36=108
7	6	42	6 49=294
8	9	72	9 64=576
9	13	117	13 81=1053
10	8	80	100 8=800
11	5	55	121 5=605
12	4	48	144 4=576
	N=48	fx = 432	fx^2 = 4012

$$\sqrt{\frac{fx^2}{N} - \left(\frac{fx}{N}\right)^2}$$

$$\sqrt{\frac{4012}{48} - \left(\frac{432}{48}\right)^2}$$

$$= \sqrt{83.50 - (9)^2} = \quad \sqrt{83.58 - 81}$$

$$\sqrt{2.58}$$

$$1.606$$

$$1.61$$

Q. : In a distribution, $n = 10, \Sigma x = 60, \Sigma x^2 = 1000$ then standard deviation is

(a) 64 (b) 8

(c) 36 (d) 6

Ans : (b) SD $\sqrt{\frac{x^2}{N} - (\bar{X})^2}$

$$\bar{X} \quad \frac{x}{n} \quad \frac{60}{10} \quad 6$$

$$S.D \quad \sqrt{\frac{1000}{10} - (6)^2} \quad \sqrt{100 - 36} \quad \sqrt{64} \quad 8$$

Q. : The standard deviation is calculated by–

(a) mean (b) Median

(c) mode (d) only of them

Ans. (a) : Standard deviation is calculated mean.

Relation between Measures of Dispersion

Normal Distribution or moderately asymmetric distributions, a certain relationship is found among quartile deviation (Q.D), mean deviation (M.D) and standard deviation (SD) which is as follows :

- QD : SD = 2 : 3
- MD : SD = 4 : 5
- QD : MD : SD = 10 : 12 : 15

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. The mean and the standard deviation of 25 observations were given as 42 and 5, respectively. Later it was found that one of the observations was incorrectly entered as 10, when its correct value was 210. What would have been the correct standard deviation?

(a) $\sqrt{1050}$ (b) $\sqrt{1048}$

(c) $\sqrt{1047}$ (d) $\sqrt{1049}$

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (d) : Given that,

Initial mean ($\bar{x}$) = 42

Final mean ($\bar{x}$) = $42+\frac{210\quad 10}{25}=50$

Standard deviation = $\sqrt{\frac{1}{n}\quad x_i^2\quad \bar{x}^2}$

(Initial) $5^2=\frac{1}{25}\quad x_i^2\quad (42)^2$

$625=\quad x_i^2-1764\times 25$

(Initial) $x_i^2\quad 625\quad 44100$

$=44725$

Final $\Sigma x_i^2 = 44725+(210)^2-10^2$

$=44725+44000=88725$

Final standard deviation = $\sqrt{\frac{1}{25}(88725)\quad (50^2)}$

$=\sqrt{3549\quad 2500}=\sqrt{1049}$

2. The mode and median of a data is 87.5 and 86, respectively. What is the mean of the data? (Use empirical formula).

(a) 85.4 (b) 87.1

(c) 85.2 (d) 84.2

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c) : Given that,

Mode = 87.5

Median = 86

Mode = 3 median – 2mean

87.5 = (3 86) – (2 mean)

(2 mean) = 258 – 87.5

mean = $\frac{170.5}{2}=85.25$

3. The mode and median of a data is 19.5 and 85, respectively. What is the mean of the data? (Use empirical formula.)

(a) 118 (b) 118.6

(c) 119.1 (d) 117.8

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : Empirical formula –

mode = 3×median–2×mean

19.5 3 85 2 mean

Mean $\frac{255\quad 19.5}{2}$

$\frac{235.5}{2}\quad 117.8$

4. The mode and median of a data is 26.7 and 71, respectively. What is the mean of the data? (Use empirical formula.)

(a) 94.3 (b) 93.2

(c) 95.1 (d) 94.6

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (b) : Formula-

Mode = 3median–2mean

26.7 = 3 71 – 2mean

2 mean = 213 – 26.7

Mean = $\frac{186.3}{2}$

Mean = 93.15

Mean 93.2

5. If each of the observations of 14, 22, 16, 24, 12, 8, 4, 18, 12. 10 is increased by 10 then what will be their new mean ?

(a) 16 (b) 26

(c) 14 (d) 24

RRB NTPC (Stage-II) –16/06/2022 (Shift-I)

Ans. (d) : Mean = $\frac{\text{Sum of observation}}{\text{Number of observation}}$

$\frac{14+22+16+24+12+8+4+18+12+10}{10}$

$=\frac{140}{10}=14$

New Mean = 14 + 10 = 24

6. The scores obtained by 10 students in a test are 82, 60, 62, 63, 78, 75, 86, 75, 91, 46
Find the arithmetic mean of their scores.

(a) 70.6 (b) 71.8

(c) 72.2 (d) 72.8

RRB NTPC (Stage-II) –16/06/2022 (Shift-I)

Ans. (b) : Arithmetic Mean = $\frac{\text{Totalsum of Scores}}{\text{Number of Students}}$

$=\frac{82+60+62+63+78+75+86+75+91+46}{10}$

$=\frac{718}{10}$

$=71.8$

7. If the mean of numbers 33, x, 47, 83 and 109 is 67, what is the mean of 50, 64, 100, 126 and x?

(a) 84 (b) 81.8

(c) 80.6 (d) 80

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (c) : According to the question,

$67 = \frac{33 \quad x \quad 47 \quad 83 \quad 109}{5}$

$335 = x + 272$

$x = 63$

Now,

$\frac{50 + 64 + 100 + 126 + 63}{5}$

$= 80.6$

8. If, for x > 0, the mean of 22.5, 56, 42.5, 2x+1, x–2, 3x, 36 is 30, then the value of x is _____.

(a) 7 (b) 4

(c) 9 (d) 6

RRB Group-D 26/08/2022 (Shift-III)

Ans. (c) : Given, mean = 30

According to the question,

$22.5 + 56 + 42.5 + 2x + 1 + x - 2 + 3x + 36 = 7 \times 30$

$156.0 + 6x = 210$

$6x = 54$

$x = 9$

Hence options (c) is correct.

9. What is the mean of the following distribution?

Marks	**0**	**0**	**0**	**0**	**0**
Number of students	**7**	**8**	**2**	**4**	**9**

(a) 52.4 (b) 50

(c) 51 (d) 49.2

RRB Group-D 09/09/2022 (Shift-II)

Ans. (b) : Given,

$\text{Mean} \quad \frac{fx}{f}$

$\frac{10 \times 17 + 30 \times 28 + 50 \times 32 + 70 \times 24 + 90 \times 19}{17 \quad 28 \quad 32 \quad 24 \quad 19}$

$\frac{6000}{120} \quad 50$

10. Find the arithmetic mean of the given frequency distribution.

Marks	**Frequency**
50	**3**
28	**4**
85	**6**
40	**7**

(a) 52.6 (b) 56.2

(c) 40.95 (d) 50.5

RRB GROUP-D – 30/09/2022 (Shift-I)

Ans. (a) :

Marks (x)	Frequency (f)	fx
50	3	150
28	4	112
85	6	510
40	7	280
	f=20	fx

Mean = $\frac{fx}{f} \quad \frac{1052}{20} \quad 52.6$

11. The mean of 36 numbers was found to be 42. Later, it was discovered that a number 47 had been mistakenly read as 41. Find the correct mean of the given numbers. (Rounded of two decimal places)

(a) 42.17 (b) 43.74

(c) 43.62 (d) 42.83

RRB GROUP-D – 17/08/2022 (Shift-II)

Ans. (a) : The mean of 36 numbers = 42

Sum of 36 number = 36 × 42 = 1512

Correct total sum = 1512 – 41 + 47= 1518

$\text{Total mean} = \frac{1518}{36}$

$= 42.1666 = \boxed{42.17}$

12. Find the arithmetic mean of the following data.

12, 13, 18, 12, 15, 15, 16, 13, 19, 17

(a) 15.5 (b) 14

(c) 13.5 (d) 15

RRB Group-D 28-09-2022 (Shift-II)

Ans. (d) : Arithmetic mean $\frac{\text{Sum of all observation}}{\text{Number of observation}}$

$\frac{12 + 13 + 18 + 12 + 15 + 15 + 16 + 13 + 19 + 17}{10}$

$\frac{150}{10} = 15$

13. Find the arithmetic mean of the following data.

x	**6**	**10**	**18**	**24**	**30**	**36**
f	**4**	**3**	**4**	**2**	**1**	**1**

(a) 13 (b) 16

(c) 17 (d) 12

RRB Group-D 29-09-2022 (Shift-II)

Ans. (b) :

x	f	f. x
6	4	24
10	3	30
18	4	72
24	2	48
30	1	30
36	1	36
total	f = 15	fx = 240

Mean = $\frac{fx}{f}$

$\frac{240}{15} = 16$

14. If the mean of 22, 25, 27, 24 and x is 26, then the value of x is:

(a) 35 (b) 32
(c) 28 (d) 41

RRB Group-D 23/08/2022 (Shift-II)

Ans. (b) :

$$\text{Mean} \quad \frac{\text{Sum of terms}}{\text{No. of terms}}$$

$$26 = \frac{22 + 25 + 27 + 24 + x}{5}$$

$$130 = 98 + x$$

$$x = 32$$

15. The mean of the values 1, 2, 3, 4, ..., n with respective frequencies 1, 2, 3, ..., n is:

(a) $\frac{2n \quad 1}{3}$ (b) $\frac{2n \quad 1}{3}$

(c) $\frac{n \quad 1}{2}$ (d) $\frac{n \quad 1}{2}$

RRB NTPC 02.02.2021 (Shift-I) Stage Ist

Ans. (b) :

$$f_1 x_1 \quad 1 \times 1 \quad 2 \times 2 \quad 3 \times 3 \quad \text{- - - - - } n \times n$$

Where, f_1 = Frequency, x_1 = Observation

$$= 1^2 + 2^2 + 3^2 + \text{- - - - - } n^2$$

$$= \frac{n \quad n \quad 1 \quad 2n \quad 1}{6}$$

and $f_1 = 1 + 2 + 3 + \text{- - - - - - - } n$

$$= \frac{n \quad n \quad 1}{2}$$

$$\text{Mean} = \frac{f_1 x_1}{f_1} = \frac{\frac{n \quad n \quad 1 \quad 2n \quad 1}{6}}{\frac{n \quad n \quad 1}{2}} = \frac{2n \quad 1}{3}$$

16. If the mean of the following data is 15, then find the value of k.

x	5	10	15	20	25
f	6	k	6	10	5

(a) 6 (b) 10
(c) 8 (d) 7

RRB NTPC 13.01.2021 (Shift-II) Stage Ist

Ans. (c) :

x	f	f ×x
5	6	30
10	k	10k
15	6	90
20	10	200
25	5	125
f = 27 + k		f.x. = 445 + 10k

$$\text{Mean} = \frac{445 \quad 10k}{27 \quad k} = 15$$

$$405 + 15k = 445 + 10k$$

$$k = 8$$

17. The following table gives a frequency distribution whose arithmetic mean is 33. Find the product of the possible values of k from the distribution.

Value (X)	Frequency (f)
29	4
30	3
30 + k	3k
34	2
62	1

(a) 5 (b) 2
(c) 3 (d) 4

RRB NTPC 24.07.2021 (Shift-II) Stage Ist

Ans. (b) :

Value (x)	Frequency (f)	f×x
29	4	116
30	3	90
30+k	3k	$90k+3k^2$
34	2	68
62	1	62
	f = 10+3k	$fx = 336+90k+3k^2$

We know that,

$$\text{Arithmetic Mean} = \frac{fx}{f}$$

$$33 = \frac{336 \quad 90k \quad 3k^2}{10 \quad 3k}$$

$$330 + 99k = 336 + 90k + 3k^2$$

$$3k^2 + 90k - 99k + 336 - 330 = 0$$

$$3k^2 - 9k + 6 = 0$$

$$k^2 - 3k + 2 = 0$$

$$(k - 2)(k - 1) = 0$$

$$k = 2, 1$$

Hence, the number of possible value of k = 2

18. If mean of the following distribution is 26, then what is the value of k ?

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	8	10	k	6	12

(a) 10 (b) 1
(c) 4 (d) 8

RRB NTPC 08.04.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question,

Class	Midpoint (x)	Frequency (f)	fx
0-10	5	8	40
10-20	15	10	150
20-30	25	k	25k
30-40	35	6	210
40-50	45	12	540

Mean = $\frac{fx}{f}$ $\frac{40 + 150 + 25k + 210 + 540}{8 \quad 10 \quad k \quad 6 \quad 12}$

$26 = \frac{940 \quad 25k}{36 \quad k}$

$936 + 26k = 940 + 25k$

$k = 4$

19. Find the mean height of persons from the following data.

Height (cm)	No. of persons
120	3
130	4
140	5
150	6
160	2

(a) 145 cm (b) 140 cm
(c) 160 cm (d) 150 cm

RRB NTPC 28.01.2021 (Shift-I) Stage Ist

Ans. (b) : From question,

Height (cm) (x_i)	No. of persons (f_i)	f_ix_i
120	3	360
130	4	520
140	5	700
150	6	900
160	2	320
	f_i 20	f_ix_i 2800

Mean height of persons = $\frac{f_ix_i}{f_i}$ $\frac{2800}{20}$

= 140 cm

20. The mean of 25 observations is 36. If the mean of its first 13 observations is 32 and the last 13 observations is 40, then what will be its 13th observation ?

(a) 38 (b) 23
(c) 36 (d) 40

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question,
Let its 13th observation is x
x = 13 (40 + 32) – 25 36
x = 13 72 – 25 36
x = 936 – 900 x = 36

21. The mean of 100 observations is 50. If one observation 50 is replaced by 150, then what will be the new mean ?

(a) 49.5 (b) 51
(c) 50.5 (d) 52

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (b) : New Mean = $50 + \frac{150 - 50}{100}$

= 50 + 1
= 51

22. The marks obtained in a test by students of a class are given below.
Scores of how many students are within a, +2/–2 range of the average score of the class?
23, 2, 15, 38, 21, 19, 24, 26

(a) 3 (b) 2
(c) 4 (d) 1

RRB NTPC 21.01.2021 (Shift-II) Stage Ist

Ans. (a) **:** Average of total students

$= \frac{23 + 2 + 15 + 38 + 21 + 19 + 24 + 26}{8} = 21$

According to question,
3 students are within a +2/-2 range of average score of classes which are 23, 21, 19.

23. Find the mean of x 77, x 7, x 5, x + 3 and x – 2.

(a) x 18 (b) x 8
(c) x – 3 (d) x – 8

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (a) : We know that,

$$\text{Mean} = \frac{\text{Sum of terms}}{\text{No. of terms}}$$

$$\frac{(x - 2) + (x + 3) + (x + 5) + (x + 7) + (x + 77)}{5}$$

$$= \frac{5x \quad 90}{5}$$

$$= \frac{5(x \quad 18)}{5} \quad (x \quad 18)$$

24. Calculate the mean of following set of values– 2.2, 4.2, 6.4, 8.3, 10.5

(a) 6.50 (b) 7
(c) 6.32 (d) 6.12

RRB NTPC 15.03.2021 (Shift-I) Stage Ist

Ans. (c) : Mean value of the set

$$\frac{2.2 + 4.2 + 6.4 + 8.3 + 10.5}{5}$$

$$\frac{31.6}{5} \quad 6.32$$

25. Find the arithmetic mean of 36, 53, 50, 43, 57, 50, 40, 35, 39 and 34.

(a) 52.4 (b) 43
(c) 50 (d) 43.7

RRB NTPC 04.03.2021 (Shift-II) Stage Ist

Ans. (d) :

Arithmetic mean = $\frac{\text{Sum of observations}}{\text{Total number of observations}}$

$$\frac{36+53+50+43+57+50+40+35+39+34}{10}$$

$$\frac{437}{10} \quad 43.7$$

26. The arithmetic mean of X observations is m. If two observations 0 and m are added, then the new mean will be:

(a) $\frac{mx}{x+1}$ (b) m

(c) $\frac{m}{x+1}$ (d) $\frac{m(x+1)}{x+2}$

RRB NTPC 12.01.2021 (Shift-II) Stage Ist

Ans. (d) **:** Sum of x observations · mx

If 0 and m are added to them, then the new mean –

$$\text{Mean} \cdot \frac{mx \quad 0 \quad m}{x \quad 2}$$

$$= \frac{m(x \quad 1)}{x \quad 2}$$

27. Find the mean of the following data:

x:	19	21	23	25	27	29	31
f:	13	15	16	18	16	15	13

(a) 30 (b) 28

(c) 20 (d) 25

RRB NTPC 16.01.2021 (Shift-I) Stage Ist

Ans. (d) :

x	f	fx
19	13	247
21	15	315
23	16	368
25	18	450
27	16	432
29	15	435
31	13	403
Total =	f = 106	fx = 2650

$$\text{Mean } \bar{x} \quad \frac{fx}{f} = \frac{2650}{106}$$

$$\bar{x} = 25$$

28. Find the missing frequency(p) for the following distribution whose mean is 8:

x:	3	5	7	9	11	13
f:	6	8	15	p	8	4

(a) 18 (b) 12

(c) 10 (d) 25

RRB NTPC 16.01.2021 (Shift-I) Stage Ist

Ans. (d):

x	f	fx
3	6	18
5	8	40
7	15	105
9	p	9p
11	8	88
13	4	52
Sum =	**f = 41 + p**	**(fx) = 303 + 9p**

$$\text{Mean} = \frac{fx}{f}$$

$$8 = \frac{303+9p}{41+p}$$

$8(41+p) = 303 + 9p$

$328 + 8p = 303 + 9p$

$9p - 8p = 328 - 303$

$p = 25$

29. Find the mean of the following distribution.

x :	5	6	7	8	9
f :	4	8	14	11	3

(a) 8.325 (b) 7.025

(c) 5.225 (d) 9.125

RRB NTPC 11.01.2021 (Shift-I) Stage Ist

Ans. (b) **:**

$fx = 5 \times 4 + 6 \times 8 + 7 \times 14 + 8 \times 11 + 9 \times 3$

$= 20 + 48 + 98 + 88 + 27$

$= 281$

$f = 4 + 8 + 14 + 11 + 3$

$= 40$

$$\text{Mean} = \frac{fx}{f} = \frac{281}{40}$$

$= 7.025$

30. What will be the median of the given data?
1, 1.1, 2.3, 0.1, 0.9, 5, 3.9, 2.5, 4.2, 4.6

(a) 2.6 (b) 2.4

(c) 2.5 (d) 2.3

RRB NTPC (Stage-II) 17/06/2022 (Shift-III)

Ans. (b) : On arranging the data in ascending order

0.1, 0.9, 1, 1.1, 2.3, 2.5, 3.9, 4.2, 4.6, 5

Number of term = 10 (even)

$$\text{Median} \quad \frac{\frac{10}{2}\text{th term} + \frac{10}{2} \quad 1 \text{ th term}}{2}$$

$$\frac{5^{th} \text{ term} \quad 6^{th} \text{ term}}{2}$$

$$= \frac{2.3 \quad 2.5}{2} = 2.4$$

31. Given are the scores of a batsman in the last 10 innings. Find the median score of the batsman in these innings.
65, 180, 81, 6, 63, 27, 122, 8, 165, 50

(a) 63 (b) 64.5

(c) 65 (d) 64

RRB NTPC (Stage-2) 17/06/2022 (Shift-III)

Ans. (d) : On arranging the given observation in ascending order

6, 8, 27, 50, 63, 65, 81, 122, 165, 180

n = 10 (even)

$$\text{Median} = \frac{\frac{n}{2}^{th}\text{ term} + \frac{n}{2}\ 1^{th}\text{ term}}{2}$$

$$= \frac{5^{th}\text{ term} + 6^{th}\text{ term}}{2}$$

$$= \frac{63\ \ 65}{2} = 64$$

32. What is the median of 15, 2, 7, 8, 11, 5 and 14?

(a) 8 (b) 7.5

(c) 7 (d) 9.5

RRB NTPC (Stage-II) –12/06/2022 (Shift-II)

Ans. (a) : On arranging the numbers in ascending orders–

2, 5, 7, 8, 11, 14, 15

Median = $\frac{n\ \ 1}{2}^{th}$ term (Where n = number of terms)

$$- \frac{7\ \ 1}{2}^{th} - \frac{8^{th}}{2} - 4^{th}\text{ term} = 8$$

33. Find the median of the numbers given below:
2, 7, 5, 6, 7, 5, 4, 4, 0, 3, 0, 3, 1, 1, 3

(a) 3.5 (b) 4.5

(c) 3 (d) 4

RRB NTPC (Stage-II) –13/06/2022 (Shift-I)

Ans. (c) : On writing the numbers in ascending order–

0, 0, 1, 1, 2, 3, 3, 3, 4, 4, 5, 5, 6, 7, 7

N = 15 (Odd number)

Required median = $\frac{15\ \ 1}{2}^{th}$ term

= 8th term

= 3

34. If an observation 70 is removed from the data 60, 68, 70, 72, 74, 76, 78, 80, then the median is increased by:

(a) 0.5 (b) 1.5

(c) 2 (d) 1

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (d) : Given observations– 60, 68, 70, 72, 74, 76, 78, 80 Number of term = 8 (even)

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{th}\text{ term}\quad\left(\frac{n}{2}\ \ 1\right)^{th}\text{ term}}{2}$$

$$= \frac{\left(\frac{8}{2}\right)^{th}\text{ term}\quad\left(\frac{8}{2}\ \ 1\right)^{th}\text{ term}}{2}$$

$$= \frac{4^{th}\text{ term}\quad 5^{th}\text{ term}}{2}$$

$$= \frac{72\quad 74}{2}$$

$$= \frac{146}{2}$$

Median = 73

Number of term on removing 70 = 7 (odd)

$$\text{Median} = \frac{n\ \ 1}{2}^{th}\text{ term}$$

$$= \frac{7\ \ 1}{2} = 4^{th}\text{ term}$$

= 74

Then, Increased median = 74 – 73

= 1

35. Calculate the value of $\frac{\text{Range}}{\text{Median}}$ for the set of data given below:
134, 98, 194, 122, 108, 156

(a) $\frac{48}{67}$ (b) $\frac{3}{4}$

(c) $\frac{8}{9}$ (d) $\frac{48}{61}$

RRB NTPC (Stage-II) 16/06/2022 (Shift-III)

Ans. (b) : Ascending order of the given sets 98, 108, 122, 134, 156, 194 n = 6 (even)

Range = Maximum value – minimum Value = 194 – 98

= 96

If the number of term is even

$$\text{Median} = \frac{\frac{n}{2}\text{th term} + \frac{n}{2}\ \ 1\ \text{th term}}{2}$$

$$= \frac{3\text{th term} + 4\text{th term}}{2}$$

$$= \frac{122 + 134}{2} = 128$$

$$\frac{\text{Range}}{\text{Median}} = \frac{96}{128}\quad\frac{3}{4}$$

36. Find the median of:

CI	0-10	10-20	20-30	30-40	40-50	50-60	60-70
F	2	4	7	9	10	12	6

(a) 40 (b) 43

(c) 42 (d) 41

RRB Group-D 24-08-2022 (Shift-I)

Ans. (b) : According to the question,

CI	F	CF
0 10	2	2
10 20	4	6
20 30	7	13
30 – 40	9	22 – c.f
40 50	10 f	32
50 60	12	44
60 70	6	50
	n 50	

$\frac{n}{2}$ 25, is included in cumulative frequency 32

So, 40–50 will be median class.

$$\text{Median} = l + \frac{\frac{n}{2} - C.f}{f} \times h$$

$$= 40 + \frac{25 - 22}{10} \times 10$$

$$= 40 + 3$$

$$= 43$$

37. The nominal marks obtained by students who appeared in a test are given below. Find the median marks of the students.

Marks	11	20	8	16	29	22
No. of students	14	5	11	9	3	8

(a) 13 (b) 13.5

(c) 8 (d) 10.5

RRB GROUP-D – 27/09/2022 (Shift-II)

Ans. (b) : On writing the given number in ascending order -

Marks	No. of students	Cumulative frequency (CF)
8	11	11
11	14	25
16	9	34
20	5	39
22	8	47
29	3	50

$n = 50$

$$\text{Median} = \frac{\frac{n}{2}\text{th term} + \left(\frac{n}{2}+1\right)\text{th term}}{2}$$

$$= \frac{25\text{th term} + 26\text{th term}}{2} = \frac{11 + 16}{2} = \frac{27}{2} = 13.5$$

38. The following observations are arranged in ascending order.

29, 32, 48, 50, x, x+2 72, 78, 84, 95

If the median is 63, then what is the value of x ?

