Sure shots (1 Mark) Solutions

1.

Comparing the equation $2x^2 - 5x + 7 = 0$ with $ax^2 + bx + c = 0$,

$a = 2,\ b = -5,$

The values of a and b are **2** and **−5** respectively.

2.

$t_n = 4n - 3.$

Taking $n = 2$,

$t_2 = 4 \times 2 - 3$

$= 8 - 3$

$= 5$

The second term is **5**.

3.

$\text{CGST} = \text{SGST} = \frac{\text{GST}}{2}$

$\therefore \text{CGST} = \text{SGST} = \frac{12\%}{2} = 6\%$

The rate of CGST and SGST each is **6%**.

4.

The true lower class limit of the class 5−9 is **4.5**.

[The difference between the upper class limit of a class and the lower class limit of its succeeding class is 1.

$\therefore$ subtract $1 \div 2 = 0.5$ from the lower class limit of the class 5−9.]

5.

$5x - 2y = 10$ ... (1)

$x + 8y = 26$ ... (2)

$6x + 6y = 36$ ... [Adding equations (1) and (2)]

$x + y = 6$ ... (Dividing both the sides by 6)

The value of $x + y$ is **6**.

6.

$\alpha + \beta = -6,\ \alpha\beta = 4$

The required quadratic equation is $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$\therefore x^2 - (-6)x + 4 = 0$. i.e. $x^2 + 6x + 4 = 0$

The quadratic equation is $\mathbf{x^2 + 6x + 4 = 0}$.

7.

MV = ₹ 50, Brokerage = 0.2%

Brokerage per share = MV × Rate of brokerage

$$= ₹\,50 \times \frac{0.2}{100} = ₹\,0.10$$

The brokerage is **₹ 0.10**.

8.

$\Sigma f_i d_i = 18,\ \Sigma f_i = 15,\