(a) 31 (b) 62

(c) 50 (d) 63

RRB GROUP-D – 19/09/2022 (Shift-II)

Ans. (b) : Given - On ascending order -

29, 32, 48, 50, x, x + 2, 72, 78, 84, 95

n = 10 (even)

$$\text{Median} = \frac{1}{2}\left[\frac{n}{2}\text{th term} + \left(\frac{n}{2}+1\right)\text{th term}\right]$$

$$63 \quad \frac{1}{2}(5^{th}\text{ term} + 6^{th}\text{ term})$$

$$126 = x + x + 2$$

$$2x = 124$$

$$x = 62$$

39. Find the median of the data 11, 16, 33, 15, 51, 18, 71, 75, 22, 17.

(a) 18 (b) 24

(c) 20 (d) 22

RRB GROUP-D – 17/08/2022 (Shift-II)

Ans. (c) : Given data-

11, 16, 33, 15, 51, 18, 71, 75, 22, 17

In ascending order-

11, 15, 16, 17, 18, 22, 33, 51, 71, 75 n = 19 (even)

Where n is even

$$\text{For even} = \frac{\frac{n^{th}}{2}\text{term} + \left(\frac{n}{2}+1\right)^{th}\text{term}}{2}$$

$$\frac{\frac{10^{th}}{2}\text{term} + \left(\frac{10}{2}+1\right)^{th}\text{term}}{2}$$

$$\frac{5^{th}\text{ term} + 6^{th}\text{ term}}{2} \quad \frac{18 + 22}{2} \quad \frac{40}{2} = \boxed{20}$$

40. If the upper quartile represents 75% of the data and if the lower quartile represents 25% of the data, then which will show the median?

(a) 20% (b) 100%

(c) 50% (d) 80%

RRB Group-D – 05/12/2018 (Shift-III)

Ans : (c) Median = $\frac{75\% + 25\%}{2} \quad \frac{100\%}{2} \quad 50\%$

41. The median of 151, 153, 158, 165, 150, 140, 170, 153, 158 and 151 is:

(a) 165 (b) 151

(c) 140 (d) 153

RRB NTPC 02.03.2021 (Shift-I) Stage Ist

Ans. (d) :

On writing the given data in ascending order

140, 150, 151, 151, 153, 153, 158, 158, 165, 170

Number of terms (n) = 10 (even)

$$\text{Median} = \frac{\frac{n^{th}}{2}\text{ term} + \left(\frac{n}{2}+1\right)^{th}\text{ term}}{2}$$

$$\frac{\frac{10}{2}^{th}\text{ term} + \left(\frac{10}{2}+1\right)^{th}\text{ term}}{2}$$

$$\frac{5^{th}\text{ term} + 6^{th}\text{ term}}{2} \quad \frac{153 + 153}{2} \quad \frac{306}{2} = 153$$

42. The median of the data in ascending order 7, 11, 12, (x – y), (x + y), 20, 21, 29 is 16. Find the value of x.

(a) 15 (b) 14

(c) 12 (d) 16

RRB NTPC 19.01.2021 (Shift-I) Stage Ist

Ans. (d): Data in Ascending order:-
7, 11, 12, (x – y), (x + y), 20, 21, 29
Median (M) = 16
Number of terms (n) = 8
Then, Median (M)

$$16 = \frac{4^{th}\text{ term} \quad 5^{th}\text{ term}}{2}$$

$$16 = \frac{x \quad y \quad x \quad y}{2}$$

$$16 = \frac{2x}{2}$$

$$x = 16$$

Hence, x = 16.

43. What is the median for the following series?
2, 5, 4, 1, 8
(a) 4 (b) 3.5
(c) 7 (d) 4.5

RRB NTPC 08.02.2021 (Shift-II) Stage Ist

Ans. (a) : On writing the above series in ascending order-
1, 2, 4, 5, 8
Where n = 5 (Odd number)

$$\text{Median} = \frac{n \quad 1}{2}^{th}\text{ term} \quad \frac{5 \quad 1}{2}^{th} = 3^{rd}\text{ term}$$

i.e. Median = 4

44. In the given data if 30 is replaced by 100 then find the difference of the two medians.
80, 90, 40, 30, 20, 10, 70, 60, 50
(a) 60 (b) 50
(c) 10 (d) 40

RRB NTPC 28.01.2021 (Shift-I) Stage Ist

Ans. (c) : 80, 90, 40, 30, 20, 10, 70, 60, 50
On Writing in ascending order to the given number,
10, 20, 30, 40, 50, 60, 70, 80, 90
Where, n = 9

$$\text{Median} = \frac{n \quad 1}{2}^{th}\text{ term} \qquad [\because n = \text{odd number}]$$

$$\frac{9 \quad 1}{2}^{th}\text{ term} \quad \frac{10}{2}^{th}\text{ term} = 5^{th}\text{ term}$$

Median = 50
according to the question, putting 100 in place of 30
Given data will as follows –10, 20, 40, 50, 60, 70, 80, 90, 100

$$\text{Median} = \frac{n \quad 1}{2}^{th}\text{ term} = \frac{9 \quad 1}{2}^{th}\text{ term} = \frac{10}{2}^{th}\text{ term}$$

$= 5^{th}$ term
Median = 60
Hence, Required difference = 60 – 50 = 10

45. The median of 4, 4, 5, 7, 6, 7, 7, 12, 3 :
(a) 4 (b) 6
(c) 5 (d) 7

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (b) : On writing the numbers in ascending order
3, 4, 4, 5, 6, 7, 7, 7, 12
No. of terms = odd

$$\text{Median} = \frac{n+1}{2}^{th}\text{ term} = \frac{9+1}{2}^{th}\text{ term} = 5^{th}\text{ term}$$

Hence, Median = 6

46. What is the median of the following data?
78, 56, 22, 34, 45, 54, 39, 68, 54, 84
(a) 54 (b) 53
(c) 55 (d) 51

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (a) : For the median of data-
78, 56, 22, 34, 45, 54, 39, 68, 54, 84
Number of term = 10 (even)
Arrange in the ascending order-
22, 34, 39, 45, 54, 54, 56, 68, 78, 84

$$\text{Median} = \frac{\frac{n}{2}\text{ th term} \quad \frac{n}{2} \quad 1\text{ th term}}{2}$$

$$= \frac{\frac{10}{2}\text{ th term} \quad \frac{10}{2} \quad 1\text{ th term}}{2}$$

$$= \frac{5\text{ th term} \quad 6\text{ th term}}{2} \quad \frac{54 \quad 54}{2} \quad 54$$

47. Find the median of 7, 14, 13, 12, 20, 11, 15 and 8.
(a) 11 (b) 12.5
(c) 11.5 (d) 12

RRB NTPC 04.03.2021 (Shift-II) Stage Ist

Ans. (b) : 7, 14, 13, 12, 20, 11, 15, 8
Arrange in ascending order- 7, 8, 11, 12, 13, 14, 15, 20
Number of terms (n) = 8
Note- If the series of numbers are odd then to calculate median, arrange the series in ascending/descending order and the number which is positioned in between would be the median. If the numbers are in even then add the 2 numbers which are positioned in between and divide it by 2.

$$\text{If even number then median} = \frac{\frac{n}{2}\text{th term} \quad \frac{n}{2} \quad 1\text{ th term}}{2}$$

$$\text{Median} = \frac{\frac{8}{2}\text{th term} \quad \frac{8}{2} \quad 1\text{ th term}}{2}$$

$$= \frac{12 \quad 13}{2} = \frac{25}{2} = 12.5$$

48. The given data is arranged in ascending order and its median is 17. Find the value of x.
8, 10, 12, 15, x, x+2, 20, 25, 30, 32

(a) 16 (b) 18
(c) 19 (d) 17

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (a) : 8, 10, 12, 15, x, x+2, 20, 25, 30, 32
n = 10 (Even)

$$\text{Median for even terms} \cdot \frac{\left(\frac{n}{2}\right)^{th}\text{ term} \quad \left(\frac{n}{2}\ 1\right)^{th}\text{ term}}{2}$$

$$\text{Median} = \frac{\frac{10}{2}^{th}\text{ term} \quad \frac{10}{2}\ 1\ ^{th}\text{ term}}{2} \quad \frac{x \quad x \quad 2}{2}$$

$$17 \quad \frac{2x \quad 2}{2}$$

$$17 = x + 1$$

$$x = 16$$

49. 40% is the passing criteria in an examination. Out of 9 students who appeared, 4 failed and the remaining received 80%, 55%, 52%, 66% and 81% marks. The median of the percentage marks is equal to :

(a) 58^3 (b) 66^3
(c) 52^3 (d) 81^3

RRB NTPC 17.01.2021 (Shift-II) Stage Ist

Ans. (c) : According to the question,
The criteria of pass the exam is 40%.
∵ 4 examinees have failed.
Let the % marks of 4 candidates be – A% , B%, C% and D% respectively.
Hence on putting all the percentage marks in ascending order.

Number of candidates = 9 (odd)

$$\text{Median of obtained marks} = \frac{n+1}{2}\ \text{term}$$

Hence, the median of the obtained marks = 52%

50. The following observations are arranged in ascending order. If the median of the data is 19, then find the value of x.
6, 9, 15, x + 4, x + 8, x + 12, 30, 32

(a) 13 (b) 8
(c) 10 (d) 5

RRB NTPC 12.01.2021 (Shift-II) Stage Ist

Ans. (a) : 6,9,15, (x + 4), (x + 8) , (x +12), 30, 32
Number of terms (n) = 8 (even)

$$\text{Median} \cdot \frac{\frac{n}{2}^{th}\text{ term} + \frac{n}{2}\ 1\ ^{th}\text{ term}}{2}$$

$$19 = \frac{4^{th}\text{ term} \quad 5^{th}\text{ term}}{2}$$

$$38 = x + 4 + x + 8$$

$$26 = 2x$$

$$x = 13$$

51. The digits given below are arranged in ascending order. If their median is 10, then find the value of p. 3, 5, 6, 2p +3, 3p +2, 15, 25, 51

(a) 2 (b) 3
(c) 27.5 (d) 38

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (b) When the number of terms is even then

$$\text{Median} \quad \frac{\left(\frac{n}{2}\right)^{th}\text{ term} + \left(\frac{n}{2}\ 1\right)^{th}\text{ term}}{2}$$

Where n = number of term.
here n = 8 and median · 10 (Given)

$$10 \quad \frac{\left(\frac{8}{2}\right)^{th}\text{ term} + \left(\frac{8}{2}\ 1\right)^{th}\text{ term}}{2}$$

$$10 \quad \frac{4^{th}\text{ term} \quad 5^{th}\text{ term}}{2}$$

$$10 = \frac{2p \quad 3 \quad 3p \quad 2}{2}$$

$$5p = 20 - 5 = 15$$

$$p = \frac{15}{5} = 3$$

52. Find the median of 45, 76, 32, 58, 16, 27, 64 and 35.

(a) 35 (b) 45
(c) 40 (d) 42

RRB NTPC 05.03.2021 (Shift-I) Stage Ist

Ans. (c) : 45, 76, 32, 58, 16, 27, 64 and 35 on writing in ascending order
16, 27, 32, 35, 45, 58, 64, 76, n = 8 (even),
n = No. of term.

$$\text{Mean} = \frac{\frac{n}{2}\text{th term} \quad \frac{n}{2}\ 1\ \text{th term}}{2}$$

$$= \frac{\frac{8}{2}\text{th term} \quad \frac{8}{2}\ 1\ \text{th term}}{2}$$

$$= \frac{4\text{th term} \quad 5\text{th term}}{2}$$

$$\text{Mean} = \frac{35 \quad 45 \quad 80}{2}$$

Mean = 40

53. The median of a set of 7 distinct observation is 21.5. If each of the largest 3 observations of the set is increased by 4, then the median of the new set -

(a) will be four times the original median
(b) will remain the same as that of the original set
(c) will decrease by 4
(d) will increase by 4

RRB NTPC 23.02.2021 (Shift-I) Stage Ist

Ans. (b) : The median of seven different observations writing them in ascending order $\frac{7+1}{2}$ then will be equal to 4^{th} term. So if three largest term i.e. 5^{th}, 6^{th} and 7^{th} term of the number written in ascending order in increased by 4 then there is no change in the median of 4^{th} term nor their order will change i.e. median will remain same as the original median.

54. Find the median of the data 40, 50, 30, 20, 80, 70, 90, 50. Next, if 30 is replaced by 120, find the new median. The mean of the two medians found is.....

(a) 60 (b) 110
(c) 55 (d) 50

RRB NTPC 25.01.2021 (Shift-I) Stage Ist

Ans. (c) : According the data in ascending-
= 20, 30, 40, 50, 50, 70, 80, 90 n = 8 (even)

$$\text{Median} \quad \frac{\left(\frac{n}{2}\right)\text{term} \quad \left(\frac{n}{2}+1\right)\text{term}}{2}$$

$$\frac{\left(\frac{8}{2}\right)^{th}\text{ term} \quad \left(\frac{8}{2}+1\right)^{th}\text{ term}}{2}$$

$$\frac{4^{th}\text{ term} + 5^{th}\text{ term}}{2} \quad \frac{50+50}{2} \quad 50$$

On interchanging numbers
20, 40, 50, 50, 70, 80, 90, 120

$$\text{Median} \quad \frac{\left(\frac{n}{2}\right)^{th}\text{ term} \quad \left(\frac{n}{2}+1\right)^{th}\text{ term}}{2}$$

$$\frac{\left(\frac{8}{2}\right)^{th}\text{ term} \quad \left(\frac{8}{2}+1\right)\text{term}}{2}$$

$$\frac{4^{th}\text{ term} + 5^{th}\text{ term}}{2} \quad \frac{50+70}{2} \quad 60$$

$$\text{Mean} = \frac{50+60}{2} \quad 55$$

55. What is the mode of the observations 5, 4, 4, 6, 7, 6, 9, 7, 6, 5?

(a) 4 (b) 7
(c) 5 (d) 6

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (d) : Given,
5, 4, 4, 6, 7, 6, 9, 7, 6, 5
In the given observation 6 appears maximum number of times (3 times).
Mode = 6

56. Find the mode of the following data.
15, 26, 15, 29, 19, 18, 19, 15, 24, 23, 15, 19

(a) 29 (b) 26
(c) 19 (d) 15

RRB NTPC (Stage-II) –16/06/2022 (Shift-II)

Ans. (d) : The Given data– 15, 26, 15, 29, 19, 18, 19, 15, 24, 23, 15, 19
In the given observation, 15 appears maximum number of frequency = 4
Hence, The mode of following data = 15.

57. In the data set given below, what is the difference between the Median and the Mode?
{2.1, 5, 6, 7, 8, 9.3, 11, 15, 17, 19.21, 27, 31, 31, 33, 16.5, 14, 10}

(a) 19 (b) 10
(c) 17 (d) 15

RRB NTPC (Stage-II) –12/06/2022 (Shift-I)

Ans. (c) : Arranging the numbers in ascending order,
2.1, 5, 6, 7, 8, 9.3, 10, 11, 14, 15, 16.5, 17, 19.21, 27, 31, 31, 33
Mode = 31 (has come 2 times)
and, total number of terms n = 17 (odd)

$$\text{Median} = \frac{n+1}{2}^{th}\text{ term}$$

$$= \frac{17+1}{2}^{th}\text{ term}$$

$= 9^{th}$ term = 14
Difference between Median and Mode
= 31 – 14 = 17

58. What is the mode of the following data ?
43, 41, 46, 48, 43, 50, 41, 48, 54, 46, 43, 48, 50, 46, 48, 50, 54

(a) 50 (b) 54
(c) 48 (d) 46

RRB Group-D 08/09/2022 (Shift-I)

Ans. (c) : The frequency of 48 is 4, which is the highest
Hence Mode of the given data = 48

59. Find the mode of the following data.
66, 69, 83, 69, 84, 74, 71, 83, 69, 71, 84, 74, 83, 66, 74, 83, 66, 90, 90

(a) 74 (b) 90
(c) 84 (d) 83

RRB Group-D 06/09/2022 (Shift-III)

Ans. (d) : ∵ Frequency of 83 is 4, which is the highest.
Hence mode = 83

60. In the given data, X is the size of a shirt and F denotes the sale per day. Which sized shirt is in most demand?

X	24	26	28	30	34	36	38	40	42
F	45	67	120	46	76	53	41	22	33

(a) 40 (b) 42
(c) 28 (d) 34

RRB Group-D 05/09/2022 (Shift-III)

Ans. (c) : 28 sized shirt is in most demand.

61. If the mode of the following data is 12, then find the value of k.
11, 15, 8, 9, k, 11, 12, 12, 15, 14
(a) 11 (b) 13
(c) 15 (d) 12

RRB NTPC 09.01.2021 (Shift-II) Stage Ist

Ans. (d) : Mode = the value that appears most often in a set of data value-
Hence, according to data = 11, 15, 8, 9, k, 11, 12, 12, 15, 14

k = 12

62. The marks obtained by 7 students in a class in mathematics are 43, 44, 65, 41, 53, 65, and 62, The mode of the data is:
(a) 53 (b) 65
(c) 41 (d) 62

RRB NTPC 04.01.2021 (Shift-I) Stage Ist

Ans. (b) : 43, 44, 65, 41, 53, 65, 62
The mode of the data = 65

63. The following are the weights (in kg) of 25 students:
58, 55, 53, 50, 53, 51, 52, 54, 53, 52, 54, 53, 58, 53, 59, 55, 53, 52, 51, 54, 53, 59, 55, 53, 52.
What is the most commonly observed weight (in kg)?
(a) 53 (b) 54
(c) 52 (d) 55

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (a) **:** The weight of the given 25 students has the highest frequency is 53 which came 8 times.

64. Find out the mode of 21, 22, 22, 23, 23, 24, 24, 24.
(a) 24
(b) 22
(c) 21
(d) 23

RRB ALP CBT-2 Mec. & Diesel 21-01-2019 (Shift-I)

Ans. (a) : Mode- Mode is a value which occurs the maximum number of times in a given data set.
From the question, 21, 22, 22, 23, 23, 24, 24, 24
Hence, mode = 24

65. What will be the mode of the given data as follows– 3, 12, 4, 6, 8, 5, 4
(a) 5 (b) 8
(c) 4 (d) 3

RRB RPF SI – 06/01/2019 (Shift-II)

Ans: (c) Mode = the highest frequency number
Mode = 4

66. Find out the mode of the given distribution–

Class interval	1–10	10–20	20–30	30–40	40–50	50–60
Frequency	3	16	26	31	16	8

(a) 34.5 (b) 35
(c) 42 (d) 32.5

RRB JE - 27/06/2019 (Shift-I)

Ans : (d)

Class interval	1–10	10–20	20–30	30–40	40–50	50–60
frequency	3	16	(26) F_0	(31) F_1	(16) F_2	8

Most frequency class is (30-40)
So mode category(30-40)
$L_1 = 30$, $L_2 = 40$
$F_1 = 31$, $F_2 = 16$, $F_0 = 26$

formula– $\text{Mode} = L_1 + \frac{(L_2 - L_1)(F_1 - F_0)}{2F_1 - F_0 - F_2}$

$\text{Mode} = 30 + \frac{(40 - 30)(31 - 26)}{2 \times 31 - 26 - 16}$

$\text{Mode} = 30 + \frac{50}{20}$

Mode = 30 + 2.5 = 32.5

67. A survey conducted by a group of students on 20 households in a local area resulted in the following frequency tables relating to the number of members of the household family-

Size of family	Family numbers
1–3	7
3–5	9
5–7	2
7–9	1
9–11	1

Find the mode of the given data.
(a) 3.571 (b) 3.444
(c) 3.628 (d) 3.286

RRB Group-D – 20/09/2018 (Shift-III)

Ans : (b)

Size of family	Family numbers
1–3	$7 = f_0$
3–5	$9 = f_1$
5–7	$2 = f_2$
7–9	1
9–11	1

The frequency of category 3-5 is the highest so mode category is 3-5
$L = 3$, $f_0 = 7$, $f_1 = 9$, $f_2 = 2$ and $h = 2$

$\text{mode} = L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$

$= 3 + \frac{9 - 7}{18 - 7 - 2} \times 2 = 3 + \frac{2}{9} \times 2 = 3\frac{2}{9} \times 2 = \frac{31}{9} = 3.444$

68. In Wicket taken by a bowler in 12 cricket matches are as follows:
2, 6, 4, 3, 5, 0, 3, 2, 1, 3, 2, 3
What will be the mode of the given data?
(a) 4 (b) 2
(c) 3 (d) 1

RRB Group-D – 18/09/2018 (Shift-II)

Ans. (c) : Mode of the given data = 3

69. What will be the mode of the given following data?
25, 45, 58, 87, 45, 54, 65, 12, 25, 59, 42, 60
(a) 25 (b) 45
(c) 45, 54 (d) 45, 25

RRB Group-D – 09/10/2018 (Shift-I)

Ans. (d) : Given data– 25, 45, 58, 87, 45, 54, 65, 12, 25, 59, 42, 60
In the given data the number 25 and 45 appeared equally and maximum.
So Required mode is 25, 45

70. The details of the number of persons who have taken loan from the bank on the basis of their age group are given below.

age group	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of people	37	38	70	42	13

Find the mode.
(a) 45.33 (b) 44.89
(c) 45.67 (d) 45.12

RRB Group-D – 15/11/2018 (Shift-III)

Ans : (a) :

Age category	Age category persons number
20 - 30	37
30 - 40	38
40 - 50	70 mode category
50 - 60	42
60 - 70	13

here - L = Minimum limit of mode category = 40
f_1 = Number of mode category = 70
f_0 = Number of the persons belongs to upper class of mode class = 38
f_2 = Number of persons belongs to the class below the mode class = 42
i = higher limit – lower limit (quadratic) = 10

$$\text{mode (z)} = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$$= 40 + \frac{70 - 38}{70 - 2 - 38 - 42} \times 10 = 40 + \frac{32}{140 - 80} \times 10$$

$$= 40 + \frac{320}{60} = 40 + 5.33 = 45.33$$

71. Below, details of 100 students present in the class is given on the basis of their presence (day).

The number of days of presence	6-10	10-14	14-18	18-22	22-26
Number of students	9	28	34	18	11

What will be the mode of the data?
(a) 15.09 (b) 15.01
(c) 14.71 (d) 15.04

RRB Group-D – 12/11/2018 (Shift-I)

Ans. (a) :

Number	frequency
6-10	9
10-14	$28 = f_0$
14-28	$34 = f_1$
18-22	$18 = f_2$
22-26	11

$$z\,(\text{Mode}) = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$L = 14$ $f_1 = 34$ $f_0 = 28$
$f_2 = 18$ $i = 4$

$$z = 14 + \frac{34 - 28}{68 - 28 - 18} \times 4 \quad 14 \quad \frac{24}{22}$$

$z = 15.09$

72. What will be the mode of the given data?
12, 1, 10, 1, 9, 3, 4, 9, 7, 9
(a) 9 (b) 12
(c) 1 (d) 7

RRB NTPC 17.01.2017 Shift-1

Ans : (a) In the given data , mode = 9 (3 times)
$\because$ mode is the highest frequency number.

73. What will be the mode of the given data as follows– 32, 34, 35, 36, 35, 34, 33, 35, 33, 31 and 37
(a) 33 (b) 34
(c) 35 (d) 32

RRB NTPC 04.04.2016 Shift : 3

Ans :(c) 32, 34, 35, 36, 35, 34, 33, 35, 33, 31, 37
$\because$ highest frequency is 3 of the number 35.
So mode = 35

74. What will be the mode of the given data as follows – 12, 14, 15, 16, 15, 14, 13, 15, 13, 11 and 17
(a) 13 (b) 14
(c) 15 (d) 12

RRB NTPC 03.04.2016 Shift : 3

Ans :(c) If the frequency of a number is the most frequent in the data, then that number is the mode of the given data.
So mode of data = 15

75. What will be the mode of the given data follows as– 2, 4, 5, 6, 5, 4, 3, 5, 3, 1 and 7

(a) 3 (b) 4
(c) 5 (d) 2

RRB NTPC 02.04.2016 Shift : 3

Ans : (c) 2, 4, 5, 6, 5, 4, 3, 5, 3, 1, 7
Frequency of 5 is highest in the given data.
mode = 5

76. If the mode of the given data is 52, then find the value of x?
52, 45, 49, 54, 56, x-3, 56

(a) 52 (b) 55
(c) 54 (d) 56

RRB NTPC 29.03.2016 Shift : 2

Ans : (b) $\because$ Mode of figures = 52
$x - 3 = 52$ $\boxed{x = 55}$

77. What will be the mode of the given data–
$1, \frac{1}{2}, \frac{1}{2}, \frac{3}{4}, \frac{1}{4}, 2, \frac{1}{2}, \frac{1}{4}, \frac{2}{4}$

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{3}{4}$ (d) 1

RRB NTPC 07.04.2016 Shift : 3

Ans :(b)
$\because$ frequency of $\frac{1}{2}$ is maximum (3) in data.
mode = $\frac{1}{2}$

78. If the mean is 25 and the standard deviation is 5 then the coefficient of variation is:

(a) 48% (b) 27%
(c) 20% (d) 60%

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (c) : Given,
Mean = 25
Standard deviation = 5
We know that,

$$\text{Coefficient of variation} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

$$= \frac{5}{25} \quad 100 \quad 20\%$$

79. Calculate the standard deviation for the following data.
3, 4, 5, 6, 7

(a) $\sqrt{2}$ (b) $\sqrt{6}$
(c) 2 (d) $\sqrt{3}$

RRB NTPC 14.03.2021 (Shift-I) Stage Ist

Ans. (a): Standard deviation $\sqrt{\frac{|x \quad \bar{x}|^2}{n}}$

where x term
$\bar{x}$ mean
n number of terms

$$\text{mean } (\bar{x}) = \frac{\text{Sum of total terms}}{\text{Total number of terms}}$$

$$\bar{x} = \frac{3 \quad 4 \quad 5 \quad 6 \quad 7}{5} = \frac{25}{5} = 5$$

$$\sqrt{\frac{|x \quad \bar{x}|^2}{n}}$$

$$\sqrt{\frac{3-5^{\ 2} + 4-5^{\ 2} + 5-5^{\ 2} + 6-5^{\ 2} + 7-5^{\ 2}}{5}}$$

$$\sqrt{\frac{4 \quad 1 \quad 0 \quad 1 \quad 4}{5}}$$

$$\sqrt{\frac{10}{5}} \quad \sqrt{2}$$

80. If mean is 40 and standard deviation is 5 then C.V. (Coefficient of variation) is

(a) 20% (b) 12.5%
(c) 5% (d) 100%

RRB NTPC 30.12.2020 (Shift-I) Stage Ist

Ans. (b) : Given,
Mean = 40, Standard deviation = 5

$$\text{Coefficient of Variation} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

$$\frac{5}{40} \quad 100 = 12.5\%$$

81. Find the standard deviation of {11, 7, 10, 13, 9}.

(a) 1 (b) 2
(c) 4 (d) 5

RRB RPF SI – 10/01/2019 (Shift-II)

Ans : (b) Standard deviation $\sqrt{\frac{(x \quad \bar{x})^2}{n}}$

Where, $\bar{x}$ mean
n The number of terms

$$\bar{x} = \frac{11 \quad 7 \quad 10 \quad 13 \quad 9}{5} = \frac{50}{5} = 10$$

$(x - \bar{x})^2 = (11-10)^2 + (7-10)^2 + (10-10)^2 + (13-10)^2 + (9-10)^2 = 1 + 9 + 0 + 9 + 1 = 20$

Standard deviation $\sqrt{\frac{20}{5}}$ 2

82. The value of the 5 variance is 16. If each value becomes double then find the new value of standard deviation?

(a) 16 (b) 4
(c) 10 (d) 8

RRB JE - 28/05/2019 (Shift-I)

Ans : (d) We know that-

Standard deviation = $\sqrt{\text{Variance}}$

Standard deviation = 4

Note : if the figures are added subtracted, multiplied or divided by a given number, then the standard deviation is the same process.

Hence the new standard deviation = $4 \times 2 = 8$

83. The variance of the 5 values is 36. If each value becomes double, then what will be the standard deviation?

(a) 12 (b) 6
(c) 18 (d) 10

RRB JE - 30/05/2019 (Shift-III)

Ans : (a) Variance = ^{2}

Standard deviation $\sqrt{\ ^2\ }$ $\sqrt{36}$

Standard deviation = = 6

New standard deviation =

(Where = n times each value)

= 2 6 = 12

84. What will be the standard deviation of the given following data–
6, 12, 9, 7, 8, 4, 3, 12, 15, 4

(a) 3.80 (b) 2
(c) 3.48 (d) 4

RRB JE - 26/06/2019 (Shift-I)

Ans. (a)

x	6	12	9	7	8	4	3	12	15	4
d $(x \quad \bar{x})$	−2	+4	1	−1	0	−4	−5	+4	+7	−4
d^2	4	16	1	1	0	16	25	16	49	16

$d^2 = 144$

Mean $(\bar{x}) = \dfrac{6+12+9+7+8+4+3-12+15-4}{10}$ 8

Standard deviation = $\sqrt{\dfrac{d^2}{n}} = \sqrt{\dfrac{144}{10}} = \sqrt{14.4} = 3.8$

85. What will be the standard deviation of the first n natural number?

(a) $\sqrt{\dfrac{n^2 \quad 1}{12}}$ (b) $\dfrac{n \quad 2n \quad 1}{3}$

(c) $\sqrt{\dfrac{n^2 \quad 1}{6}}$ (d) $\dfrac{n \quad n \quad 1}{12}$

RRB JE - 02/06/2019 (Shift-II)

Ans. (a) (S.D) = $\sqrt{\dfrac{x_i^2}{n} \quad \dfrac{x_i}{n}^2}$

First 'n' natural number

$x_i = 1 + 2 + 3 + \text{-----} + n = \dfrac{n(n \quad 1)}{2}$

$x_i^{\ 2} = (1^2 + 2^2 + 3^2 + \text{-----} + n^2) \quad \dfrac{n(n \quad 1)(2n \quad 1)}{6}$

$= \sqrt{\dfrac{n(n+1)(2n+1)}{6 \quad n} \quad \dfrac{n(n+1)}{2n}^2}$

$= \sqrt{\dfrac{(n+1)(2n+1)}{6} \quad \dfrac{(n+1)^2}{4}}$

$= \sqrt{(n \quad 1)\dfrac{(4n \quad 2 \quad 3n \quad 3)}{12}}$

$= \sqrt{\dfrac{(n \quad 1)(n \quad 1)}{12}} = \sqrt{\dfrac{n^2 \quad 1}{12}}$

86. Sachin Tendulkar scored run in ten innings against Australia 38, 70, 48, 34, 42, 55, 63, 46, 54, and 44. Find the average deviation with respect to mean.

(a) $\dfrac{44}{5}$ (b) $\dfrac{43}{5}$

(c) $\dfrac{41}{5}$ (d) $\dfrac{42}{5}$

RRB Group-D – 05/12/2018 (Shift-III)

Ans : (b)

Average = $\dfrac{34+38+42+44+46+48+54+55+63+70}{10}$

$\dfrac{494}{10} = \dfrac{247}{5}$

Mean= $\underbrace{34+38+42+44+46}$ $\underbrace{48+54+55+63+70}$

$= \dfrac{204}{5}$ $= \dfrac{290}{5}$

Standard deviation = $\dfrac{247}{5} \quad \dfrac{204}{5} \quad \dfrac{43}{5}$

87. If the standard deviation of the given numbers is 255. Then find the value of 'd'
1, 1 + d, 1 + 2d.....1+ 100d

(a) 20.2 (b) 10.1
(c) 20.0 (d) 10.5

RRB Group-D – 16/11/2018 (Shift-II)

Ans : (b) 1,1 + d, 1 + 2d.....1+ 100 d is in arithmetic progression.

$\because$ Number of total terms = 101

Arithmetic mean $\bar{x}$ $\dfrac{1+ \ 1+d \ + \text{.....} \ 1+100d}{101}$

$\dfrac{101 \ 1 \quad 50d}{101}$

$\bar{x} \quad 1 \quad 50d$

mean deviation = $\dfrac{1}{101}\sum_{i\ 0}^{100} |x_i - \bar{x}|$

$$-\frac{1}{101}\,|-50d|-|-49d|+....|-d|+0-|d|+|2d|-.....+|50d|$$

$$255\quad\frac{2d}{101}\,\frac{50\quad 51}{2}\qquad\qquad 255\quad\frac{d}{101}\quad 50\quad 51$$

$$d=\frac{255\quad 101}{50\quad 51}=\frac{25755}{2550}=10.1$$

88. What will be the standard deviation of the given data–3, 10, 10, 4, 7, 10, 5

(a) $\frac{49}{7}$ (b) $\frac{19}{7}$

(c) $\frac{50}{7}$ (d) $\frac{18}{7}$

RRB NTPC 17.01.2017 Shift-1

Ans : (d) Data 3, 10, 10, 4, 7, 10, 5

Mean $=\frac{3+10+10+4+7+10+5}{7}=\frac{49}{7}$

Mean = 7

Mean deviation $=\frac{\sum_{i\ 1}^{N}|M\quad Xi|}{N}$

$$\frac{|7\quad 3|+|7\quad 10|+|7\quad 10|+|7\quad 4|+|7\quad 7|+|7\quad 10|+|7\quad 5|}{7}$$

$$\frac{4+3+3+3+0+3+2}{7}$$

mean deviation $\frac{18}{7}$

89. What will be the standard deviation of the given set {10, 11, 12, 9, 8}

(a) 1 (b) $\sqrt{2}$

(c) 2 (d) $2\sqrt{2}$

RRB NTPC 31.03.2016 Shift : 2

Ans : (b) $\bar{x}=\frac{10\quad 11\quad 12\quad 9\quad 8}{5}=\frac{50}{5}=10$

$$\sum_{i\ 1}^{5}x_i\quad\bar{x}^{\ 2}=(10-10)^2+(11-10)^2+(12-10)^2+(9-10)^2$$

$$+(8-10)^2$$

$$=0+1+4+1+4=10$$

Standard deviation $=\sqrt{\frac{\sum_{i\ 1}^{5}x_i\quad\bar{x}^{\ 2}}{N}}=\sqrt{\frac{10}{5}}=\sqrt{2}$

90. If the standard deviation of a distribution is 6, then what is the value of variance?

(a) 8 (b) 24

(c) 36 (d) 12

RRB NTPC 18.01.2017 Shift : 3

Ans : (c) Variance = $(\text{Standard deviation})^2$

$=(6)^2=36$

91. If the variance of a data set is 196, the standard deviation will be?

(a) 14 (b) 14

(c) 96 (d) 98

RRB NTPC 11.04.2016 Shift : 1

Ans : (b) Standard deviation

$=\sqrt{\text{variance}}=\sqrt{196}=14$

92. The variance of a data set is 169, then what will be the standard deviation?

(a) 13 (b) 13

(c) 69 (d) 845

RRB NTPC 26.04.2016 Shift : 2

Ans : (b) Standard deviation $\sqrt{\text{variance}}$

$\sqrt{169}\quad 13\quad 13$

93. In an observations $x_1, x_2, x_3, ...x_n$, frequency will be given as $f_1, f_2, f_3 .....f_x$. What will be the standard deviation $\bar{x}$

(a) $\sqrt{\frac{\sum_{i\ 1}^{n}f_i(x_i\quad\bar{x})}{\sum_{i\ 1}^{n}f_i}}$ (b) $\sqrt{\frac{\sum_{i\ 1}^{n}f_i(x_i\quad\bar{x})^2}{\sum_{i\ 1}^{n}f_i}}$

(c) $\sqrt{\frac{\sum_{i\ 1}^{n}f_i(x_i^{\ 2}\quad\bar{x})}{\sum_{i\ 1}^{n}f_i}}$ (d) $\sqrt{\sum_{i\ 1}^{n}f_i(x_i\quad\bar{x})}$

RRB NTPC 26.04.2016 Shift : 3

Ans : (b) Standard deviation $\sqrt{\frac{\sum_{i\ 1}^{n}f_i(x_i\quad\bar{x})^2}{\sum_{i\ 1}^{n}f_i}}$

where $\bar{x}$ = mean

94. Mean of given observation $x_1, x_2, x_3, ...x_n$ is $\bar{x}$. What will be the standard deviation of the n observation?

(a) $\sqrt{\frac{\sum_{1}^{n}x_i\quad\bar{x}}{n}}$ (b) $\sqrt{\frac{\sum_{1}^{n}x_i\quad\bar{x}^{\ 2}}{n}}$

(c) $\sqrt{\frac{\sum_{1}^{n}x_i^{\ 2}\quad\bar{x}}{n}}$ (d) $\sqrt{\frac{\sum_{1}^{n}x_i\quad\bar{x}^{\ 2}}{n}}$

RRB NTPC 30.04.2016 Shift : 3

Ans : (b) Standard deviation S.D. $\sqrt{\frac{\sum_{1}^{n}x_i\quad\bar{x}^{\ 2}}{n}}$

where $\sum_{1}^{n}x_1\quad\bar{x}^{\ 2}$ variables

95. Let $f(x) = x^2$ in R, then the range of f will be:

(a) Whole numbers
(b) Non negative numbers
(c) Positive real numbers
(d) Negative real numbers

RRB NTPC 07.01.2021 (Shift-II) Stage Ist

Ans. (c) : The square of any number will be always positive real numbers.

$f(x) = x^2$

Range of f = [0,] = R^+

Hence, the range of f will be positive real numbers.

96. Calculate the variance from the following data: 3, 6, 5, 2, 4

(a) 2.5 (b) 2.2
(c) 2 (d) 3

RRB NTPC 02.03.2021 (Shift-II) Stage Ist

Ans. (c) : Variance = $\frac{x_i \quad \bar{x}^{\,2}}{N}$

Mean $\bar{x} = \frac{20}{5} = 4$

$$\frac{x_i \quad \bar{x}^{\,2}}{N} = \frac{(3-4)^2 - (6-4)^2 - (5-4)^2 + (2-4)^2 + (4-4)^2}{5}$$

$$= \frac{(-1)^2 + (2)^2 + (1)^2 + (-2)^2 + (0)^2}{5}$$

$$= \frac{1 \quad 4 \quad 1 \quad 4}{5} = \frac{10}{5} = 2$$

97. Find the variance of the following data points: 6, 7, 5, 9, 12, 15

(a) $\frac{37}{6}$ (b) $\frac{37}{3}$
(c) $\frac{81}{3}$ (d) $\frac{67}{6}$

RRB NTPC 03.02.2021 (Shift-II) Stage Ist

Ans. (b) : Given data = 6, 7, 5, 9, 12, 15

Variance (^{2}) = $\frac{X i \quad M^{\,2}}{n}$ [where, M = Mean]

Mean of data (M) = $\frac{\text{Sum of data}}{n}$

$$= \frac{6 \quad 7 \quad 5 \quad 9 \quad 12 \quad 15}{6} \quad \frac{54}{6} \quad 9$$

Variance (^{2}) = $\frac{x_i \quad M^{\,2}}{n}$

$$\frac{6\ 9^{\,2} \ 7\ 9^{\,2} \ 5\ 9^{\,2} \ 9\ 9^{\,2} \ 12\ 9^{\,2} \ 15\ 9^{\,2}}{6}$$

$$\frac{9 \quad 4 \quad 16 \quad 0 \quad 9 \quad 36}{6} = 74/6 = 37/3$$

98. The variance of 20 observations is 5. If each observation is multiplied by 2, then the variance of the resulting observations will be

(a) 2×5 (b) 2×5^2
(c) 5 (d) $2^2 \times 5$

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (d) : Number of observations · 20

Variance · $\frac{1}{n} \quad x_i \quad \bar{x}^{\,2}$

5 $\frac{1}{20} \quad x_i \quad \bar{x}^{\,2}$

$x_i \quad \bar{x}^{\,2} \quad 100$ .....(i)

If each observation is multiplied by 2 then new variance will be

$$\frac{1}{n} \quad 2x_i \quad 2\bar{x}^{\,2}$$

$$= \frac{1}{20} \Sigma \quad x_i - \bar{x}^{\,2} \times 4$$

$$\frac{1}{20} \quad 100 \quad 4$$

Variance = $20 = 2^2 \times 5$

99. In a frequency distribution, the mid value of a class is 12 and its width is 6. The lower limit of the class is

(a) 12 (b) 9
(c) 18 (d) 6

RRB NTPC 05.01.2021 (Shift-I) Stage Ist

Ans. (b) : Maximum limit of distribution = M,
Range = R
Minimum limit of distribution = L

According to question, $\frac{M \quad L}{2} \quad 12$

M+L = 24 ……..(i)
M–L = 6 ……..(ii)

For solving eq^n (i) and eq^n (ii)

L = 9

100. The following are the weights (in kg) of 25 students:
58, 55, 53, 50, 53, 51, 52, 54, 53, 52, 54, 53, 58, 53, 59, 55, 53, 52, 51, 54, 53, 59, 55, 53, 52
What is the range of the given data.

(a) 6 (b) 8
(c) 9 (d) 7

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (c) : The range of the given data = 59 – 50 = 9

101. Find the range of data - 9, 5, 9, 3, 4, 7, 8, 4, 8, 9, 5, 9

(a) 3 (b) 5
(c) 6 (d) 4

RRB RPF Constable – 24/01/2019 (Shift-III)

Ans : (c) Data range = highest value – lowest value
= 9 – 3 = 6

102. Find the range of data-11, 13, 9, 17, 13, 19, 10, 11

(a) 6 (b) 10
(c) 11 (d) 13

RRB RPF SI – 12/01/2019 (Shift-II)

Ans : (b) Range of the given data = highest value – lowest value
= 19 – 9 = 10

103. The standard deviation of a group of values is 4.5. If each value increases by K. Then find the variance of group of new values?

(a) 10.5 (b) 20.25
(c) 100.25 (d) 4.5

RRB JE - 26/06/2019 (Shift-I)

Ans. (b) If in each value is increased by K, the standard deviation will have no effect.
Variance = (Standard deviation)^2
= $(4.5)^2 = 20.25$

104. The variance of a set of values X_1, X_2, ... X_n by which of the following formula has given?

(a) $\frac{x^2}{n} \quad \frac{x}{n}^2$

(b) $\frac{x}{n}^2 \quad \frac{x^2}{n}$

(c) $\frac{x}{n}^2$

(d) $\frac{x^2}{n} \quad \frac{x}{n}$

RRB JE - 01/06/2019 (Shift-II)

Ans : (a) Variance (^{2}) = $\frac{x^2}{n} \quad \frac{x}{n}^2$

105. What will be the range of first 7 prime number?

(a) 15 (b) 8.3
(c) 9 (d) 17

RRB JE - 27/06/2019 (Shift-III)

Ans : (a) First 7 prime number· 2, 3, 5, 7, 11, 13, 17
Range = maximum number – minimum number
Range = 17 – 2 = 15

106. A set of four numbers. The mean of these three smallest numbers is 19 and the mean of three largest numbers is 23. What will be the range of this set?

(a) 18 (b) 12
(c) 14 (d) 15

RRB Group-D – 24/09/2018 (Shift-II)

Ans : (b) Sum of the three smallest number in four numbers = 19 × 3 = 57
sum of three smallest numbers = 23 × 3 = 69
Range of sets = 69 – 57 = 12

107. The mean of three numbers is 20. The range of this data set is 12, while the difference between two smallest numbers is 3. Find the largest number.

(a) 28 (b) 25
(c) 27 (d) 24

RRB Group-D – 28/09/2018 (Shift-II)

Ans. (c) : Suppose numbers = x, y, z where x < y < z
As per the question-
x y z 60 (i)
z − x − 12 → z − 12 + x .....(ii)
y − x 3 → y 3 + x .....(iii)
On solving equation (i),(ii) and (iii)
x + y + z = 60
x + 3 + x + 12 + x = 60
3x + 15 = 60
3x = 45
x = 15
y = 18
z = 12 + x
z = 12 + 15
z = 27
z = 27 largest number (z) = 27

108. What will be the range of the following data?
6, 7, 8, 9, 5, 6, 7, 4, 8, 9, 5, 9

(a) 2 (b) 3
(c) 4 (d) 5

RRB NTPC 31.03.2016 Shift : 1

Ans : (d) lowest limit = 4
highest limit = 9
Range = highest limit – lowest limit = 9 – 4 = 5

109. What will be the range of the following data?
12, 11, 18, 28, 19, 13, 19, 18

(a) 11 (b) 17
(c) 18 (d) 19

RRB NTPC 30.03.2016 Shift : 2

Ans : (b) The difference between the highest and lowest values of the given data is called range.
Range = 28–11 = 17

110. If the standard deviation of a population is 9.5, then what will be its variance?

(a) 19 (b) 90.25
(c) 81.25 (d) 93.25

RRB NTPC 19.04.2016 Shift : 1

Ans : (b) Variance = (Standard deviation)^2
= $(9.5)^2$
= 90.25

111. If the standand deviation of a population is 4.5, then what will be its variance?

(a) 20.25 (b) 20
(c) 9 (d) 18

RRB NTPC 16.04.2016 Shift : 1

Ans : (a) Variance = (Standard deviation)^2
= $(4.5)^2 = 20.25$

112. If the variance of data 2, 4, 5, 6, 8, 18 is 23.33 then what will be the variance of the given following data 4, 8, 10, 12, 16, 36

(a) 11.66 (b) 46.66
(c) 93.3333 (d) 483

RRB NTPC 11.04.2016 Shift : 1

Ans : **(b)** The number of data is doubled, so their variance will also be doubled.

Variance = 2 × 23.33
= 46.66

113. The following information is $60 \quad x^2 \quad 18000$, $x \quad 960$ variance is related to the size of a sample.

(a) 55 (b) 44
(c) 22 (d) 16

RRB NTPC 07.04.2016 Shift : 3

Ans :(b) $60 \quad x^2 \quad 18000$

$$\Sigma x^2 = \frac{18000}{60} \Rightarrow \boxed{\Sigma x^2 = 300}$$

$\because \quad x \quad 960$

Average of 60 terms $\frac{960}{60} \quad 16$

$$\Sigma x^2 = 16^2 \Rightarrow \boxed{\Sigma x^2 = 256}$$

Variance = 300 – 256 = 44

114. What will be the range of the following data?
3, 1, 4, 6, 5, 7, 3, 8, 1, 4

(a) 3 (b) 8
(c) 7 (d) 6

RRB NTPC 26.04.2016 Shift : 1

Ans : (c) Arranging the numbers in ascending order-
1, 1, 3, 3, 4, 4, 5, 6, 7, 8
Range = largest number – smallest number
= 8 – 1 = 7

115. If the difference between the mean and the mode of certain observations is 69, then the difference between the mean and the median is_____.

(a) 24 (b) 21
(c) 23 (d) 22

RRB NTPC (Stage-II) 15/06/2022 (Shift-III)

Ans. (c) : Mode = 3 Median –2 Mean .....(i)
According to the question,
Mean – Mode = 69 .....(ii)
Mode = Mean – 69
From equation (i),
3 Median – 2 Mean = Mean – 69
3 Mean – 3 Median = 69
3 (Mean – Median) = 69
Mean – Median = $\frac{69}{3} \quad 23$

116. The maximum weight lifted by 750 participants are recorded and it is found that the Mean and the Median of this distribution are both more than the Mode. If the Mean and the Median are 184 Kg and 178 Kg respectively, then which of the following is the most likely value of the Mode (in Kg).

(a) 168 (b) 166
(c) 162 (d) 172

RRB NTPC (Stage-II) –13/06/2022 (Shift-II)

Ans. (b) : Given,
Mean of 750 participants = 184 kg
and Median = 178 kg
Mode = ?
We know that, Mode = 3 Median – 2 Mean
= 3 × 178 – 2 × 184
= 534 – 368
= 166

117. The numbers 4, 6, 10, x, 20, 24, 32 are arranged in ascending order. Find the value of x if their mean and their median are equal.

(a) 20 (b) 8
(c) 16 (d) 12

RRB NTPC (Stage-II) 17/06/2022 (Shift-III)

Ans. (c) :

$$\text{Mean} = \frac{4 + 6 + 10 + x + 20 + 24 + 32}{7}$$

$$= \frac{96 \quad x}{7}$$

$\because$ Number of terms = 7
Hence, Median = middle term = (x)
According to the question,
Mean = Median

$\because \frac{96 \quad x}{7} \quad x$

6x = 96
x = 16

118. If the difference between the mode and median is 2, then find the difference between the median and mean (in the given order) using empirical relation.

(a) 1 (b) 2
(c) 4 (d) 3

RRB NTPC (Stage-II) 14/06/2022 (Shift-I)

Ans. (a) : Given,
Mode – Median = 2 ——— (i)
Mode = 3 × Median – 2 × Mean ———(ii)
From equation (i) and (ii)
3 × Median – 2 × Mean – Median = 2
2 × Median– 2 × Mean = 2
Median – Mean= 1

119. For a given data, if mean and mode are 42 and 60, respectively, then find the median of the data empirical relation.

(a) 46 (b) 48
(c) 44 (d) 50

RRB Group-D 26/08/2022 (Shift-III)

Ans. (b) : Given, Mean = 42
Mode = 60
We know that,
Mode = 3 Median – 2 Mean

$$\text{Median} = \frac{\text{Mode} \quad 2\text{Mean}}{3}$$

$$\text{Median} = \frac{60 \quad 2 \quad 42}{3}$$

Median = 48

120. For a certain data the mode is 24.6 and the mean is 20.1. Find the median of the data.
(a) 23.5 (b) 24.1
(c) 21.6 (d) 22.2

RRB Group-D 06/09/2022 (Shift-II)

Ans. (c) : Mode = 3 Median – 2 mean
According to the question,
24.6 = 3 × Median – 2 × 20.1

$$\text{Median} = \frac{24.6 \quad 40.2}{3}$$

Median = 21.6

121. The mode and median of some data are 23.6 and 24 respectively. Find the mean of the data. (use the empirical formula).
(a) 24.2 (b) 23.2
(c) 24.8 (d) 23.6

RRB Group-D 06/09/2022 (Shift-I)

Ans. (a) : According to the question,
Mode = 3 Median – 2 mean
23.6 = 3 × 24 – 2 Mean
2 mean = 72 – 23.6

$$\text{Mean} = \frac{48.4}{2} = 24.2$$

122. Which of the following options gives the correct empirical relationship between mean, median and mode of a data set?
(a) Mean – Mode = 3 (Mean + Median)
(b) Mean – Mode = 3 (Mean – Median)
(c) Mean + Mode = 3 (Mean – Median)
(d) Mean + Mode = 3 (Mean + Median)

RRB GROUP-D – 29/09/2022 (Shift-I)

Ans. (b) : Mean – Mode = 3 (Mean – Median)

123. Which of the following is the correct empirical formula?
(a) $\frac{\text{Mode} \quad \text{Mean}}{3}$ Median Mean
(b) $\frac{\text{Mode} \quad \text{Mean}}{3 \quad 2}$ Median Mean
(c) 3 (mode-mean) = median-Mean
(d) $\frac{3}{2}$ (Mode–Mean) = Median – Mean

RRB Group-D 24-08-2022 (Shift-I)

Ans. (a) : Correct formula

$$\text{Median} - \text{Mean} = \frac{\text{Mode} \quad \text{Mean}}{3}$$

124. If the mode of a distribution is 27 and its median is 35, then the mean of the distribution is _____ (using empirical relation).
(a) 43.5 (b) 39
(c) 62 (d) 37.5

RRB GROUP-D – 15/09/2022 (Shift-III)

Ans. (b) : Mode = 27
Median = 35
Mean = ?
∵ Mode = 3 Median – 2 mean
27 = 3 35 – 2 mean
2 mean = 105 – 27

$$\text{Mean} \quad \frac{78}{2} \quad 39$$

125. For a certain number of observations the median is 55 and the mean is 58. Find the mode.
(a) 49 (b) 52
(c) 51 (d) 50

RRB Group-D 19-09-2022 (Shift-III)

Ans. (a) : Given, Median = 55, Mean = 58
By formula-
Mode = 3 median – 2 mean
Mode = 3 × 55 – 2 × 58
= 165 – 116
= 49

126. Sakshi attended to the following number of clients at the front desk during her internship for 15 days :
18, 20, 16, 17, 32, 12, 6, 16, 12, 13 17, 28, 24, 45,17.
Find the average of the mode and median of the given data.
(a) 19.5 (b) 34
(c) 18.25 (d) 17

RRB NTPC 19.01.2021 (Shift-II) Stage Ist

Ans. (d) : 18, 20, 16, 17, 32, 12, 6, 16, 12, 13 17, 28, 24, 45,17
On writing the data in ascending order
6, 12, 12, 13, 16, 16, 17, **17**, 17, 18, 20, 24, 28, 32, 45
Mode = 17 (has come 3 times)

$$\text{Median} = \frac{n+1}{2}^{\text{th}} \text{ term}$$

$$= \frac{15+1}{2}^{\text{th}} \text{ term} = 8^{\text{th}} \text{ term} = 17$$

$$\text{Average} = \frac{\text{Mode} + \text{Median}}{2} = \frac{17+17}{2} = 17$$

127. Given below is the marks obtained by 20 students in mathematics out of 30 marks.
7, 9, 12, 12, 13, 12, 14, 14, 14, 14, 15, 16, 17, 18, 18, 19, 20, 18, 20, 13.Then (2 × median – mode) of the data is equal to:

(a) 14 (b) 18
(c) 12 (d) 0

RRB NTPC 28.12.2020 (Shift-II) Stage Ist

Ans. (a) : On arranging the given number in ascending order
7, 9, 12, 12, 12, 13, 13, 14, 14, 14, 14 15, 16, 17, 18, 18, 18, 19, 20, 20

$n = 20$ even

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{th}\text{ term} \quad \left(\frac{n}{2}+1\right)^{th}\text{ term}}{2}$$

$$\frac{\left(\frac{20}{2}\right)^{th}\text{ term} \quad \left(\frac{20}{2}+1\right)^{th}\text{ term}}{2}$$

$$\frac{10^{th}\text{ term} \quad 11^{th}\text{ term}}{2}$$

$$\frac{14 \quad 14}{2} = 14$$

Mode = 14
2×Median – Mode = 2× 14 – 14 = 14

128. In the frequency distribution, if the mid-value of the class is 35 and the value of the lower boundary is 30, then the value of its upper boundary is:

(a) 40 (b) 30
(c) 10 (d) 20

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (a) : According to the question,
Mid–value

$$\frac{\text{Upper limit} \quad \text{Lower limit}}{2}$$

$$35 = \frac{\text{Upper limit} \quad 30}{2}$$

Upper limit = 70 – 30
= 40

129. The mean of three numbers is 53. The range of this data set is 28 while the difference between the two smallest numbers is 8. The greatest of the three numbers is:

(a) 71 (b) 72
(c) 73 (d) 69

RRB NTPC 09.03.2021 (Shift-II) Stage Ist

Ans. (d) : Let three numbers are x, y and z.
According to the question,

$x + y + z = 53 \times 3 = 159$ … (i)
$x – z = 28$ … (ii)
$y – z = 8$ … (iii)

Putting the value of x from equation (ii) and value of y from equation (iii) in equation (i),
$z + 28 + z + 8 + z = 159$
$3z = 159 – 36$
$3z = 123$
$z = 41$

Putting the value of z in equation (ii) and (iii),
$x = 28 + 41 = 69$
$y = 41 + 8 = 49$

Hence, the greatest number = 69

130. If the standard deviation of a set of numbers is 3 and the arithmetic mean of these numbers is 6, what is the coefficient of variation of these numbers?

(a) 75 (b) 125
(c) 100 (d) 50

RRB NTPC 08.04.2021 (Shift-I) Stage Ist

Ans. (d) **:**

$$\text{coefficient of variation} = \frac{\text{Standard deviation}}{\text{mean}} \times 100$$

$$= \frac{3}{6} \times 100$$

Coefficient of Variation = 50

131. Find the median and the mode for the following set of numbers.
2, 2, 3, 5, 5, 5, 6, 8, 9

(a) Median = 2, Mode = 5
(b) Median = 5, Mode = 2
(c) Median = 0, Mode = 9
(d) Median = 5, Mode = 5

RRB NTPC 07.04.2021 (Shift-II) Stage Ist

Ans. (d) **:** Set of numbers 2, 2, 3, 5, 5, 5, 6, 8, 9
Number of term 9 (odd)

$$\text{Median} = \frac{n+1}{2}^{th}\text{ term}$$

$$= \frac{9+1}{2}^{th}$$

$= 5^{th}$ term
Hence, median = 5
2, 2, 3, 5, 5, 5, 6, 8, 9
∵ Mode the value that occurs most often
Mode = 5

132. Find the median and the mode of the following data:

2, 3, 5, 7, 2, 3, 3, 5, 7 and 9

(a) 4, 3 (b) 3, 4

(c) 3, 3 (d) 4, 4

RRB NTPC 22.02.2021 (Shift-I) Stage Ist

Ans. (a) : The ascending order of the given data = 2, 2, 3, 3, 3, 5, 5, 7, 7, 9

Number of terms (n) = 10

$\because$ The number of terms is even,

$$\therefore \text{Median} \quad \frac{\left(\frac{n}{2}\right)^{th} \text{term} \quad \left(\frac{n}{2} \quad 1\right)^{th} \text{term}}{2}$$

$$\frac{\left(\frac{10}{2}\right)^{th} \text{term} \quad \left(\frac{10}{2} \quad 1\right)^{th} \text{term}}{2} \qquad \frac{5^{th} \text{term} \quad 6^{th} \text{term}}{2}$$

$$\text{Median} = \frac{3+5}{2} = \frac{8}{2} = 4$$

And Mode = The number with the highest frequency.

Hence, the mode of above data = 3

133. The mean of three number is 32. The range of this data set is 28 while the difference between the two smallest numbers is 8. the greatest of the three numbers is:

(a) 52 (b) 51

(c) 50 (d) 48

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (d) : Let the smallest number be x.

Middle number = x + 8

The greatest number = x + 28

According to question–

$x + x + 8 + x + 28 = 3 \quad 32$

$3x + 36 = 96$

$3x = 60$

$x = 20$

Hence the greatest no. of the three no. is (20 + 28) = 48

134. Find the mode, if mean and median are 4 and 5 respectively.

(a) 11 (b) 7

(c) 5 (d) 9

RRB NTPC 05.02.2021 (Shift-I) Stage Ist

Ans. (b) : We know that–

Mode = 3 Median – 2 Mean

$$= 3 \times 5 - 2 \times 4 \quad \left\{ \begin{array}{l} \because \text{Median} = 5 \\ \text{Mean} = 4 \end{array} \right\}$$

$= 15 - 8 = 7$

135. The mean and standard deviation of 100 observations were calculated as 40 and 5.1 respectively by a student who took 50 instead of 40 for one observation. What is the correct mean and standard deviation ?

(a) 39.09,5 (b) 39.9,50

(c) 39.0,5 (d) 39.9,5

RRB NTPC 10.02.2021 (Shift-II) Stage Ist

Ans. (d) : $\bar{x} = 40, \quad = 5.1, n = 100$

$$\bar{x} = \frac{1}{n} \sum_{i\ 1}^{n} x_i$$

$$\sum_{i\ 1}^{100} x_i = 40 \times 100$$

$$\sum_{i\ 1}^{100} x_i = 4000$$

Incorrect mean = 4000 – 50 + 40 = 3990

$$\text{Correct mean} \quad \frac{\text{Incorrect mean}}{\text{Number of obsevations}}$$

$$\frac{3990}{100}$$

Correct mean · 39.9

$$\sigma = \sqrt{\frac{1}{n} \sum_{i\ 1}^{n} x_i^2 - \bar{x}^2}$$

$$5.1^2 = \frac{1}{100} \sum_{i\ 1}^{n} x_i^2 \quad 40^2$$

$$26.01 \quad 1600 \times 100 = \sum_{i\ 1}^{100} x_i^2$$

$$\sum_{i\ 1}^{100} x_i^2 = 162601$$

$$= 162601 - 50^2 + 40^2$$

$$= 162601 - 2500 + 1600$$

$$= 161701$$

Correct Standard Deviation

$$= \sqrt{\frac{1}{n} \sum_{i\ 1}^{n} x_i^2 \quad \bar{x}^2}$$

$$= \sqrt{\frac{161701}{100} \quad 39.9^2}$$

$$= \sqrt{1617.01 \quad 1592.01}$$

$$= \sqrt{25}$$

Correct Standard Deviation · 5

136. There are three positive integers a, b and c such that their average is 35 and a b c. If the median is (a + 18), find the least possible value of c.

(a) 41 (b) 42

(c) 39 (d) 40

RRB NTPC 31.01.2021 (Shift-I) Stage Ist

Ans. (a) : According to the question,

$$\frac{a + b + c}{3} = 35$$

$a + b + c = 105$

The median of a, b and c will be, $b = a + 18$

$\because b = a+18$

$a + a + 18 + c = 105$

$2a + c = 87$

on putting $a = 22$,

$b = 40$

$c = 87 – 44 = 43$

on putting $a = 23$

$b = 41$

$c = 87 – 46 = 41$

It is clear that minimum possible value of $c = 41$

137. Find the sum of mean, median and mode of the given data.

9, 35, 20, 25, 25, 15, 25

(a) 75 (b) 72

(c) 47 (d) 50

RRB NTPC 30.01.2021 (Shift-I) Stage Ist

Ans. (b) :

Mean $\frac{9 + 35 + 20 + 25 + 25 + 15 + 25}{7}$

$\frac{154}{7}$ 22

On writing the data in ascending order

9, 15, 20, 25, 25, 25, 35

N = 7 terms (odd)

Median = $\frac{N \quad 1}{2}$ th term

$\frac{7 \quad 1}{2}$ term = 4 term

Median = 25

Mode · The number that occurs the highest number of times

= 25

Sum of mean, median and mode = 22 + 25 + 25

= 72

138. Let a set S = {1, 2, 2, 3, 3, 3, 4, 4, 4, 4}. Then the value of 4 × mean + 2 × mode – 8 × median is :

(a) –4

(b) 14

(c) 10

(d) 4

RRB NTPC 21.01.2021 (Shift-I) Stage Ist

Ans. (a) : Set = {1, 2, 2, 3, 3, 3, 4, 4, 4, 4, }

Mode = 4

$$\text{Mean} = \frac{1 + 2 + 2 + 3 + 3 + 3 + 4 + 4 + 4 + 4}{10}$$

$$= \frac{30}{10} \quad 3$$

In case the data is even (n = 10)

$$\text{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{th} \text{term} + \left(\frac{n}{2} \quad 1\right)^{th} \text{term}\right]$$

$$= \frac{1}{2}\left[\frac{10}{2}^{th} \text{term} + \frac{10}{2} \quad 1 \quad ^{th} \text{term}\right]$$

$$= \frac{1}{2}(5^{th} \text{ term} + 6^{th} \text{ term})$$

$$= \frac{1}{2} \quad 3 \quad 3 \quad \frac{1}{2} \quad 6$$

$= 3$

Hence, 4 × mean + 2 × mode – 8 × median

$= 4 \times 3 + 2 \times 4 – 8 \times 3$

$= 12 + 8 – 24$

$= 20 – 24$

$= – 4$

139. The standard deviation of 12 values is 3. If each value is increased by 4, then find the variance of the new set of values.

(a) 25

(b) 16

(c) 7

(d) 9

RRB NTPC 29.01.2021 (Shift-I) Stage Ist

Ans. (d) : Standard deviation of 12 values = 3

($\because$ = Standard deviation)

Variance ^{2} $(3)^2$ 9

09 Permutation, Combination & Probability

Permutation & Combination

By using permutation and combination we find out how some or all of the given items are selected at a time.

"If one action or work can be done in 'p' different ways and second action or work can be done in 'q' different ways, then the total ways of doing both those works will be p × q.

Permutation

Permutation = order + selection (ordered selection)

If the order of items is also kept in mind while selecting them, then each method of selection is called permutation.

In the other words,

Each of the different arrangements which can be made by taking some or all of a number of distinct objects is called permutation.

Example : Out of 3 objects (a, b, c) taking 2 at a time total arrangements or (ab, ba) (ac, ca) (bc, cb)

It is clear that taking 2 out of these objects together there are 6 different arrangements can be placed in sequences. Hence the total number of permutation is 6.

Analysis in mathematical form : The total number of permutation obtained by taking 'r' objects together out of 'n' different objects is represented by the symbol ${}^{n}p_{r}$ or P(n, r)

$${}^{n}P_{r} \quad P(n,r)$$

$${}^{n}P_{r} \quad n(n \quad 1)(n \quad 2) \ldots\ldots\ldots \text{ to r factors}$$

$$\boxed{{}^{n}P_{r} \quad \frac{n!}{(n \quad r)!}}$$

☞ **Meaning of n! :** The consecutive product of all natural numbers or positive integers from 1 to n is symbolized as n! or $\lfloor n$ which is read as 'Factorial n'

$$n! = n(n-1)\,(n-2).....3.\,2.\,1$$

$$(n-1)! = (n-1)\,(n-2).....3.\,2.\,1$$

$$n! \quad n(n \quad 1)!$$

$$= n(n-1)(n-2)(n-3).....3 \times 2 \times 1$$

Example : $\lfloor 9 = 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

Some important results :

(i) $0! \quad 1$ (ii) ${}^{n}P_{0} \quad 1$

Proof :

$${}^{n}P_{0} \quad \frac{n!}{n \quad 0!}$$

$${}^{n}P_{0} \quad \frac{n!}{n!} \quad 1$$

(iii) ${}^{n}P_{n} \quad n!$

Proof :

$${}^{n}P_{n} \quad \frac{n!}{(n \quad n)!}$$

$${}^{n}P_{n} \quad \frac{n!}{0!}$$

$${}^{n}P_{n} \quad \frac{n!}{1} \quad n!$$

(iv) ${}^{n}P_{r} \quad n \quad {}^{(n \quad 1)}P_{(r \quad 1)}$

Proof :

$${}^{n}P_{r} \quad n \quad {}^{(n \quad 1)}P_{(r \quad 1)}$$

$${}^{n}P_{r} \quad n \quad \frac{n \quad 1!}{n \quad 1 \quad r \quad 1!}$$

$${}^{n}P_{r} \quad \frac{n!}{n \quad r!} \quad {}^{n}P_{r}$$

Important formulas to find permutation :

Total items	Items taken at a time	Number of permutation
n	r	${}^{n}P_{r} \quad \frac{n!}{(n \quad r)!}$
n	n	${}^{n}P_{n} \quad n!$
n	p is alike of one kind q is alike of second kind r is alike of third kind and rest are different types	$\frac{n!}{p!\ q!\ r!}$

n	(r) Each of which can be repeated any number of times	n^r
n	(r) When a particular item must be taken	$r^{(n-1)}P_{(r-1)}$

Circular Permutations: The method of placing some or all of the given objects in different orders around the circumferences of a circle are called circular or cyclic permutation.

Formula to find circular permutation :

Case 1. When there is a difference between clockwise and anticlockwise sequences -

In this case after taking 'r' items from 'n' items

no. of cyclic permutations $\frac{{}^nP_r}{r}$

in special case when r = n, means all objects (items) are taken at a time

number of cyclic permutations $(n-1)!$

Case 2. When there is no difference between clockwise and anticlockwise -

number of cyclic permutations $\frac{(n-1)!}{2}$

Important Practice Questions

1. Find the value ${}^{12}P_2$:

(a) 24 (b) 132
(c) 144 (d) 264

Ans. (b) : As we know that,

$${}^nP_r = \frac{n!}{n-r!}$$

$${}^{12}P_2 = \frac{12!}{12-2!}$$

$$\frac{12!}{10!}$$

$$\frac{12 \times 11 \times 10!}{10!}$$

$$12 \times 11 = 132$$

2. Find the value ${}^{10}P_4$:

(a) 5020 (b) 5030
(c) 5040 (d) 4000

Ans. (c) : ${}^{10}P_4 = \frac{10!}{10-4!}$

$$\frac{10 \times 9 \times 8 \times 7 \times 6!}{6!}$$

$$90 \times 56 = 5040$$

3. Find the value ${}^6P_2$:

(a) 12 (b) 36
(c) 30 (d) 72

Ans. (c) : ${}^6P_2 = \frac{6!}{6-2!}$

$$\frac{6!}{4!}$$

$$\frac{6 \times 5 \times 4!}{4!} = 30$$

4. If ${}^{15}P_r = 2730$ then find the value of r :

(a) 1 (b) 2
(c) 3 (d) 4

Ans. (c) : ${}^{15}P_r = 2730$

$\Rightarrow$ ${}^{15}P_r = 15 \times 14 \times 13$

$\Rightarrow$ ${}^{15}P_r = {}^{15}P_3$

$\rightarrow$ $r = 3$

5. If ${}^9P_r = 60480$ then find the value of r :

(a) 6 (b) 7
(c) 5 (d) 4

Ans. (a) : ${}^9P_r = 60480$

$\Rightarrow$ ${}^9P_r = 9 \times 8 \times 7 \times 6 \times 5 \times 4$

$\Rightarrow$ ${}^{12}P_r = {}^9P_6$

$\rightarrow$ $r = 6$

6. There are three cycle in an alphabet lock and the numbers 0, 1, 2, ...9 are engraved on each cycle. What are the total possible arrangements for opening a lock and how many ways can a person fail to open the lock?

(a) 1000,999 (b) 2000,1999
(c) 500,499 (d) 900,899

Ans. (a) : The number of cycles in the lock is 3.

Each cycle has 0, 1, 2, ...9 digits i.e. 10 digits.

Then the total possible ways of arrangements

$= 10 \times 10 \times 10 = 1000$

If the lock can be opened by only one way, then person will fail to open the lock = 1000 – 1 = 999 times.

7. 7 trains depart and 7 arrive between Kanpur and Allahabad find out, in how many ways can a person return from Allahabad to Kanpur, when he does not have to return by the train by which he had gone?

(a) 49 (b) 42

(c) 35 (d) 56

Ans. (b) : Kanpur to Allahabad can be reached by any one of the 7 train so there are 7 ways to reach Allahabad, but while returning only 6 train could be used, because there is no way to return by train by which he had gone. So there are only 6 way of return.

Hence, to go from Kanpur to Allahabad by any train and return by any other train, there were $7 \times 6 = 42$ ways.

8. There were 10 boats at the bank of ganga while bathing then find out in how many ways can a traveler go to the other side and return, when he does not have to return by the boat by which he had gone?

(a) 100 (b) 110

(c) 90 (d) 70

Ans. (c) : At the time bathing in ganga, the bank can be reached by any one of the 10 boats. There were 10 ways to go. But while returning only 9 boats can be used. because they does not have to return by the boat by which they had gone. So there are only 9 ways to return.

Total ways = 10 9 = 90

9. How many numbers can be made from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 between 1000 and 10000 ?

(a) 2430 (b) 3024

(c) 1000 (d) 10000

Ans. (b) : It is clear that each number between 1000 and 10000 will have 4 digits. There are total 9 digits here. Now the total number of ways of making 4 digit number from 9 digits ${}^{9}P_4$

$$\frac{9!}{9\ 4\ !} \quad \frac{9!}{5!}$$

$$\frac{9\ 8\ 7\ 6\ 5!}{5!}$$

72 42 3024

10. How many four digits numbers will be formed from the digit 1, 2, 3, 4 and 5, while no digit appears more than once?

(a) 120 (b) 130

(c) 140 (d) 100

Ans. (a): By taking four digit at a time from the given five digits 1, 2, 3, 4 and 5 the number of permutation obtained will be ${}^{5}P_4$ 5 4 3 2 = 120

11. How many numbers can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 where repetition is not allowed and when the number have only one digit?

(a) 8 (b) 9

(c) 10 (d) 11

Ans. (b) : It is clear that the required number ${}^{9}P_1$

$$\frac{9!}{9\ 1\ !} \quad \frac{9!}{8!}$$

$$\frac{9\ 8!}{8!} \quad 9$$

12. How many numbers can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, when repetition of digits is not allowed and the numbers have only 2 digits?

(a) 72 (b) 60

(c) 120 (d) 36

Ans. (a) : It is clear that the required number ${}^{9}P_2$

$$\frac{9!}{9\ 2\ !} \quad \frac{9!}{7!}$$

$$\frac{9\ 8\ 7!}{7!} \quad 72$$

13. How many numbers can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, when repetition of digits is not allowed and the numbers have only 4 digits?

(a) 3030 (b) 3020

(c) 3024 (d) 3034

Ans. (c) : It is clear that the required number ${}^{9}P_4$

$$\frac{9!}{9\ 4\ !} \quad \frac{9!}{5!}$$

$$\frac{9\ 8\ 7\ 6\ 5!}{5!}$$

72 42

3024

14. How many numbers can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, when repetition of digits is not allowed and the numbers have only 8 digits?

(a) 7! (b) 8!

(c) 10! (d) 9!

Ans. (d): It is clear that the required number ${}^{9}P_8$

$$\frac{9!}{9\ 8\ !}$$

$$\frac{9!}{1!} \quad 9!$$

15. How many numbers can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, when repetition of digits is not allowed and the numbers have two digit and three digit?

(a) 484 (b) 676

(c) 576 (d) 841

Ans. (c) : It is clear that the two digit number ${}^{9}P_{2}$

and three digits number ${}^{9}P_{3}$

Total number ${}^{9}P_{2}$ ${}^{9}P_{3}$

$$\frac{9!}{9\ 2!} \quad \frac{9!}{9\ 3!}$$

$$\frac{9 \times 8 \times 7!}{7!} \quad \frac{9 \times 8 \times 7 \times 6!}{6!}$$

9 8 9 8 7

72 504

576

16. How many words can be formed from the letters of 'COURTESY' if only letter C comes in the beginning and Y comes at the end then how many words can be formed?

(a) 5! (b) 6!

(c) 7! (d) 8!

Ans. (b) : The first place will always be taken by C and the last place by Y. The remaining six places can be filled by the six letters in ${}^{6}P_{6}$ ways.

total number of words = $1 \times 1 \times {}^{6}P_{6} = 6$

17. By the help of digits 0, 1, 2, 3, 4 and 5, how many four digit numbers can be formed?

(a) 360 (b) 300

(c) 420 (d) 400

Ans. (b) : Total no. of digits from 0 to 5 = 6

No. of ways to form 4 digit number. = ${}^{6}P_{4}$

But which no. start with '0' is count in ${}^{6}P_{4}$.

Then, ${}^{6}P_{4} - {}^{5}P_{3}$

$$\frac{6!}{6\ 4!} \quad \frac{5!}{5\ 3!}$$

$$\frac{6 \times 5 \times 4 \times 3 \times 2!}{2!} \quad \frac{5 \times 4 \times 3 \times 2!}{2!}$$

360 – 60

300

OR

0, 1, 2, 3, 4 and 5 are total 6 digit from which we have to make 4 digit number

$$\underline{5} \times \underline{5} \times \underline{4} \times \underline{3} = 5 \times 5 \times 4 \times 3 = 300$$

(↓ we can use zero in the beginning; ↓ remaining digits)

Then there are 300 ways to form 4 digit number from the digits 0, 1, 3, 4 and 5.

18. How many three digit numbers can be formed by using digits 1, 2, 3, 4, 5 ?

(a) 60 (b) 50

(c) 120 (d) 100

Ans. (a) : Total digit = 5,

then the 3 digit number that can be formed by using 5 digits ${}^{5}P_{3}$

$$\frac{5!}{5\ 3!} \quad \frac{5\ 4\ 3\ 2\ 1}{2}$$

$= 5\ 4\ 3 = 60$

19. The number of words which can be formed from the letters of the word 'MATHEMATICS' ?

(a) 4989500 (b) 4989600

(c) 4998600 (d) 4698500

Ans. (b) : There are 11 letters in the given word 'MATHEMATICS'. In which A is 2 times, M is 2 times, T is 2 times and remaining are different.

Hence, number of different words formed from this word

$$\frac{11!}{2!2!2!}$$

$$\frac{11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2\ 2\ 2}$$

$$- 11 \times 10 \times 9 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$$

990 210 24 4989600

20. How many different words can be formed the letters of the word 'EQUATION' while vowels can come together?

(a) 2800 (b) 2820

(c) 2840 (d) 2880

Ans. (d) : There are total 8 letters in the word 'EQUATION' and the vowels A, E, I, O, U are total 5 letters. If the vowels can come together then we will consider the 5 vowels are one letter, in this way only 4 letters remain AEIOU, Q, T, N

But letter AEIOU can be arranged in ${}^{5}P_{5}$ ways.

Hence the total number of ways will be ${}^{5}P_{5} \times 4!$

$= 5\ 4\ 3\ 2\ 1\ 4\ 3\ 2\ 1$

$= 120\ 24 = 2880$

21. What is the number of ways of arranging the letters of the word 'BANANA', so that no two N's appear together :

(a) 40 (b) 60

(c) 80 (d) 100

Ans. (a) : Number of ways that can be formed by using the words like 'BANANA' = $\frac{6!}{3!2!}$ 60

no. of ways in which two 'N' comes together = $\frac{5!}{3!}$ 20

required number of ways = 60 – 20 = 40

22. How many such words can be made from the letters of the word 'TRIANGLE', which have T in the beginning and E in the end?

(a) 720 (b) 700

(c) 5040 (d) 4032

Ans. (a) : There are total eight letters in the word 'TRIANGLE'

Two letters 'T' and 'E' are fixed in their position.

Then, number of remaining latters = 6

Hence, the total number of ways = 6!

= 6 5 4 3 2 1

= 720

23. How many words can be formed by placing the letters of the word 'LAHORE' in different sequences, while all the words starts with L?

(a) 720 (b) 120

(c) 24 (d) 60

Ans. (b) : Total letters are 6. If the first letter is L then only five letters are left which is 5! = 120

Hence, total number of words = 120

24. How many words can be formed by using all the letters of the ward 'DELHI', if no words starts with D?

(a) 120 (b) 24

(c) 96 (d) 720

Ans. (c) : Words not starting with letter D = Total words – words starting with D

= 120 – 24 = 96

25. How many words can be formed by keeping the letters of the word 'LAHORE' in different sequences, while the any word does not start with 'L'?

(a) 720 (b) 120

(c) 600 (d) 500

Ans. (c) : The total number of letters is 6, so with restrictions 6! types of word can be written, including those words which are start with 'L'

Now the number of words which are started with 'L'

= 5!

= 5 × 4 × 3 × 2 × 1 = 120

Hence, the total number of words which has not start with L = 6! – 5! 720 – 120 = 600

26. How many words can be made by keeping the letters of the word 'LAHORE' in different sequences, while 'L' is in the beginning and 'E' is in the end?

(a) 20 (b) 24

(c) 25 (d) 120

Ans. (b) : L 4 3 2 1 E

According to the question L is at the beginning and 'E' is in the end, then remaining words will be arranged as

= 4!

= 4 × 3 × 2 × 1 = 24

27. How many words can be formed from the letters 'DELHI', while taking 3 at a time :

(a) 720 (b) 120

(c) 60 (d) 100

Ans. (c) : Required number of formed words

$= {}^5P_3 = \frac{5!}{5\ 3} = \frac{5!}{2!}$

$\frac{5\ 4\ 3\ 2\ 1}{2\ 1}$

= 5 4 3 = 60

28. How many words can be made from the letters of the word 'DELHI', while taking all letters at a time?

(a) 720 (b) 120

(c) 60 (d) 160

Ans. (b) : Required number of formed words

${}^5P_5$ 5!

= 5 4 3 2 1 = 120

29. How many words can formed from the letters of word 'DELHI', while all the words start with D?

(a) 24 (b) 60

(c) 120 (d) 720

Ans. (a) : Total letters are 5, if the first letter is D.

Then only for letters will be left E, L, H, I and the way of arrangements of these letters will be

$= 4!$

$= 4 \quad 3 \quad 2 \quad 1 = 24$

30. How many words can be formed by using all the letters of the word 'DELHI', while 'D' is at the beginning and 'I' is at the end?

(a) 6 (b) 7

(c) 8 (d) 12

Ans. (a) : Total number of letters = 5

D $3 \times 2 \times 1$ I

According the question 'D' is at the beginning and 'I' is at the end the way of arrangements of remaining letters

$= 3! \quad 3 \quad 2 \times 1 = 6$

31. How many words can be made from the letters of the word 'DELHI', if 'L' comes in middle of the word?

(a) 24 (b) 96

(c) 120 (d) 720

Ans. (a) : The word 'DELHI' has five different letters, if 'L' is fixed in the middle position then remaining four letters can be arranged in 4! ways.

Hence, required number of ways = $4! = 4 \quad 3 \quad 2 \quad 1$

$= 24$

32. How many words can be made from the letters of the word 'DELHI' while 'L' and 'H' always come together?

(a) 24 (b) 48

(c) 96 (d) 120

Ans. (b) : When L, H is to be kept together then L, H can be combined and considered as one letter. In this way only four letters remained LH, D, E, I which can be written in 4! ways, and letter LH can be arranged in 2! ways.

Hence the total number of ways = $4! \quad 2!$

$= 4 \quad 3 \quad 2 \quad 1 \quad 2 \quad 1$

$= 24 \quad 2 = 48$

33. There is one book each on the subjects of Mathematic, Geography, History, Hindi, Urdu and Sanskrit. Then in how many ways can book be kept in a cupboard, while Geography and History books should never be kept together?

(a) 240 (b) 480

(c) 360 (d) 580

Ans. (b) : Total number of ways for arrangement of 6 book = $6! = 720$

If the book of geography and history comes together then total no. of ways of arrangement

$= 5 \times 4 \times 3 \times 2 \times 1$

G H – – – – – – $= 5! \times 2! = 240$

2×1

Hence, the total number of ways to keep the book in cupboard, while History and Geography book should never be C kept together

$= 720 - 240 = 480$

34. How many number between 6000 and 8000 can be formed from the digits 1, 2, 3, 4, 6 and 8 without any repetition of the digits?

(a) 120 (b) 60

(c) 720 (d) 90

Ans. (b) : The number which starts with digit '6' will be between 6000 and 8000

Therefore after determining the position of digit 6. Now the selection of 3 digits out of remaining 5 digits 1, 2, 3, 4, 8 is ${}^5P_3$

Hence, required four digit number between 6000 to 8000 will be ${}^5P_3 = 5 \times 4 \times 3 = 60$

35. How many such permutations can be made of the letters of the word 'SERIES' which will starts with 'S' and end with 'S'?

(a) 24 (b) 12

(c) 36 (d) 6

Ans. (b) : Now, if S is at the beginning and S is at the end, then four letters will be left in which 'E' is twice and the remaining are different.

Hence, number of words $\frac{4!}{2!}$

$\frac{4 \quad 3 \quad 2}{2} \quad 12$

36. How many such permutations can be made from the letters of the word 'SERIES' in which vowels and consonants will be alternate order?

(a) 9 (b) 36

(c) 27 (d) 18

Ans. (d) : The given word has 3 vowels and 3 consonants. Now 3 places should be fixed in alternating order, where the ways of placing three vowels, out of which 2 are alike $\frac{3!}{2!} \quad 3$

Remaining three places, the ways of placing three consonants, out of which 2 are alike

$= \frac{3!}{2!} = \frac{3 \quad 2 \quad 1}{2 \quad 1} = 3$

Total ways $= 3 \times 3 = 9$

Similarly, total ways of placing three consonants at three fixed places and vowels at the remaining places in alternating order = 9

Therefore, the required permutation = $9 + 9 = 18$

37. How many such permutations can be made of the letters of the word ' CONSTANTINOPLE'?

(a) 14! 4! (b) 14! 3!

(c) 14! 2! (d) 14! 5!

Ans. (a) : The word 'CONSTANTINOPLE' has total 14 letters and consist of 3 'N', 2 'O' and 2 'T'

Now the number of total words $\frac{14!}{2!2!3!}$

$$\frac{14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3!}{2 \quad 1 \quad 2 \quad 1 \quad 3!}$$

$=14! \quad 4!$

38. Find the total number of words formed from the letters of the word 'CALCULUS' :

(a) 5040 (b) 5020

(c) 4050 (d) 4020

Ans. (a) : There are total 8 letters in the word 'CALCULUS' and C, U and L are repeated twice

Now the number of total words $\frac{8!}{2!\ 2!\ 2!}$

$$\frac{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \quad 2 \quad 2}$$

$$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \quad 5040$$

39. How many words can be formed from the letters of the word 'MISSISSIPPI'?

(a) 38650 (b) 34640

(c) 34650 (d) 34000

Ans. (c) : There are total 11 letters in the word 'MISSISSIPPI' it has 'S' 4 times, 'I' 4 times and 'P' 2 times.

Now the total number of words that can be formed

$$\frac{11!}{4!\ 4!\ 2!}$$

$$\frac{11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4!}{4! \times 4 \times 3 \times 2 \times 1 \times 2 \times 1}$$

$$11 \times 10 \times 9 \times 7 \times 5$$

$$110 \quad 9 \quad 35$$

$$110 \quad 315 \quad 34650$$

40. How many numbers can be made from the digits 0, 1, 2, 3, 5, 7, 9 where the repetition of digits are not allowed?

(a) 12613

(b) 7710

(c) 10742

(d) 11742

Ans. (d) : (i) Number of one digit numbers except zero $= {}^6P_1 = 6$

(ii) Number of those permutations where the number is two digits $= {}^7P_2$

but in this ${}^6P_1$ numbers will have zero at the beginning.

Hence it will have only one digit number.

Hence, number of two digit number $= {}^7P_2 - {}^6P_1$

$$\frac{7!}{7 \quad 2!} \quad 6 \quad \frac{7!}{5!} \quad 6 \quad 7 \times 6 \quad 6 \quad 36$$

(iii) Similarly number of three digit numbers

$${}^7P_3 \quad {}^6P_2 \quad 180$$

(iv) Number of four digit numbers ${}^7P_4 \quad {}^6P_3 \quad 720$

(v) Number of five digit numbers ${}^7P_5 \quad {}^6P_4 \quad 2160$

(vi) Number of six digit numbers ${}^7P_6 \quad {}^6P_5 \quad 4320$

(vii) Number of seven digit numbers ${}^7P_7 \quad {}^6P_6 \quad 4320$

Hence, the sum of total numbers

$$6 + 36 + 180 + 720 + 2160 + 4320 + 4320 \quad 11742$$

41. How many numbers greater than forty thousand can be made from the digits 2, 4, 5, 5, 7?

(a) 60 (b) 12

(c) 48 (d) 72

Ans. (c) : Since number greater than forty thousand will not have less than 5 digits. Therefore, all the five digit will have to be taken

but in the given data 5 is twice

Hence, total number $\frac{5!}{2!} = \frac{5 \quad 4 \quad 3 \quad 2 \quad 1}{2 \quad 1} = 60$

But these numbers also include those numbers which start with '2'. But they cannot be greater than forty thousand. Two find the arrangement of such numbers, we have to find the arrangements of the remaining digits except 2, in which '5' occurs twice.

Number of such permutation $\frac{4!}{2!} = \frac{4 \quad 3 \quad 2 \quad 1}{2 \quad 1} = 12$

Hence, the required permutation = 60 – 12 = 48

42. How many numbers can be formed from the digits 1, 2, 3, 2, 1. If 3 always remains in the middle?

(a) 6 (b) 7

(c) 8 (d) 12

Ans. (a): In this given digits, the place of 3 is fixed, then the number formed by the remaining four digits in which 1 and 2 are twice.

Hence, total number $\frac{4!}{2!\ 2!}$

$$= \frac{4\ 3\ 2\ 1}{2\ 1\ 2\ 1} = 6$$

43. How many numbers greater than ten lack can be formed from the digits 2, 3, 0, 3, 4, 2, 3?

(a) 60 (b) 420

(c) 480 (d) 360

Ans. (d) : Since every number greater than ten lack will not have less than 7 digits. Therefore the given 7 marks will have to be taken. Among these 7 digits, there is digit 2 twice and digit 3 thrice.

Hence, total number $\frac{7!}{2!3!}$

$$= \frac{7\ 6\ 5\ 4\ 3\ 2\ 1}{2\ 1\ 3\ 2\ 1} = 420$$

These numbers also include those numbers which have zero at the beginning. To find the permutation of such numbers, we have to find the configurations of remaining six digits except zero, in which 2 is twice and 3 is thrice.

Number of such configurations $\frac{6!}{2!3!}$

$$= \frac{6\ 5\ 4\ 3!}{2\ 3!} = 60$$

Hence the required configuration = 420 – 60 = 360

44. How many combinations can be made up from the letters $x^4\ y^2\ z^3$, so that z does not come together?

(a) 1260 (b) 105

(c) 1155 (d) 1255

Ans. (c) : There are total 9 letters in this word, in these, 4 times x, 2 times y and 3 times z has come.

Hence, the required number of words $\frac{9!}{4!2!3!}$

$$\frac{9\ 8\ 7\ 6\ 5\ 4!}{3\ 2\ 1\ 2\ 4!}$$

$$= 1260$$

These numbers also includes those numbers in which z comes together. Now if we consider 'z' as one letter only 7 letters will be left out of which x occurs four times and y occurs twice.

Hence, the number of these words $\frac{7!}{4!2!}$

$$\frac{7\ 6\ 5\ 4!}{2\ 4!}$$

$$105$$

Therefore, to find out the number of words in which 'z' never appears together = 1260–105 = 1155

45. Monica wrote 7 letters, if there are 4 post offices in the city then in how many ways can she drop the letters is the post office?

(a) 7^4 (b) 4^7

(c) 5^6 (d) 6^5

Ans. (b) : A letter can be dropped in 4 ways because it can be dropped in any of the four post offices, similarly the second letter can also be inserted in 4 ways and the remaining letters too.

Hence, required number = 4^7

46. How many total 5 digit numbers will be formed from the digits 0,1,2,3,4,5,6 while each digits can be repeated unconditionally?

(a) 14400 (b) 12406

(c) 10406 (d) 14406

Ans. (d) : Total number of digit = 7

Since each number is of five digits. In these the ten thousand digit of ten thousand cannot be filled with zero. This space can be filled with the remaining digits. Any numbers can be placed at each of the remaining 6 places, i.e.

So there are 7 methods of filling each of these.

Hence required number of total number = $6\ \ 7^4$

$6\ \ 2401$

=14406

47. There are four circles in a alphabet lock, each of which has 9 letters inscribed on it. Find the number of different methods of opening the lock?

(a) 6561 (b) 6165

(c) 6859 (d) 5968

Ans. (a) : The letter written in the first circle can be placed in 9 ways.

Similarly the letter written in second circle can be placed in 9 ways and so on.

There are four circles, hence the total number of ways to open the lock = 9^4

= 6561

48. 5 prizes are given to 4 students, then in how many ways these prizes can be given, while each student can get all the five prizes?

(a) 625 (b) 1024

(c) 450 (d) 1200

Ans. (b): Total number of students = 4

Each students can get five prizes

Hence total number of ways to distribute these prizes among four students = 4^5 = 1024.

49. 5 prizes are given to 4 students. Find out in how many ways then prizes can be given, while no student is eligible to get all the prizes?

(a) 1020 (b) 1024

(c) 625 (d) 621

Ans. (a) : Number of students (n) = 4

Number of prizes (r) = 5

Here, number of ways of receiving the prize = 4^5

But according to the question, among the four students none of the students is eligible to take all the prizes, and number of students = 4

So, the number of ways to receive the prize while no student is eligible to get the price $= 4^5 - 4$

$= 1024 - 4 = 1020$

50. In an electrical circuit, 14 switches are arranged in such a way that there are three possible positions for each, till how many types of switches or there in it?

(a) 3^{14} (b) 14^3

(c) 42 (d) 196

Ans. (a) : There are 3 types of possible positions of a switch, because if there are 14 switches in an electric circuit,

then, required number = 3^{14}

51. There are 3 post boxes and a post office in a village. Then find in how many ways can the 3 letters be inserted?

(a) 16 (b) 256

(c) 120 (d) 64

Ans. (d) : There will be a letter box in the post office, hence the total number of letter boxes = 3 + 1 = 4

Now the first letter can be inserted in any of the four letter boxes.

Hence there are 4 ways to insert the first letter similarly second letter and third letter would be inserted in four ways.

Total ways = 4 × 4 × 4 = 64

52. In how many ways can 4 boys and 4 girls be seated around a round table so that no two girls sit together?

(a) 144 (b) 120

(c) 72 (d) 150

Ans. (a) : 4 students (boy) around a round can sit in (4 – 1) = 3!

There are 4 places between them, in which there are four students (girls) also, there number of ways of sitting = $^4P_4 = 4!$

Total number of ways $3! \ 4!$

$= 3 \times 2 \times 1 \times 4 \times 3 \times 2 \times 1 = 144$

53. In how many ways can 3 men and 3 women sit around a round table, if no two women sit together?

(a) 24 (b) 12

(c) 20 (d) 10

Ans. (b) : Total number of ways $= (3 - 1)! \times 3!$

$= 2! \times 3!$

$= 2 \times 1 \times 3 \times 2 = 12$

54. How many types of garlands can be made from 10 different types of flowers?

(a) 9! (b) $\frac{1}{2}$ 9!

(c) 7! (d) 10!

Ans. (b) : Since a round garland can be by placing any flower at any places, there is no difference between the clockwise and anticlockwise :

Required permutations $\frac{1}{2}$ n 1 !

$\frac{1}{2}$ 10 1 ! $\because$ n 10

$\frac{1}{2}$ 9!

55. In how many ways can 15 members of a committee sit around a round table, while minister sits on the left side of chairman and deputy chairman on the right side?

(a) 12! (b) $\frac{1}{2}$ 12!

(c) 8! (d) 11!

Ans. (a) : The remaining 12 members, except three officers around the round table in (13 – 1)!

= 12!

56. How many seating arrangements are possible with 8 people around the round table, if there are 8 chairs?

(a) 5030 (b) 5020

(c) 5050 (d) 5040

Ans. (d) : To arrange n people around a round table

Number of arrangements = (n – 1)!

To arrange 8 people around the round table

Number of arrangements = (8 – 1)! = 7! = 5040

Combination

Combination : If the order of items is not taken into consideration while selecting them, then every method of selection is called combination, that means "Without keeping in mind the order of the items, the groups or communities that are formed by taking some or all of the given items together is called a combination.

Difference between combination and permutation : In combination, the order of the objects is not taken into account whereas in permutation, attention is paid to the order of the objects.

Notation for combination : The total number of combination formed by taking r objects out of n different objects together is represented by the symbol ${}^{n}C_{r}$ or (n, r)

Where as ${}^{n}C_{r} \quad \frac{n!}{r!\ n\ r!}$

Important formula to find combination :

Objects	Number of objects taken at a time	Number of combination
n	r	${}^{n}C_{r} \quad \frac{n!}{r!\ (n\ r)!}$
n	n	${}^{n}C_{n} \quad 1$
n	0	${}^{n}C_{0} \quad 1$
n	r in which special object 'p' is always included	${}^{n\ p}C_{r\ p}$
n	r In which special object 'p' is always excluded	${}^{n\ p}C_{r}$
n	All of them	$2^{n} \quad 1$

Important results :

The distribution/division of (p + q + r) objects into three groups of object p, q and r :

Total methods of dividing (p + q + r) objects into three groups of objects p, q and r = $\frac{p\ \ q\ \ r\ !}{p!\ \ q!\ \ r!}$

Uniform division of objects :

Total method of dividing 3p objects into the three different groups of p objects = $\frac{3p\ !}{p!^{3}}$

Total methods of dividing 3p objects into three equal groups of p objects = $\frac{3p\ !}{3!\ p!^{3}}$

Important Practice Questions

1. Find the value of ${}^{12}C_{5}$

(a) 792 (b) 892

(c) 289 (d) 279

Ans. (a) : As we know that

$${}^{n}C_{r} \quad \frac{n!}{r!\ n\ r!}$$

$${}^{12}C_{5} \quad \frac{12!}{5!\ 12\ \ 5!}$$

$$\frac{12!}{5!\ \ 7!}$$

$$\frac{12\ \ 11\ \ 10\ \ 9\ \ 8\ \ 7!}{5\ \ 4\ \ 3\ \ 2\ \ 1\ \ 7!}$$

$$11\ \ 9\ \ 8$$

$$99\ \ 8\ \ 792$$

2. In how many ways can a team of 11 players be formed out of 14 players in a collage?

(a) 360 (b) 364

(c) 300 (d) 464

Ans. (b) : The method of selecting 11 players out of 14 players = ${}^{14}C_{11}$

$$\frac{14!}{11!\ 14\ \ 11!}$$

$$\frac{14!}{11!\ \ 3!}$$

$$= \frac{14\ \ 13\ \ 12}{3\ \ 2} = 364$$

3. In how many different ways can four people be seated on three empty chairs?

(a) 4 (b) 3

(c) 5 (d) 6

Ans. (a) : Four people can be seated on three chairs in the following ways :

$${}^{4}C_{3} \quad \frac{4!}{3!\ 4\ \ 3!}$$

$$\frac{4\ \ 3!}{3!\ \ 1!} \quad 4$$

4. In how many different ways can six people be seated on 2 vacant chairs?

(a) 12 (b) 10

(c) 20 (d) 15

Ans. (d): They can be in ${}^{6}C_{2}$ ways

$^6C_2 \quad \frac{6!}{2!\,6\;2!}$

$\frac{6!}{2!4!}$

$\frac{6\;5\;4!}{2\;4!} \quad 15$

5. There are 6 point on the circumference of a circle. How many straight lines can be drawn through these?

(a) 10 (b) 20

(c) 15 (d) 12

Ans. (c) : ∵ By meeting any 2 points out of 6 points situated on the circumference one line will be obtained

Total number of points = 6

Method of selecting 2 out of 6 points = $^6C_2$

$\frac{6!}{2!\,6\;2!}$

$\frac{6\;5\;4!}{2!\;4!}$

$\frac{6\;5}{2} \quad \frac{30}{2} \quad 15$

6. There are 10 points on a circle. A hexagon can be formed by linking 6 of the 10 points. How many such hexagons are possible?

(a) 210 (b) 220

(c) 200 (d) 180

Ans. (a) : ∵ The total number of hexagon can be created in $^{10}C_6$ ways

$^{10}C_6$

$= \frac{10!}{10\;\;6!\;\;6!}$

$\frac{10\;\;9\;\;8\;\;7\;\;6!}{4!\;\;6!}$

$\frac{10\;\;9\;\;8\;\;7}{4\;\;3\;\;2\;\;1}$

$10\;\;21\;\;210$

7. Out of 6 teachers and 8 students, a committee of 11 is being formed. In how many ways can this be done, if the committee contains at least 4 teachears?

(a) 340 (b) 344

(c) 680 (d) 320

Ans. (b): The number of ways in this case is :

(a) 4 teacher and 7 students = $^6C_4 \quad ^8C_7$

(b) 5 teacher and 6 students = $^6C_5 \quad ^8C_6$

(c) 6 teacher and 5 students = $^6C_6 \quad ^8C_5$

$= {}^6C_4 \times {}^8C_7 + {}^6C_5 \times {}^8C_6 + {}^6C_6 \times {}^8C_5$

$= 15 \times 8 + 6 \times 28 + 1 \times 56$

$= 120 + 168 + 56 = 344$

8. A committee of four members out of five men and six women is formed with the condition that at least one woman must be there, find out in how many ways a committee can be formed?

(a) 320 (b) 330

(c) 325 (d) 335

Ans. (c) : The committee can be formed in the following ways :

(a) 1 women + 3 men, number of ways to form the committee = $^6C_1 \quad ^5C_3$

(b) 2 women + 2 men number of ways to form the committee = $^6C_2 \quad ^5C_2$

(c) 3 women + 1 men number of ways to form the committee = $^6C_3 \quad ^5C_1$

(d) 4 women, number of ways to form the committee $= {}^6C_4$

Total number of ways to form the committee

$= {}^6C_1 \times {}^5C_3 + {}^6C_2 \times {}^5C_2 + {}^6C_3 \times {}^5C_1 + {}^6C_4$

$= 6 \times 10 + 15 \times 10 + 20 \times 5 + 15$

$= 60 + 150 + 100 + 15 = 325$

9. Saurabh has six friends. In how many ways can he invite one or more of them to dinner?

(a) 63 (b) 60

(c) 57 (d) 67

Ans. (a) : Saurabh can invite his one, two or three friends and so on total number of ways

$= {}^6C_1 + {}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 - {}^6C_6$

$= 6 + 15 + 20 + 15 + 6 + 1 = 63$

10. In an examination, a candidate has to pass in each of the five subjects. In how many way can he fail?

(a) 32 (b) 31

(c) 33 (d) 30

Ans. (b) : The candidate can fail by failing in 1 or 2 or 3 or 4 or 5 subjects out of 5 in each case.

required number of ways

$= {}^5C_1 + {}^5C_2 + {}^5C_3 + {}^5C_4 + {}^5C_5$

$= {}^5C_1 + {}^5C_2 + {}^5C_2 + {}^5C_1 + 1 \quad [\because {}^5C_3 = {}^5C_{(5-3)} = {}^5C_2]$

$= 2({}^5C_1 + {}^5C_2) + 1 = 2 \quad 5 + \frac{5\;\;4}{2\;\;1} + 1 = 30 + 1 = 31$

11. In how many ways can pens be sorted out of ten pens?

(a) 2^{10} (b) $2^{10}\pm1$

(c) 2^{10}-1 (d) 29

Ans. (c) : 1, 2, 3, ... 10 pens sorted out of ten pens

then, total ways of sorting pens

$= {}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + {}^{10}C_4 + \ldots\ldots {}^{10}C_{10}$

(We known that ${}^{n}C_1 + {}^{n}C_2 + {}^{n}C_3 + \ldots\ldots {}^{n}C_n = 2^n - 1$)

$= 2^{10} - 1$

12. How many sets of 5 pants, 3 shirts and 4 vests can be made?

(a) 120 (b) 121

(c) 119 (d) 125

Ans. (c) : There are three different types of clothes numbered 5, 3 and 4

Hence, total number of combinations

$= (5\pm1)\ (3\pm1)\ (4\pm1)\text{-}1$

$= 6\ \ 4\ \ 5\text{-}1 = 119$

13. To pass an examination it is necessary to pass each of the six subjects. Tell me in how many ways can a student fail?

(a) 2^6 (b) 2^6-1

(c) $2^6\pm1$ (d) 2^7

Ans. (b) : The student may fail in one subject or in more than one subject. In any one subject the student either passes or fails. Therefore, there are two types of treatment with every subject. In this way, $2 \times 2 \times 2$ 2 2 2 i.e. 2^6 type of treatment is done with all the subjects. But his also includes the treatment when the student does not fail in any subject.

Hence, required ways = $2^6 - 1$

14. Two committees of 7 are to be formed out of 9 men and 5 women, if there are at least 3 women in each committee, then in how many ways can the committees be formed?

(a) 1716 (b) 1617

(c) 1725 (d) 1625

Ans. (a) : No. of men = 9 and No. of women = 5

Two committees of 7 are to be formed out of 9 men and 5 women, there are at least 3 women in each committee–

3 Women and 4 men : method of selection = ${}^{5}C_3\ \ {}^{9}C_4$

4 Women and 3 men: method of selection = ${}^{5}C_4\ \ {}^{9}C_3$

5 Women and 2 men: method of selection = ${}^{5}C_5\ \ {}^{9}C_2$

Hence, $({}^{5}C_3\ \ {}^{9}C_4) + ({}^{5}C_4\ \ {}^{9}C_3) + ({}^{5}C_5\ \ {}^{9}C_2)$

$= 1260 + 420 + 36 = 1716$

15. How many factors can be number 2310 have, while 1 and 2310 are not to be considered as factors?

(a) 30 (b) 32

(c) 28 (d) 24

Ans. (a) : The given number · 2310

$= 2^1\ \ 3^1\ \ 5^1\ \ 7^1\ \ 11^1$

There are 5 prime factors.

Hence, total number of factors

$= (1\pm1)\ (1\pm1)\ (1\pm1)\ (1\pm1)\ (1\pm1)$

$= 2\ \ 2\ \ 2\ \ 2\ \ 2$

$= 32$

$\because$ 1 and 2310 are not to be considered as factors.

Then, number of factors = $32 - 2 = 30$

16. How many combinations of fruits can be made from four bananas, five oranges and 2 guavas?

(a) 90 (b) 80

(c) 89 (d) 98

Ans. (c) : There are three types of fruits, which are 4, 5 and 2 in numbers

Hence, total number of combinations

$= [(4\pm1)\ (5\pm1)\ (2\pm1) - 1]$

[We know that, combination of (p+q+r)

$= \{(p+1)\ (q+1)\ (r+1) - 1\}]$

$= 5\ \ 6\ \ 3 - 1$

$= 90\text{-}1 = 89$

17. Tell how many rectangles including squares will be formed in a chess board?

(a) 1728 (b) 3375

(c) 1331 (d) 1296

Ans. (d) : Chess board consists of 64 squares and consists of 9 horizontal lines and 9 vertical lines. To make rectangle and square, we need 2 horizontal and 2 vertical lines, then total rectangle can be made with squares ${}^{9}C_2\ \ {}^{9}C_2$

${}^{9}C_2{}^{2}$

$\frac{9!}{2!7!}{}^{2}$

$\frac{9\ \ 8}{1\ \ 2}{}^{2}\qquad 9\ \ 4^{2}$

$36\ \ 36\ \ \ 1296$

Probability

The literal meaning of the word probability is 'possibility' or the probability of an event. When the word chance is added to an event, that event becomes uncertain. By adding uncertain words to an event, possibility arises in it. This possibility is called the probability of the event.

Generally there are two types of experiments in the world. The results of the first type of experiment are definite.

For example, no matter how many times the refractive index of glass is calculated, its value always comes to 1.5.

The second type of experiments are those whose results change when repeated repeatedly. That is, their results depend on chance.

(i) By throwing a coin it is not certain whether it will come up head or tails.

(ii) It is not certain which number 1, 2, 3, 4, 5, 6 will come up by throwing the dice at random.

Therefore, the study of the second type of experiment (which was initially done by gamblers and (speculators) is called probability.

Carner said, "Probability is a state of mind about uncertain events."

According to Laplace, "Probability is the ratio of favorable events to all events with equal probability."

Salient terminology–

Experiment : The word experiment is used where the result is to be determined.

Random experiment : When an experiment is repeated again and again and the results are not the same. Such experiments are called random experiments.

Tail and event : The experiment done or the process adopted is called 'trail'.

Example : Coin tossing (how many times), dice rolling (how many times)

A : {HH, TT}

B : {HT, TH}

C : {HT, TH, TT}

The results obtained after an experiment are called events.

Ex. : A coin getting heads or tails, a dice getting any number (1, 2, 3, 4, 5, 6).

Exhaustive event– The total number of possible outcomes of a random experiment is called the exhaustive events.

Ex. : A coin can be tossed to get heads or tails. Hence the number of exhaustive events will be 2.

Mathematical explanation : If in an experiment an event E can occurs by 'a' methods and cannot occur by b methods and each of these methods is equally likely, that is, all these methods have equal probability, then, the event will occur.

Probability of occurrence $\frac{a}{a \quad b}$

Probability of event not occurring $\frac{b}{a \quad b}$

If the probability of occurrence is P(E)

then $P(E) \quad \frac{a}{a \quad b}$

If the probability of not occurrence is $P(\bar{E})$

then $P(\bar{E}) \quad \frac{b}{a \quad b}$

Ex. : In an lottery, there are 6 prize tickets and 11 tickets are vacant. So the probability of getting the reward and the probability of not getting the reward.

Sol. : $P(E) \quad \frac{6}{6 \quad 11} \quad \frac{6}{17}$

$P(\bar{E}) \quad \frac{11}{6 \quad 11} \quad \frac{11}{17}$

When we say that an event can happen in 'a' ways and cannot happen in 'b' ways, it means the probability of the event happening and not happening is in the ratio a : b. If the probability of occurrence is denoted by Ka, where K is an undetermined constant, then the probability of failure of the event will be denoted by Kb.

Since the probability of occurrence + the probability of not occurrence = K (a + b)

Since the event will either occur or will not occur, hence the sum of the probability of occurrence and the probabilities of not occurring is K(a + b), which is the certainty represent accuracy.

If certainty is taken to be unit, K(a + b) = 1

$K \quad \frac{1}{a \quad b}$

Thus the probability of occurrence $\frac{a}{a \quad b} \quad P(E)$

The probability of not occurrence $\frac{b}{a \quad b} \quad P(\bar{E})$

The event $\bar{E}$ is called the complementary of E. If the probability of occurrence of an event is denoted by p and the probability of not occurrence is denoted by q, then,

$$P(E) + P(\bar{E}) = p + q = \frac{a}{a \quad b} + \frac{b}{a \quad b} = 1$$

$$\boxed{q \quad 1 \quad p}$$

or $P(A)' \quad P(A) \quad 1$

Example: If the chance of favorable ratio of an event is 3 : 5 then find the probability of occurrence.

The chance of favorable ratio $\frac{3}{5}$

Occurrence of an event $\frac{3}{3\ \ 5}\ \ \frac{3}{8}$

Sample space– The set of results of an experiment is called sample space. It is denoted by S.

Example : In tossing a coin, the sample space consists of two points : head and tail.

S = {HT}

Example : If there are four balls of different colours in a bag. Red (R), Blue (B), Yellow (Y) and White (W). If two balls are drawn at a time what will be the sample space :

Solution : Any two balls can be taken out at a time, then the sample space is :

S = {RB, RY, RW, BY, BW, YW}

If it is said that only two pairs of blue-yellow and blue-white are to be taken, then we will write

S(E) = (BY, BW)

Where, S(E) is the number of points representing event E.

Expression of probability : Probability is always a number between 0 to 1. If an event is certain to happen thenits probability will be one (1). If it is certain that the event will never happen then its probability will be zero (0).

The probability of occurrence of an event E is the ratio S(E)/S(P).

Probability of occurrence of event E =

$$\frac{S\ E}{S\ P}\ \ \frac{Favorable\ outcome}{Total\ outcome}$$

Where, S(E) is a subset of S(P)

Example : Find the probability of each number written on twelve tickets being a multiple of 2 or 3, from 1 to 12?

Solution : In the number 1 to 12 the multiples of 2 or 3 are 2, 3, 4, 6, 8, 9, 10, 12 since the probability is 8 out of 12 situations.

Hence, S(P) = 12, S(E) = 8

required probability = $\frac{S\ E}{S\ P}\ \ \frac{8}{1\,2}\ \ \frac{2}{3}$

Equally likely events : If each of two or more events, the probability of occurrence is equal then such events are called equally likely events.

For example, in a throw of a dice, every occurrence of any of the number 1, 2, 3, 4, 5, 6 coming up is equally probable.

Mutually exclusive events : Those events are called mutually exclusive, out of which only one can happen (be successful) the other can't happen.

Example : If a one rupee coin is tossed and the face part is called head and other part is called tail and when it tossed, the head comes up, then tail cannot comes up and if tail comes up then head cannot comes up. Hence both the events are mutually exclusive events.

Example : The probability of appointment of A is 1/3 and that of B is 2/5. What is the probability that only one of them is appointed.

Solution : Appointment of A or B to a post is a mutually exclusive event, because if A is appointed then B will not be appointed vice-versa.

Hence, probability of appointment of only one

$$= \frac{1}{3}\ \ \frac{2}{5}\ \ \frac{1\,1}{1\,5}$$

Independent and dependent events : If the probability of one event occurring is not affected by the occurrence or non-occurrence of another event, then both the events are called mutually independent. Otherwise the events are called dependent events.

Example : If two cards are drawn sequentially from a deck of cards.

Then both the cards are drawn in two ways :

(i) The first ace drawn is shuffled into the deck.

(ii) The drawn card is not added to the deck again.

Solution : In the above S = {52 playing cards}

(i) E_1 = {Event of drawing second ace out of 52 cards}

E_2 = {Event of drawing second ace out of 52 cards}

Here both the cards are drawn from 52 cards only.

Hence, both events are independent.

(ii) E_3 = {Event of drawing an ace from 52 cards}

E_4 = {Event of drawing an ace from 51 cards

The occurrence of event E_3 affects the event E_4. Hence E_4 is a dependent event on E_3.

Complementary event : If the sample space in an experiment is S and its subset E represents some event, then the complementary set E' of E with respect to S is also an event, which is called the complementary event of E.

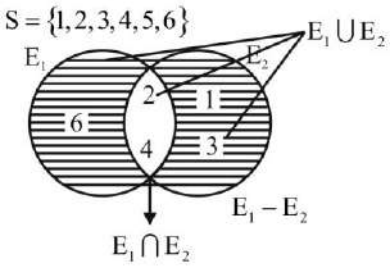
Example : If A' is an event and A is its complementary event.

then, P(A) = 1 – P(A)

Operation of events :

(i) Union of events : If E_1 and E_2 are two events of the sample space S, then the event in which all those elements are present, which are either E_1 or E_2 or both E_1 and E_2 the event E_1 and E_2 are called and denoted by E_1 E_2.

Picture for a throw of dice :



S = To roll the dice $1, 2, 3, 4, 5, 6$

E_1 = To find even number $2, 4, 6$

E_2 = To find number less than 5 $1, 2, 3, 4$

Ex. : If two coin are tossed find the event

(i) At least one head appears

(ii) At least one tail appears

Sol. : (i) Events of at least one head appears HH, HT, TH

Therefore the model set A HH, HT, TH

(ii) Events of at least one tail appears {TT, TH, HT}

the model set B = {TT, TH, HT}

A B = {HH, HT, TH, TT}

(ii) Intersection of events : If E_1 and E_2 are two events of model space S, then the event which includes all those elements that are in both E_1 and E_2 is called intersection of events and is represented by E_1 E_2.

(iii) Difference of events : If E_1 and E_2 are two events of the sample space S. Then the event consisting of all these elements of E_1 and which are not elements of E_1 is represented by $E_2 - E_1$ is called difference of events.

Theorem of total probability or additive property of probability : If P_1, P_2, P_3, ... P_n are mutually exclusive probabilities of occurrence of n events respectively then the probability of occurrence of any one of these numbers is $P_1 + P_2 + P_3 + ... P_n$.

Example : To probability of appointment of A to a post is 1/3 and the probability of appointment of B is 2/5. What is the probability that only one of them is appointed?

Solution : The appointment of A or B to a post are mutually exclusive events. If a appointed, then B will not. If B is appointed, then A will not be. Hence, the probability of appointment of any one of them is :

$$\frac{1}{3} \quad \frac{2}{5}$$

$$\frac{5 \quad 6}{15} \quad \frac{11}{15}$$

Theorem of compound probability: If the probability of two independent events are known separately, then both events will occur (simultaneously). The probability of this is equal to their individual probabilities.

If the probabilities of independent events are P_1, P_2, P_3 ..... P_n, the probability of occurrence of all the events is P.

So, $P = P_1 . P_2 . P_3 ..... P_n$

Note 1 : If the probability of occurrence of an event in one attempt is P, then the probability of its happening in consecutive 'r' attempts is P. P ..... r times = P^r.

Note 2 : If the probability of occurrence of n events are $P_1 . P_2$ ..... P_n then there is a probability of not happening of all these events

$= 1 - (1 - P_1) (1 - P_2) ..... (1 - P_n)$

Example : Four cards one by one from the deck of cards are drawn and are not put back into the deck, then find what is the probability of them all being kings?

Solution : There are 4 kings in a deck of 52 cards so one probability of drawing the king = $\frac{4}{52}$. Since the drawn card is not put back into the deck. Hence the remaining 51 cards remain and so on.

Second time probability = $\frac{3}{51}$

Third time probability = $\frac{2}{50}$

Fourth time probability = $\frac{1}{49}$

Required probability = $\frac{4}{52} \times \frac{3}{51} \times \frac{2}{50} \times \frac{1}{49} = \frac{1}{270725}$

Example : The probability of A solving a question is 2/3, and the probability of B solving it is 3/5. Find the probability that the question will be solved by at least one of these two?

Solution : P1 = Probability of solving the question by A = 2/3 and P2 = Probability of solving the question by B = 3/5, then the probability of solving the question by at least one of the two = $1-(1 - P_1) (1 - P_2)$

$$= 1 - \left(1 - \frac{2}{3}\right)\left(1 - \frac{3}{5}\right)$$

$$1 \quad \frac{1}{3} \quad \frac{2}{5}$$

$$\frac{15 \quad 2}{15} \quad \frac{13}{15}$$

Mathematical expectation : If P is the probability of a person succeeding in a task and M is the money he will receive if he succeeds, then P × M is his expectation.

Example : A and B throw a dice for a price of Rs. 1100 which is won by the player who throws first. If A throws the dice first, what is this respective expectations?

Solution : Probability of throwing a six = $\frac{1}{6}$

The probability of A of winning in the first throw is = $\frac{1}{6}$ and the probability that B will get the chance is $\frac{5}{6}$, because in that case A will loss.

Therefore, probability of 'B' winning in the first throw = $\frac{5}{6}\ \frac{1}{6}$

In second throw probability of 'A' winning = $\frac{5}{6}\ \frac{5}{6}\ \frac{1}{6}$ (Because in that case B would have lost)

Probability of B winning in second throw

$$= \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{1}{6} = \left(\frac{5}{6}\right)^3 \times \frac{1}{6}$$

Probability of A winning in third throw = $\left(\frac{5}{6}\right)^4 \frac{1}{6}$

Probability of B winning in third throw = $\left(\frac{5}{6}\right)^5 \frac{1}{6}$

Hence, the probability of A winning

$$= \frac{1}{6} + \left(\frac{5}{6}\right)^2 \frac{1}{6} + \left(\frac{5}{6}\right)^4 \frac{1}{6} + \ldots\ldots\ldots$$

$$\Rightarrow \frac{1}{6}\left[1 + \left(\frac{5}{6}\right)^2 + \left(\frac{5}{6}\right)^4 + \ldots\ldots\right]$$

$$\rightarrow \frac{1}{6} \cdot \frac{1}{1 - \frac{25}{36}} = \frac{6}{11}$$

$$\left[\because \text{in geometric series } a + ar + ar^2 + \ldots\ldots \infty \quad S_n = \frac{a}{a - r}\right]$$

and probability of B winning :

$$= \frac{5}{6} \times \frac{1}{6} + \left(\frac{5}{6}\right)^3 \times \frac{1}{6} + \left(\frac{5}{6}\right)^5 \times \frac{1}{6} + \ldots\ldots\ldots$$

$$\Rightarrow \frac{1}{6} \times \frac{5}{6}\left[1 + \left(\frac{5}{6}\right)^2 + \left(\frac{5}{6}\right)^4 + \ldots\ldots\right]$$

$$\rightarrow \frac{5}{36} \times \frac{1}{1 - \frac{25}{36}} = \frac{5}{11}$$

Hence, A's expectation $\frac{6}{11}$ 1100 rupees

= 600 rupees

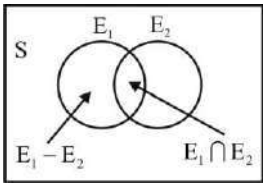
and B's expectation $\frac{5}{11}$ 1100 rupees

= 500 rupees

Probability theorem based on set theory :

(i) If E_1 and E_2 are two events, then

$$P(E_1 - E_2) = P(E_1) - P(E_1 \cap E_2)$$



(ii) Additive theorem of probability :

(a) If there are two events E_1 and E_2 in a sample space, then the sum of the probability of both the events is equal to the sum of the probability of the union and intersection of both events.

$$P(E_1) + P(E_2) = P(E_1 \cup E_2) + P(E_1 \cap E_2)$$

or

$$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

If E_1 and E_2 are mutually exclusive events then the sum of the probability is of individual events is equal to the sum of probabilities of both the events.

$\because\ P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$

☞ **If the events are exclusive,**

then, $P(E_1 \cap E_2) = 0$

Hence, $P(E_1 \cup E_2) = P(E_1) + P(E_2)$

☞ **If the events are independent,**

then, $P(E_1 \cap E_2) = P(E_1) \times P(E_2)$

Hence,

$$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1) \times P(E_2)$$

Example : If number from 1 to 10 (one on each) are written on 10 tickets. No number are repeated if A is such event in which there are odd numbers and B is an event in which number divisible by 3 is marked. The show P (A B) = P(A) + P(B) – P(A B).

Sol. : Sample space 1, 2, 3, ...10

A 1, 3, 5, 7, 9

B 3, 6, 9

$$P(A) = \frac{5}{10} = \frac{1}{2},\ P(B) = \frac{3}{10}$$

$A \cup B = 1, 3, 5, 6, 7, 9$

$A \cap B = 3, 9$

$P(A \cap B) = \frac{6}{10} = \frac{3}{5}$

$P(A \cap B) = \frac{2}{10} = \frac{1}{5}$

$\therefore \quad P(A) + P(B) - P(A \cap B) = \frac{1}{2} + \frac{3}{10} - \frac{1}{5} = \frac{3}{5}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Conditional probability : Suppose there are two events E_1 and E_2 in a sample space and $P(E_1) \neq 0$.

If it is assumed that the event E_1 occur, then considering all the elements of the complete sample space S, we will consider only the elements of E_1. Under this restriction the sample space will be E1 only. Now for the occurrence for E1, it is necessary that some point (element) $E_1 \cap E_2$ be found.

Therefore, the probability of E_2 on this reduced sample space is $\frac{n(E_1 \cap E_2)}{n(E_1)}$

This is called the restricted probability of event E_2 on the basis of the restriction of occurrence E_1.

Hence, $P\left(\frac{E_2}{E_1}\right) = \frac{n(E_1 \cap E_2)}{n(E_1)}$

Example : There are 80 students in a class of a school. In which 50 have taken Mathematics, 40 have taken statistics and 10 have taken both the subjects. A student is selected at random. Find the probability that he is a student of statistics.

Sol. : Let the set of mathematics students be M and the set of statistics student be S.

$\therefore \quad n(M) = 50, \quad n(S) = 40$

$n(M \cap S) = 10$

$\because$ Only one student can be selected in 80 ways

$P(M) = \frac{50}{80} = \frac{5}{8}, \quad P(S) = \frac{40}{80} = \frac{1}{2}$

$P(M \cap S) = \frac{10}{80} = \frac{1}{8}$

Hence the probability of being a student in mathematics is

$$P(S/M) = \frac{P(S \cap M)}{P(M)} = \frac{P(M \cap S)}{P(M)} = \frac{1/8}{5/8} = \frac{1}{5}$$

Compound probability theorem :

(i) If the probability of occurrence of two events E_1 and E_2 is equal to the product of the probability of E_1 and the restricted probability of E_2 when E_1 has occurred i.e.

$$P(E_1 \cap E_2) = P\left(\frac{E_2}{E_1}\right) . P(E_1)$$

(ii) If two events E1 and E2 are independent, then the probability of their occurring together is equal to the product of their individual probability i.e.

$$P(E_1 \cap E_2) = P(E_1). P(E_2)$$

Example : From a deck of 52 common cards, 2 cards are taken out one by one. Find the probability when the first card is Ace and the second is Honour card. The first card is not put back into the deck before the second card is drawn.

Sol. : Honour card refers to Ace, King, Queen and Jack.

Suppose the event of drawing an ace is E_1 and the event of drawing honour card is E_2.

$$P(E_1) = \frac{4}{52} = \frac{1}{13} \text{ तथा } P\left(\frac{E_2}{E_1}\right) = \frac{15}{51} = \frac{5}{17}$$

Hence, from the mixed probability,

$$P(E_1 \cap E_2) = P(E_1) P\left(\frac{E_2}{E_1}\right)$$

$$\frac{1}{13} \quad \frac{5}{17} \quad \frac{5}{221}$$

Ex. : If there are 3 balls of different colour in a bag. Red (R), Blue (B) and Yellow (Y), if two balls are drawn at a time, what will be its pattern.

Sol. : There are 3 balls of different colour in the bag. If red is denoted by R, blue by B and yellow by Y, then the sample space of this test is :

$$S = \{RB, BY, YR, BR, YB, RY\}$$

Ex. : Two coins (one of Rs. 1 and the other of Rs. 5) are tossed once. Find the sample space :

Sol. : Number of sample space $= 2^2 = 4$

[HH, TT, TH, HT]

Ex. : If a coin has been tossed four times :

Sol. : If a coin is tossed four time then the number of sample space will be $= 2^4 = 16$

S = {HHHH, HHHT, HHTH, HTHH, THHH, HHTT, HTHT, HTTH, THHT, THTH, TTHH, HTTT, THTT, TTHT, TTTH, TTTT}

Ex. : A dice is thrown twice :

Sol. : In general terms each outcome can be represented by an ordered pair (x, y) where x are the numbers appearing on the first dice and the numbers appearing on the first dice and y are the numbers appearing on the second dice. Hence the sample space is as follows :

S = {(x, y) : x} : x is the number appearing on the first dice and y is the number appearing on the second dice.

Hence,

{(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}.

Ex. : When a dice and a coin is tossed :

Sol. : When a dice and a coin is tossed then sample space will be :

S = {1H, 2H, 3H, 4H, 6H, 1T, 2T, 3T, 4T, 5T, 6T}

Ex. : Suppose 3 oranges are taken out at random from a box of oranges. After examining each orange, we mark the bad one with D and the good one with N. Find the sample space of this test :

Sol. : We know that bad orange is represented by D and good orange is represented by N.

3 oranges are drawn at random from the box. Therefore, the sample space of the test,

S = {DDD, DDN, DND, NDD, NND, NDN, DNN, NNN}

Ex. : Four coins are thrown. The sample space related to this event will be :

Sol. : The result is the same whether four coins are tossed or the coin is tossed four times.

Hence, S = {HHHH, HHHT, HHTH, HTHH, THHH, HHTT, HTHT, HTTH, THHT, THTH, TTHH, HTTT, THTT, TTHT, TTTH, TTTT}

Ex. : Write the model space for throwing a coin.

Sol. : On throwing a coin, the sample space,

S = {H, T}.

Ex. : There are 4 yellow and 3 blue marbles in a bag. If 1 marble is drawn at random, then write the sample space of this test and the marble drawn is blue in colour :

Sol. : There are 4 yellow and 3 blue marbles in the bag. 4 yellow marbles are denoted as Y1, Y2, Y3, Y4 and 3 blue marbles are denoted as B1, B2, B3.

Let the sample space of events of taking out 1 marble out of 7 marbles kept in the bag be

$S = \{Y_1, Y_2, Y_3, Y_4, B_1, B_2, B_3\}$ and $B = \{B_1, B_2, B_3\}$

Ex. : (A) The probability of occurrence of an event is $\frac{1}{2}$ then tell the probability of not occurring of the event.

(B) If the probability of not occurrence of an event is $\frac{1}{3}$ then tell the probability of occurring of the event.

Sol. : (A) $\because$ $P(E) + P(\bar{E}) = 1$

Probability of occurrence

$$P(\bar{E}) \quad 1 \quad P(E)$$

$$1 \quad \frac{1}{2} \quad \frac{1}{2}$$

(B) $\because$ $P(E) \quad P(\bar{E}) \quad 1$

Probability of not occurrence

$$P(E) \quad 1 \quad P(\bar{E})$$

$$1 \quad \frac{1}{3} \quad \frac{2}{3}$$

Ex. : The probability of hitting the target of three persons is $\frac{4}{5}, \frac{3}{4}, \frac{2}{3}$ respectively, then–

(a) Find the probability of hitting the target

(b) Find the probability of hitting the target by at least two persons.

Sol. : Let three persons are A, B and C respectively then,

Probability of hitting target by A $\frac{4}{5}$

Probability of hitting target by B $\frac{3}{4}$

Probability of hitting target by C $\frac{2}{3}$

(a) Probability of not hitting target by A $1 \quad \frac{4}{5} \quad \frac{1}{5}$

Probability of not hitting target by B $1 \quad \frac{3}{4} \quad \frac{1}{4}$

Probability of not hitting target by $1 \quad \frac{2}{3} \quad \frac{1}{3}$

Probability of not hitting target by any one

$$\frac{1}{5} \quad \frac{1}{4} \quad \frac{1}{3} \quad \frac{1}{60}$$

Hence, probability of hitting the target $1 \quad \frac{1}{60} \quad \frac{59}{60}$

(b) At least two targets can be hitting in following ways :

(i) A, B, C all of three hit the target then probability

$$\frac{4}{5} \quad \frac{3}{4} \quad \frac{2}{3} \quad \frac{2}{5}$$

(ii) Probability of hitting the target by B and C but not by A $\frac{1}{5} \quad \frac{3}{4} \quad \frac{2}{3} \quad \frac{1}{10}$

(iii) Probability of hitting the target by A and C but not by B $\frac{4}{5} \quad \frac{1}{4} \quad \frac{2}{3} \quad \frac{2}{15}$

(iv) Probability of hitting the target by A and B but not by C $\frac{4}{5} \quad \frac{3}{4} \quad \frac{1}{3} \quad \frac{1}{5}$

$\because$ All these are mutually exclusive event,

Hence, required probability $\frac{2}{5} \quad \frac{1}{10} \quad \frac{2}{15} \quad \frac{1}{5}$

$$\frac{12 \quad 3 \quad 4 \quad 6}{30}$$

$$\frac{25}{30}$$

$$\frac{5}{6}$$

Ex. : A card has been drawn from a well shuffled deck of 52 cards. Find the probability of the card drawn

(i) The card is of diamond

(ii) The card is not of diamond

(iii) The card is black in colour (i.e. club and spade)

(iv) The card is not black in colour

Sol. : Total number of cards = 52

(i) Total number of diamond cards in deck = 13

the probability of card being a diamond $\frac{13}{52} \quad \frac{1}{4}$

(ii) Total number of cards drawn which are not diamond = 52 – 13 = 39

probability of the card drawn which is not diamond $\frac{39}{52} \quad \frac{3}{4}$

(iii) Number of black cards = 13 + 13 = 26

probability of black card $\frac{26}{52} \quad \frac{1}{2}$

(iv) Probability of the card which is not black $1 \quad \frac{1}{2} \quad \frac{1}{2}$

RRB Technician Grade- I Previous Year Questions and some Important Questions

1. The odds against an event is 7 : 4 and the odds in favour of another event is 8 : 5. If both the events are independent, then the probability that at least one of the event will happen is :

(a) $\frac{35}{143}$ (b) $\frac{88}{143}$ (c) $\frac{108}{143}$ (d) $\frac{76}{143}$

RRB Technician Gr. I Signal 19.12.2024, Shift-I

Ans. (c) :

Probability of event A not happening n $(\overline{A}) = \frac{7}{11}$

Probability of event B not happening n $(\overline{B}) = \frac{5}{13}$

Probability of both the events not happening

$$= \frac{7}{11} \quad \frac{5}{13} \quad \frac{35}{143}$$

Probability of at least one event happening

$$= 1 - [n(\overline{A}).\ n(\overline{B})]$$

$$= 1 - \frac{35}{143} \quad \frac{108}{143}$$

2. The probability that a student passes a Mathematics test is $\frac{3}{4}$ and the probability that he passes both the Mathematics and a Physics test is $\frac{13}{36}$. The probability that he passes at least one test is $\frac{5}{6}$. What is the probability that he passes the Physics test?

(a) $\frac{5}{36}$ (b) $\frac{5}{9}$

(c) $\frac{4}{9}$ (d) $\frac{7}{9}$

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (c) : Probability of passing in mathematics P(M) = $\frac{3}{4}$

Probability of passing in mathematics and physics- $P(M \quad Phy) \quad \frac{13}{36}$

Probability of passing in at least one test- $P(M \quad Phy) \quad \frac{5}{6}$

$\because \quad P\ M \ + P\ Phy \ - P(M \cup Phy) + P(M \cap Phy)$

$$\frac{3}{4} + P(Phy) = \frac{5}{6} + \frac{13}{36}$$

$P(Phy) \quad \frac{5}{6} \quad \frac{13}{36} \quad \frac{3}{4}$

$P(Phy) = \frac{4}{9}$

3. If an event has odds in favour 4 : 5, then the probability that the event will NOT occur is :

(a) $\frac{5}{9}$ (b) $\frac{1}{5}$

(c) $\frac{4}{5}$ (d) $\frac{4}{9}$

RRB Technician Gr. I Signal 19.12.2024, Shift-II

Ans. (a) : Probability of the event occurring $= \frac{4}{4 \quad 5} =$

$\frac{4}{9}$

Probability that the event not occurring $= 1 - \frac{4}{9} = \frac{5}{9}$

4. A coin is thrown eight times. The probability of getting exactly five tails is :

(a) 0.11 (b) 0.28

(c) 0.78 (d) 0.22

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (d) : Let, the probability of getting heads, $P \quad \frac{1}{2}$

the probability of getting tails $Q \quad \frac{1}{2}$

$n \quad 8$ times

Formula $P \; r \quad {}^{n}C_{r} P^{r} q^{n \; r}$

The probability of getting exactly five tails

$P \; r = 5 \; = {}^{8}C_{5} \times \left(\frac{1}{2}\right)^{5} \times \left(\frac{1}{2}\right)^{3}$

$\frac{{}^{8}C_{5}}{2^{8}}$

$\frac{8 \quad 7 \quad 6 \quad 5!}{3 \quad 2 \quad 5! \quad 256} \quad \frac{56}{256} \quad 0.218$

0.22

5. Two dice (both numbered 1 to 6) are rolled, simultaneously. What is the probability of observing a sum of 8?

(a) $\frac{7}{36}$ (b) $\frac{5}{6}$

(c) $\frac{5}{36}$ (d) $\frac{1}{6}$

RRB Technician Gr. I Signal 19.12.2024, Shift-III

Ans. (c) :

Favorable event $- \; 2 + 6, 6 + 2, 3 + 5, 5 + 3, 4 + 4$

5

Total event 36

probability of observing a sum of 8 $P \quad E \quad \frac{5}{36}$

6. If three cards are drawn one by one randomly from a pack of 52 cards, then what is the probability that three of them are jack?

(a) $\frac{3}{5525}$ (b) $\frac{1}{5525}$

(c) $\frac{4}{555}$ (d) $\frac{3}{552}$

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (b) : Way of choosing three cards $= {}^{52}C_{3}$

$= 22100$

Way of getting three jacks $= {}^{4}C_{3}$

$= 4$

Probability of getting three jacks $= \frac{{}^{4}C_{3}}{{}^{52}C_{3}}$

$= \frac{4}{22100} = \frac{1}{5525}$

7. A bag contains balls numbered from 1 to 42. One ball is drawn at random from these balls. The probability that its number is a multiple of 7 or 8 is :

(a) $\frac{22}{42}$ (b) $\frac{11}{42}$ (c) $\frac{11}{22}$ (d) $\frac{13}{22}$

RRB Technician Gr.-I Signal 20.12.2024, Shift-I

Ans. (b) : Total number of ball in bag = 42

Multiple of 7 and 8 = (7, 14, 21, 28, 35, 42)

(8, 16, 24, 32, 40)

Total number of multiple of 7 and 8 = 11

So, Probability of multiple of 7 or 8 = $\frac{11}{42}$

8. In a single throw of a dice what is the probability of getting a number greater than 4:

(a) $\frac{1}{4}$ (b) $\frac{2}{3}$

(c) $\frac{1}{3}$ (d) $\frac{1}{2}$

RRB Group-D – 29/10/2018 (Shift-III)

Ans. (c): Probability = Number of favourable outcomes / Total outcomes

Possible outcomes = 2 {5, 6}

Total number of outcomes = 6 {1, 2, 3, 4, 5, 6}

Probability = $\frac{2}{6} \quad \frac{1}{3}$

required probability $\frac{1}{3}$

9. From a pack of 52 playing cards, a card is drawn at random. What is the probability that the card is an ace?

(a) $\frac{4}{13}$ (b) $\frac{2}{13}$

(c) $\frac{3}{13}$ (d) $\frac{1}{13}$

RRB JE - 30/05/2019 (Shift-III)

Ans. (d) : According to the question,

There are four aces in 52 cards

So, probability of getting an ace

$\frac{4}{52} \quad \frac{1}{13}$

10. A bag contains 3 red and 5 blue balls. The probability that one ball is red :

(a) $\frac{3}{8}$ (b) $\frac{5}{8}$

(c) $\frac{1}{8}$ (d) $\frac{3}{5}$

RRB JE - 28/05/2019 (Shift-I)

Ans. (a) : Total balls in the bag = 3 + 5 = 8

the probability of red ball $\frac{3}{8}$

11. Find the probability of getting 53 Sunday in a non leap years?

(a) $\frac{2}{7}$ (b) $\frac{3}{7}$

(c) $\frac{1}{7}$ (d) $\frac{5}{7}$

RRB Group-D – 16/10/2018 (Shift-I)

Ans. (c) : There are 365 days in non-leap year

365 days = 52 weeks and 1 extra day

The one extra day can be either a monday, tuesday, wednesday thursday, friday, saturday or a sunday

Hence, number of favourable outcomes/total number of events.

So, probability $\frac{1}{7}$

12. There are 12 students in a class of which 7 are girls and the remaining are boys. One student has to be selected from that class what is the probability that he is a boy?

(a) $\frac{7}{12}$ (b) $\frac{5}{12}$

(c) $\frac{5}{7}$ (d) $\frac{1}{2}$

RRB RPF SI – 05/01/2019 (Shift-II)

Ans. (b) : According to the question,

Total no. of students = 12

Number of girls = 7

Number of boys = 12 – 7 = 5

Probability of boy $\frac{5}{12}$

13. Probability of getting 5 on throwing a dice :

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$

(c) $\frac{2}{5}$ (d) $\frac{1}{2}$

RRB NTPC 04.03.2021 (Shift-I) Stage Ist

Ans. (a) : Total outcomes = 6

Favorable outcome = 1

Probability of getting 5 $\frac{1}{6}$

14. If the favorable outcome ratio of an event is 3 : 5, then find the probability of occurrence :

(a) $\frac{5}{8}$ (b) $\frac{3}{8}$

(c) $\frac{1}{2}$ (d) $\frac{7}{8}$

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (b) : Probability of occurrence $\frac{3}{3 \quad 5} \quad \frac{3}{8}$

15. If 4 red, 5 black and 7 white balls are drawn at random from a bag, what is the probability that it is black ?

(a) $\frac{1}{16}$ (b) $\frac{7}{16}$

(c) $\frac{5}{16}$ (d) $\frac{3}{16}$

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (c) : Total balls in the bag = 4 + 5 + 7 = 16

Probability of getting a black ball $\frac{5}{16}$

16. Find the probability of having 5 Sunday in a month of 30 days chosen at random :

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$

(c) $\frac{3}{7}$ (d) $\frac{4}{7}$

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (b) : In a month of 30 days, there are 4 full week is (including Sunday) and two day left. These two days can be of the following seven possible types :

(i) Monday and Tuesday

(ii) Tuesday and Wednesday

(iii) Wednesday and Thursday

(iv) Thursday and Friday

(v) Friday and Saturday

(vi) Saturday and Sunday

(vii) Sunday and Monday

Of these seven equally probable conditions, Sunday is included in the last two events

Probability

$$= \frac{\text{Number of conditions favorable of the event}}{\text{Number of possible outcomes}}$$

required probability $\frac{2}{7}$

17. If the unfavorable outcome ratio of an event is 2 : 5, then find the probability of the event occurring :

(a) $\frac{5}{7}$ (b) $\frac{2}{7}$

(c) $\frac{3}{7}$ (d) $\frac{4}{7}$

RRB NTPC 13.03.2021 (Shift-II) Stage Ist

Ans. (a) : $\because$ Unfavorable outcome ration of event $\frac{2}{5}$

Favorable outcome ratio $\frac{m}{n}$ $\frac{5}{2}$

Probability of occurrence of event $= \frac{m}{m \quad n} = \frac{5}{5 \quad 2} = \frac{5}{7}$

Hence the probability of occurrence of event $\frac{5}{7}$

18. The favorable odds ratio of three horses participating in a race are 1 : 2, 1 : 3, 1 : 4 one of these three horses will emerge victorious. Find its probability :

(a) $\frac{37}{60}$ (b) $\frac{47}{60}$

(c) $\frac{31}{60}$ (d) $\frac{41}{60}$

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (b): Since only one horse can win and the rest will lose, the event of their winning are mutually exclusive. If the probabilities of A, B, C winning are P_1, P_2, P_3 respectively

P_1 $\frac{1}{1 \quad 2}$ $\frac{1}{3}$

P_2 $\frac{1}{1 \quad 3}$ $\frac{1}{4}$

P_3 $\frac{1}{1 \quad 4}$ $\frac{1}{5}$

Required probability $P_1 \quad P_2 \quad P_3$

$\frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{5}$

$\frac{20 \quad 15 \quad 12}{60}$

$\frac{47}{60}$

19. The probability of horse A winning a race is $\frac{1}{5}$ and the probability of horse B winning the race is $\frac{1}{6}$. Find the probability of one of those horses winning :

(a) $\frac{5}{6}$ (b) $\frac{5}{11}$

(c) $\frac{1}{30}$ (d) $\frac{11}{30}$

RRB NTPC 03.03.2021 (Shift-II) Stage Ist

Ans. (d) : Winning of horse A and horse B is mutually exclusive events the probability of one of those winning is $= \frac{1}{5} \quad \frac{1}{6} \quad \frac{11}{30}$

20. The probability of a question being solved by A is $\frac{1}{3}$ and the probability of it being solved by B $\frac{1}{6}$. Find the probability of the question being solved by any one of them :

(a) $\frac{1}{2}$ (b) $\frac{1}{18}$

(c) $\frac{1}{12}$ (d) $\frac{1}{9}$

RRB Group-D – 29/10/2018 (Shift-III)

Ans. (a) : Probability being solved by any one of them:

$= \frac{1}{3} \quad \frac{1}{6}$

$\frac{2 \quad 1}{6}$

$\frac{3}{6} \quad \frac{1}{2}$

21. To solve a question, the probability of A is $\frac{2}{3}$ and probability of B is $\frac{5}{12}$. Find the probability of solving the question :

(a) $\frac{7}{36}$ (b) $\frac{29}{36}$

(c) $\frac{1}{18}$ (d) $\frac{31}{36}$

RRB JE - 30/05/2019 (Shift-III)

Ans. (b) :

P_1 = Probability of solving the question by A $\frac{2}{3}$ and

P_2 = Probability of solving the question by B $\frac{5}{12}$

Probability of solving the question by at least one

$$1 \quad 1 \quad P_1 \quad 1 \quad P_2$$

$$= 1 - \left(1 - \frac{2}{3}\right)\left(1 - \frac{5}{12}\right)$$

$$1 \quad \frac{1}{3} \quad \frac{7}{12}$$

$$1 \quad \frac{7}{36} \quad \frac{36 \quad 7}{36} \quad \frac{29}{36}$$

22. The probability of occurrence of event A is $\frac{1}{3}$ and the probability of occurrence of event B is $\frac{1}{4}$. If both the events are mutually independent, then find the probability that neither event A nor event B occurs.

(a) $\frac{2}{3}$ (b) $\frac{3}{4}$

(c) $\frac{1}{2}$ (d) $\frac{1}{3}$

RRB JE - 28/05/2019 (Shift-I)

Ans. (c) : ∵ Both the event are mutually independent

Probability that neither A nor B occurs

$$= P \quad A' \quad B'$$

$$P \quad A' \quad .P \quad B'$$

$$= \left[1 - P \quad A \right].\left[1 - P \quad B \right]$$

$$1 \quad \frac{1}{3} \quad 1 \quad \frac{1}{4} \qquad \frac{2}{3} \quad \frac{3}{4} \quad \frac{1}{2}$$

23. A bag contain 10 white and 15 red balls and the other bag contain 16 white and 9 red balls. One ball is taken out from each bags. Find the probability that both ball will be of same colour:

(a) $\frac{32}{125}$ (b) $\frac{27}{125}$

(c) $\frac{59}{125}$ (d) $\frac{1}{25}$

RRB Group-D – 16/10/2018 (Shift-I)

Ans. (c) :

Total number of balls in the first bag = 10 + 15 = 25

and the number of white balls = 10

and the number of red balls = 15

Probability of drawing a white ball from the first bag

$\frac{10}{25} \quad \frac{2}{5}$

Probability of drawing a red ball from the first bag

$\frac{15}{25} \quad \frac{3}{5}$

Again the total number of balls in second bag = 16 + 9 = 25

Number of white balls = 16

Number of red balls = 9

Probability of drawing a white ball from the second bag $\frac{16}{25}$

Probability of drawing a red ball from the second bag

$\frac{9}{25}$

Probability of both balls being white $\frac{2}{5} \quad \frac{16}{25} \quad \frac{32}{125}$

Probability of both balls being red $\frac{3}{5} \quad \frac{9}{25} \quad \frac{27}{125}$

Probability of both balls being of same colour

$\frac{32}{125} \quad \frac{27}{125} \quad \frac{59}{125}$

24. The probability of occurrence of an event is $\frac{2}{5}$ and the probability of occurrence of second event is $\frac{5}{8}$, then find the probability of occurrence of both events :

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{1}{4}$ (d) $\frac{1}{5}$

RRB RPF SI – 05/01/2019 (Shift-II)

Ans. (c): Probability of occurrence of both events

$$P(E_1 \cap E_2) = P(E_1).P(E_2)$$

[Here, both E_1, E_2 are exclusively independent event]

$$\frac{2}{5}.\frac{5}{8} = \frac{2}{8} = \frac{1}{4}$$

25. Find the probability of getting heads each time in tossing a coin twice :

(a) $\frac{1}{2}$ (b) $\frac{1}{6}$

(c) $\frac{1}{4}$ (d) $\frac{1}{8}$

RRB NTPC 04.03.2021 (Shift-I) Stage Ist

Ans. (c) : If E_1 is the event of head in the first throw and E_2 is the event of head in second throw, then

$$P(E_1 \cap E_2) = P(E_1).P(E_2) = \frac{1}{2}\frac{1}{2} = \frac{1}{4}$$

26. Two cards are drawn from a deck of cards, what will be the probability that one of them will be a king and the other a queen?

(a) $\frac{17}{663}$ (b) $\frac{8}{663}$

(c) $\frac{8}{636}$ (d) $\frac{7}{1326}$

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (b) : Total ways of drawing 2 cards from 52 cards

$$^{52}C_2 = \frac{52\ 51}{1\ 2}$$

$= 26\ \ 51 = 1326$

Total number of sample space, $n(S) = 1326$

Total ways of getting 1 king out of 4 king $= {}^4C_1 = 4$

Total ways of getting 1 queen out of 4 queen $= {}^4C_1 = 4$

For required event 'E'

$$n(E) = 4\ 4 = 16$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{16}{1326} = \frac{8}{663}$$

27. If unfavorable odds ratio of Arun solving question 4 : 3 and the favorable odds of Alok solving question is 7 : 5, then find the probability of both of the together solving the question :

(a) $\frac{5}{21}$ (b) $\frac{13}{21}$

(c) $\frac{11}{21}$ (d) $\frac{16}{21}$

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (d) : Probability of Arun not being able to solve the question $= \frac{4}{4\ 3} = \frac{4}{7}$

Probability of Alok not being able to solve the question $= \frac{5}{7\ 5} = \frac{5}{12}$

Probability of Alok and Arun not being able to solve the question together $= \frac{4}{7}\ \frac{5}{12} = \frac{5}{21}$

Hence, the probability of solving the question by both of them together $= 1 - \frac{5}{21} = \frac{16}{21}$

28. A mathematical question was given to three students to solve and their probability of solving is $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively, if all of them to solve it, find the probability of solving the question :

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$

(c) $\frac{1}{4}$ (d) $\frac{3}{4}$

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (d) : Probability of first student not being able to solve the question

$$1 - \frac{1}{2} = \frac{1}{2}$$

Probability of second student not being able to solve the question

$$1 - \frac{1}{3} = \frac{2}{3}$$

Probability of third student not being able to solve the question

$$1 - \frac{1}{4} = \frac{3}{4}$$

The probability that question could not be solved any of three students

$$\frac{1}{2}\ \frac{2}{3}\ \frac{3}{4} = \frac{1}{4}$$

Hence the probability of the question being solved

$$1 - \frac{1}{4} = \frac{3}{4}$$

29. The probability of occurrence of event A is $\frac{1}{2}$ and the probability of occurrence of event B is $\frac{1}{3}$. If both the events are mutually independent, then find the probability that neither A happens not B happens :

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$

(c) $\frac{1}{2}$ (d) $\frac{1}{3}$

RRB NTPC 13.03.2021 (Shift-II) Stage Ist

Ans. (b) : Both the events are mutually independent, hence the probability of event occurring is–

$$P(E) = P(A).P(B)$$

$$\frac{1}{2}.\frac{1}{3} = \frac{1}{6}$$

Probability that neither A nor B occurs

$$1 - P(E)$$

$$1 - \frac{1}{6} = \frac{5}{6}$$

30. Out of 52 playing cards, one card is taken out at random. Find the probability that the card is neither a spade nor a king :

(a) $\frac{1}{13}$ (b) $\frac{4}{13}$

(c) $\frac{9}{13}$ (d) $\frac{3}{52}$

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (c) : Spade cards + kings = 16

Number of cards containing neither spade nor king = 52 – 16 = 36

Probability that card is neither spade nor king

$$\frac{36}{52} = \frac{9}{13}$$

31. A ball is taken out from a bag containing 10 block and 20 white balls. The probability of that ball being black is :

(Uttrakhand PCS Mains, 2004)

(a) Zero (b) 1/3

(c) 2/3 (d) 1

Ans. (b) : Probability of that ball being black

$$\frac{10}{10+20} = \frac{10}{30}$$

$$\frac{1}{3}$$

32. For any two events A and B

[SSC (Statistical Investigator) CGL Tier-II Paper-III 25.10.2015]

(a) $P(A) \quad P(A \cap B) \quad P(A \cap B^c)$

(b) $P(A) \quad P(A \cap B) \quad P(A \cap B^c)$

(c) $P(A) \quad P(A \cup B) \quad P(A \cup B^c)$

(d) $P(A) \quad P(A \cup B) \quad P(A \cup B^c)$

Ans : (b) $\because \quad P(A \cap B^c) \quad P(A) \quad P(A \cap B)$

$$P(A) \quad P(A \cap B) \quad P(A \cap B^c)$$

33. If A and B are two independent event P(A) = 0.5, P(A ∪ B) = 0.6 then P (B) is

[SSC (Statistical Investigator) CGL Tier-II Paper-III 25.10.2015]

(a) 0.5 (b) 0.2

(c) 0.3 (d) 0.1

Ans : (b) $\because \quad P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\because$ A and B are two Independent event

then, $P(A \cap B) = P(A) \cdot P(B)$

$P(A \cup B) = P(A) + P(B) - P(A)\,P(B)$

According to question,

$0.6 = 0.5 + P(B) - 0.5\,P(B)$

$0.6 - 0.5 = P(B)\,[1 - 0.5]$

$0.1 = 0.5\,P(B) \qquad P(B) = \frac{0.1}{0.5} = \frac{1}{5} = 0.2$

34. A dice is thrown 3 times. The probability that the sum of the numbers appearing on the top face is 4 is

[SSC (Statistical Investigator) CGL Tier-II Paper-III 25.10.2015]

(a) $2\frac{1}{6}^3$ (b) $4\frac{1}{6}^3$

(c) $\frac{1}{6}^3$ (d) $3\frac{1}{6}^3$

Ans : (d) The sum of the above given number is 4.

The condition of all three throw should be as follow :

First 1, 1, 2 4

(i.e. 1 point on the first and throw by 2 point on the third throw)

Second 1, 2, 1 4

Third 2, 1, 1 4

(Total three possible situations)

$\because$ Any of the dice probability of getting a face = $\frac{1}{6}$

Required probability = $3\frac{1}{6}^3$

35. Consider a random experiment of throwing a coin and a die simultaneously. Then the number of elementary outcomes of the random experiment is–

[SSC (Statistical Investigator) CGL Tier-II Paper-III 11.04.2015]

(a) 8 (b) 2^6

(c) 6^2 (d) 12

Ans : (d) When a coin is tossed, it will either head or tail.

The number of events occurring when the coin is thrown = 2 (Head or tail)

Sample space of throwing a dice = 6 (1, 2, 3, 4, 5 and 6)

Therefore, number of initial outcomes of random experiment = 2×6 = 12

36. An urn contains three white and two black balls. Balls are drawn one by one with replacement. What is the probability that a black ball appears first at the fourth draw ?

[SSC (Statistical Investigator) CGL Tier-II Paper-III 11.04.2015]

(a) $\frac{2}{25}$ (b) $\frac{24}{625}$

(c) $\frac{54}{625}$ (d) $\frac{81}{625}$

Ans : (c) Probability of drawing white ball $\frac{3}{5}$

and probability of drawing black ball $\frac{2}{5}$

Probability of drawing black ball at 4^{th} time

White for the first time × white for the second time × white for the third time × black for the fourth time

$\Rightarrow \frac{3}{5} \times \frac{3}{5} \times \frac{3}{5} \times \frac{2}{5} = \frac{54}{625}$

37. What is the probability of getting a total of 5 when a pair of dice is tossed simultaneously?

[SSC (Statistical Investigator) CGL Tier-II Paper-III 20.09.2014]

(a) $\frac{1}{36}$ (b) $\frac{1}{12}$

(c) $\frac{4}{9}$ (d) $\frac{1}{9}$

Ans : (d)

First dice	+	Second dice	Score
1	+	4	= 5
2	+	3	= 5
3	+	2	= 5
4	+	1	= 5

Therefore, in tossing both dice together

Probability of getting sum of 5 = $\frac{\text{Obtained probability}}{\text{Total probability}}$

$= \frac{4}{6 \quad 6} \quad \frac{1}{3 \quad 3} \quad \frac{1}{9}$

38. In a random arrangement of the letters of the word 'ENGINEERING', what is the probability that vowels always occur together?

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $\frac{5}{7}$ (b) $\frac{1}{66}$

(c) $\frac{6}{11}$ (d) $\frac{1}{6}$

Ans : (b) $\because$ Probability = $\frac{\text{Favorable outcomes}}{\text{Total outcomes}}$

$\because$ Total outcomes = $\frac{\lfloor 11}{\lfloor 3 \quad \lfloor 3 \quad \lfloor 2 \quad \lfloor 2}$

and favorable outcomes = $\frac{\lfloor 7 \quad \lfloor 5}{\lfloor 3 \quad \lfloor 3 \quad \lfloor 2 \quad \lfloor 2}$

$$P \quad \frac{\frac{\lfloor 7 \quad \lfloor 5}{\lfloor 3 \quad \lfloor 3 \quad \lfloor 2 \quad \lfloor 2}}{\frac{\lfloor 11}{\lfloor 3 \quad \lfloor 3 \quad \lfloor 2 \quad \lfloor 2}}$$

$$P \quad \frac{\lfloor 7 \times \lfloor 5}{\lfloor 11} \quad \frac{\lfloor 5 \times \lfloor 7}{11 \quad 10 \quad 9 \quad 8 \quad \lfloor 7}$$

$$= \frac{5 \quad 4 \quad 3 \quad 2 \quad 1}{11 \quad 10 \quad 9 \quad 8} = \frac{1}{66}$$

39. A bag contains 30 balls numbered from 1 to 30. One ball is drawn at random. Find the probability that the number of the balls is neither a multiple of 5 nor of 6.

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$

(c) $\frac{1}{10}$ (d) $\frac{1}{5}$

Ans : (b) Total number of balls = 30

Probability the ball in neither the multiple of 5 nor 6

=(1,2,3,4,**7**,8,9,11,13,14,16,17,19,21,22,23,26,27,28,29

20 events

$\because$ Probability = $\frac{\text{Possible events}}{\text{Total events}}$

$\frac{20}{30} \quad \frac{2}{3}$

40. Letters are drawn one at a time from a box containing the letters A, H, M, O, S, T, R, E and E. What is the probability that the letters in the order spell the word THEMOARSE ?

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $\frac{2!}{9!}$ (b) $\frac{1}{9!}$

(c) $\frac{9!}{2!}$ (d) $9!$

Ans : (a)

Required probability = $\frac{1}{9} \times \frac{1}{8} \times \frac{2}{7} \times \frac{1}{6} \times \frac{1}{5} \times \frac{1}{4} \times \frac{1}{3} \times \frac{1}{2}$

$\frac{2}{9!}$

41. Twenty-five books are placed at random in a shelf. Find the probability that a particular pair of books shall be never together.

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $\frac{2}{25}$ (b) $\frac{23}{25}$

(c) $\frac{1}{25}$ (d) $\frac{4}{25}$

Ans : (b) Required probability $1 \quad \frac{24!\ 2!}{25!}$

$1 \quad \frac{2}{25} \quad \frac{23}{25}$

42. Probability of getting 53 Sundays in a particular leap year is–

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $\frac{2}{7}$ (b) $\frac{3}{7}$

(c) $\frac{1}{7}$ (d) $\frac{4}{7}$

Ans : (a) Number of days in a leap year = 366

means 52 weeks and 2 days

Those two days Monday and Tuesday

or

Tuesday and Wednesday

or

Wednesday and Thursday

or

Thursday and Friday

or

Friday and Sunday

or

Saturday and Sunday

or

Sunday and Monday

So Sunday will come in only two events

Required probability $\frac{2}{7}$

43. A and B are friends. The probability that they have same birthday is–

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $\frac{2}{365}$ (b) $\frac{1}{365}$

(c) $\frac{2}{366}$ (d) $\frac{1}{366}$

Ans : (b) A can celebrate on any day out of 365 days.

and B can also celebrate his birthday on any day out of 365 days.

Probability that A and B do not celebrate

$\frac{365}{365} \quad \frac{364}{365} \quad \frac{364}{365}$

Then probability that day both celebrate their birthday together $1 \quad \frac{364}{365} \quad \frac{1}{365}$

44. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is 5/6. Then the probability that he will knock down fewer than 2 hurdles is–

[SSC (Statistical Investigator) CGL Tier-II Paper-III 28.09.2013]

(a) $3 \quad \frac{5}{6}^{10}$ (b) $2 \quad \frac{5}{6}^{10}$

(c) $3 \quad \frac{6}{5}^{10}$ (d) $2 \quad \frac{6}{5}^{10}$

Ans : (b) $\because$ Number of total hurdles = 10

Probability of clearing the hurdle $\frac{5}{6}$

Probability of not clearing the hurdle $1 \quad \frac{5}{6} \quad \frac{1}{6}$

Probability of clearing at least two hurdle $n_{c_r} p^r q^{n-r}$

$^{10}C_1 \quad \frac{1}{6}^1 \quad \frac{5}{6}^9$

$10 \quad \frac{1}{6} \quad \frac{5}{6}^9 \quad 2 \quad 5 \quad \frac{1}{6} \quad \frac{5}{6}^9 \quad 2.0 \quad \frac{5}{6}^{10}$

45. Five salesmen, A, B, C, D and E, of a company are considered for a three member trade delegation to represent the company at an international trade conference. What is the probability that A gets selected?

(a) $\frac{1}{5}$ (b) $\frac{3}{5}$

(c) $\frac{2}{5}$ (d) $\frac{4}{5}$

RRB NTPC 01.03.2021 (Shift-I) Stage Ist

Ans. (b) : Probability of A, being selected

$$= \frac{\text{Favourable prospect}}{\text{Total prospect}}$$

$$\frac{{}^{3}C_{1}}{{}^{5}C_{1}} = \frac{\frac{3 \quad 2!}{2!}}{\frac{5 \quad 4!}{4!}} = \frac{3}{5}$$

46. There are 20 people in a party. If every person shakes hand with every other person, then what will be the total number of handshakes?

(a) 145 (b) 190

(c) 180 (d) 155

RRB NTPC 08.02.2021 (Shift-II) Stage I

Ans. (b) : The total number of handshakes = ${}^{20}C_2$

$$= \frac{20!}{2!\ (20-2)!} \qquad \left\{ \because {}^{n}C_{r} = \frac{n!}{r!(n-r)!} \right\}$$

$$\frac{20!}{2!\ 18!}$$

$$\frac{20 \quad 19 \quad 18!}{2 \quad 18!}$$

=190

47. A bag contains cards numbered between 33 and 92. If one card is drawn from the bag, the probability of the number on the drawn card is a perfect square is:

(a) $\frac{1}{12}$ (b) $\frac{5}{59}$

(c) $\frac{1}{15}$ (d) $\frac{4}{59}$

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (c) : Perfect square numbers between 33 and 92 are 36, 49, 64 and 81

We know that,

$$\text{Probability } P(E) \quad \frac{n(E)}{n(S)}$$

$$l \quad a \quad (n \quad 1)d$$

Where d = last term, a = First term, n = Total number

d = Difference

92 = 33+(n-1)1

92-33+1 = n

60 = n

$$P(E) \quad \frac{4}{60}$$

$$P(E) \quad \frac{1}{15}$$

48. Kings and Queens of black colour are taken out from a deck of 52 playing cards. A card is drawn from the remaining well-shuffled cards. Probability of getting a spade card is:

(a) $\frac{11}{13}$ (b) $\frac{11}{48}$

(c) $\frac{11}{52}$ (d) $\frac{1}{4}$

RRB NTPC 01.04.2021 (Shift-I) Stage Ist

Ans. (b) :

The total number of cards in a deck of cards = 52

The number of black cards = 13+13 = 26

Number of cards remaining after drawing the black colour of king and queen = 48

Number of spades in the remaining cards = 11

Probability of drawn cards being spades = $\frac{11}{48}$

49. A box contains 2 black, 6 green and 4 yellow balls. If 2 balls are picked up at random, the probability that both are green is:

(a) 1/6 (b) 1/22

(c) 3/11 (d) 5/22

RRB NTPC 13.03.2021 (Shift-II) Stage Ist

Ans. (d) : Total balls 2 + 6 + 4 = 12

$$\text{Probability of green balls} = \frac{{}^{6}c_{2}}{{}^{12}c_{2}} \quad \frac{\frac{6 \quad 5}{2 \quad 1}}{\frac{12 \quad 11}{2 \quad 1}}$$

$$\frac{30}{12 \quad 11}$$

$$\frac{5}{22}$$

50. A dice is cast twice, and the sum of the appearing numbers is 10. The probability that the number 5 has appeared at least once is:

(a) 2/3 (b) 1/4

(c) 1/2 (d) 1/3

RRB NTPC 13.03.2021 (Shift-II) Stage Ist

Ans. (d) : On throwing the dice twice

No. of probability of appearing the sum "10"

(4,6) (6,4) (5,5)

n(S) = 3

Probability that number '5' has appeared at least "once" = (5, 5)

n(E) = 1

$P(E) = \frac{n(E)}{n(S)} = \frac{1}{3}$

51. A letter of English alphabet is chosen at random. Probability of getting a vowel is:

(a) $\frac{5}{26}$ (b) $\frac{5}{21}$

(c) $\frac{1}{4}$ (d) $\frac{6}{25}$

RRB NTPC 03.03.2021 (Shift-II) Stage Ist

Ans. (a) :

Total letter in English alphabet n (s) = 26

Number of vowels = n(E) = 5

Probability of selected letter to be vowel

$\frac{n(E)}{n(s)}$

= 5/26

52. If 9 students are standing on a circular path, then the probability that 2 of them are always standing together is:

(a) $\frac{2}{7}$ (b) $\frac{1}{3}$

(c) $\frac{1}{4}$ (d) $\frac{7}{8}$

RRB NTPC 17.02.2021 (Shift-II) Stage Ist

Ans. (c) : As per the question,

Take 2 particular people as 1 unit

Then total outcomes (s) = (9-1)! = 8!

Hence,

Total number of events = 7! × 2!

Required probability = $\frac{7!\ 2!}{8!} = \frac{7!\ 2}{8!\ 7!} \quad \frac{2}{8} \quad \frac{1}{4}$

53. A box contains 6 white, 2 black and 3 red balls. if a ball is drawn at random, what is the probability that it will not be white?

(a) $\frac{5}{11}$ (b) $\frac{6}{11}$

(c) $\frac{5}{6}$ (d) $\frac{6}{5}$

RRB NTPC 09.01.2021 (Shift-I) Stage Ist

Ans. (a) : Total Ball = 6 + 2 + 3 = 11

Probability of an event P(E)

$\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

Number of favorable outcome of ball will not be white = 5

Total number of outcomes = Total Balls

So, probability of ball that will not be white $\frac{5}{11}$

54. There are 30 balls in a bag on which the numbers 1, 2, 3……30 are marked, one ball is drawn randomly from the bag. Find the probability that the number marked on the ball taken out of the bag is divisible by 4 or 6.

(a) $\frac{1}{15}$ (b) $\frac{2}{5}$

(c) $\frac{3}{10}$ (d) $\frac{1}{3}$

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (d) : The number of balls is 30

n (S) = 30

The number marked on the ball is divisible by 4 or 6.

· 4, 6, 8, 12, 16, 18, 20, 24, 28 and 30

n (A) = 10

Hence required probability P(A) = $\frac{n(A)}{n(S)} = \frac{10}{30} = \frac{1}{3}$

55. There are 20 balls in a bag which are numbered 1, 2, 3……20. Find the probability that the number marked on the ball taken out of the bag is divisible by 3 or 5.

(a) $\frac{1}{10}$ (b) $\frac{9}{20}$

(c) $\frac{2}{5}$ (d) $\frac{1}{2}$

RRB NTPC 06.04.2021 (Shift-II) Stage Ist

Ans. (b) : Number of balls is 20

n (s) = 20

The number of balls marked by a number divisible by 3 or 5

· 3, 5, 6, 9, 10, 12, 15, 18 and 20

n (A) = 9

Required probability P (A) = $\frac{n(A)}{n(s)} = \frac{9}{20}$

56. Two cards are drawn from a pack of 52 cards. The probability that out of 2 cards, one card is red and one card is black is :

(a) $\frac{26}{51}$ (b) $\frac{13}{25}$

(c) $\frac{25}{51}$ (d) $\frac{1}{2}$

RRB NTPC 08.03.2021 (Shift-II) Stage Ist

Ans. (a): The total number of cards is = 52
which has 26 red cards and 26 black cards.

$$n(S) \quad 52_{C_2} = \frac{52 \quad 51}{2 \quad 1} = 26 \times 51$$

and

$$n(E) \quad 26_{C_1} \quad 26_{C_1}$$

$$26 \quad 26$$

$$P(E) \quad \frac{n(E)}{n(S)}$$

Where,
P(E) = Probability
n(E) = Events to be founds
n(S) = Total possible events

$$P(E) \quad \frac{26 \quad 26}{26 \quad 51} \quad \frac{26}{51}$$

57. If tossing three coins at a time, the probability of getting at least one heads is:

(a) $\frac{1}{2}$ (b) $\frac{1}{8}$

(c) $\frac{3}{8}$ (d) $\frac{7}{8}$

RRB NTPC 04.03.2021 (Shift-I) Stage Ist [SSC (Statistical Investigator) CGL Tier-II Paper-III 25.10.2015]

Ans. (d) : Probability of results in tossing three coins at a time = {HHH, TTT, THT, TTH, HHT, HTH, THH, HTT}
So number of probable results at tossing three coins is 8
Now, Probable results of getting at least one head · {HHH, THT, TTH, HHT, HTH, THH, HTT}
So, number of probable results of getting at least one head · 7
Hence, Probability of getting at least one head $\frac{7}{8}$

58. What is the probability that a two digit number is not a prime number when a number is chosen at random?

(a) 7/30 (b) 23/30

(c) 21/90 (d) 67/90

RRB JE - 29/05/2019 (Shift-II)

Ans : (b) Total number of two digits = 90
Total prime numbers of two digits = 21
Total composite numbers of two digits = 69

Probability $\frac{\text{number of favourable results}}{\text{number of total results}} \quad \frac{69}{90} \quad \frac{23}{30}$

59. When a pair of dice is thrown, what is the probability of the sum of numbers being odd?

(a) 1 (b) 0.25

(c) 0.4 (d) 0.5

RRB JE - 29/05/2019 (Shift-II)

Ans : (d) When two dice are thrown,
The probability of occurrence of some event is n (s) = 36
The probability of odd sum of numbers = n (E) = 18
The probability that the sum is odd = $\frac{n(E)}{n(S)} \quad \frac{18}{36} \quad \frac{1}{2} = 0.5$

60. Satish puts 5 yellows and 3 blue balls in a closed box. His brother Manish picks two balls at random. Calculate the probability that balls picked are of the same colour.

(a) $\frac{15}{28}$ (b) $\frac{15}{23}$

(c) $\frac{13}{28}$ (d) $\frac{11}{23}$

RRB RPF Constable – 17/01/2019 (Shift-III)

Ans : (c) Number of total balls is 8
Probability of picking balls of the same colour

$$\frac{{}^5C_2 \quad {}^3C_2}{{}^8C_2} \qquad \left[{}^nc_r = \frac{n!}{r!\ n-r\ !} \right]$$

$$\frac{\frac{5!}{3!\ 2!} \quad \frac{3!}{1!\ 2!}}{\frac{8!}{2!\ 6!}}$$

$$\frac{\frac{5 \quad 4 \quad 3!}{2 \quad 1 \quad 3!} \quad \frac{3 \quad 2!}{2!\ 1}}{\frac{8 \quad 7 \quad 6!}{2 \quad 1 \quad 6!}}$$

$$\frac{\frac{5 \quad 4}{2 \quad 1} \quad 3}{\frac{8 \quad 7}{2 \quad 1}}$$

$$= \frac{\frac{5 \quad 4}{2} \quad 3}{8 \quad 7/2} = \frac{\frac{26}{2}}{\frac{56}{2}} = \frac{13}{28}$$

61. In a shooting competition, to hit a target, probability 1/2 for A, 2/3 for B and 3/4 for C. If they hit the target together, then what will be the probability of penetration for each of them?

(a) 1/6 (b) 3/8
(c) 2/3 (d) 1/4

RRB JE - 28/05/2019 (Shift-I)

Ans : (d) Probability of A goal (A) = $\frac{1}{2}$

And the probability of not penetrating the goals of A

$(A') = 1 \quad \frac{1}{2} \quad \frac{1}{2}$

Probability of B goal (B) = $\frac{2}{3}$

And probability of not hitting B goal (B') = $1 \quad \frac{2}{3} \quad \frac{1}{3}$

Probability of C's target (C) = $\frac{3}{4}$

and probability of not hitting the goals of

$(C') = 1 \quad \frac{3}{4} \quad \frac{1}{4}$

Probability of hitting the target of one when B and C are Hitting simultaneously

$= (A \times B' \times C') + (A' \times B \times C') + (A' \times B' \times C)$

$= \frac{1}{2} \times \frac{1}{3} \times \frac{1}{4} + \frac{1}{2} \times \frac{2}{3} \times \frac{1}{4} + \frac{1}{2} \times \frac{1}{3} \times \frac{3}{4}$

$= \frac{1}{24} + \frac{2}{24} + \frac{3}{24} = \frac{6}{24} = \frac{1}{4}$

62. One black, one red and one green dice are thrown together, what is the probability of sum of three numbers is ≥17

(a) 7/216 (b) 5/216
(c) 1/54 (d) 1/36

RRB JE - 30/05/2019 (Shift-III)

Ans : (c) The probability of the sum of the numbers exceeding from 17 or 17 when throwing all three passes together—

Favourable events = (5, 6, 6), (6, 5, 6), (6, 6, 5), (6,6,6)

Total events = $6 \quad 6 = 216$

Intended probability $\frac{4}{216} \quad \frac{1}{54}$

63. Find the probability that if a dice is thrown twice, the sum of the digits is 10.

(a) 3 (b) 1/36
(c) 1/12 (d) 5/36

RRB RPF SI – 05/01/2019 (Shift-II)

Ans : (c) 2 times a dice is thrown—

Total probability N (S) = $6^2 = 36$

The probability of the sum of digits being 10 is N(E) = (4, 6) (6, 4) (5, 5) = 3

So intended probability(E) = $\frac{N(E)}{N(S)} \quad \frac{3}{36} \quad \frac{1}{12}$

64. What will be the probability to remove face card from card dick?

(a) $\frac{6}{13}$ (b) $\frac{12}{13}$
(c) $\frac{3}{13}$ (d) $\frac{3}{26}$

RRB Group-D – 12/10/2018 (Shift-I)

Ans. (c) : Total number of cards = 52

Number of face card = 12

so probability of face card = $\frac{12}{52} \quad \frac{3}{13}$

65. To ace out the deck of cards probability can be

(a) $\frac{12}{13}$ (b) $\frac{15}{26}$
(c) $\frac{9}{13}$ (d) $\frac{1}{13}$

RRB Group-D – 16/10/2018 (Shift-I)

Ans. (d) : The number of card is 52.

The number of Ace in deck of card is 4.

Probability of getting ace out of the deck of cards

$= \frac{4}{52} \quad \frac{1}{13}$

66. A box contains 100 pens, out of which eight are defective. One pen is out from the box. Find the probability that the pen is not defective.

(a) 23/25 (b) 8/100
(c) 100/8 (d) 25/23

RRB Group-D – 29/10/2018 (Shift-III)

Ans : (a)

Number of total pens = 100

Number of waste pens = 8

Probability of taking waste pens $\frac{8}{100}$

Probability of not having waste pen

$1 \quad \frac{8}{100} \quad \frac{2}{100} \quad \frac{23}{25}$

67. When a coin is tossed once, what are the probability of coming Head?

(a) 1 (b) 1/2
(c) 2 (d) Zero

RRB NTPC 29.04.2016 Shift : 1

Ans : (b) Head favorable probability when a coin is tossed is one

Required probability = $\frac{\text{Favourable events}}{\text{total events}} = \frac{1}{2}$

So probability to come Head $\frac{1}{2}$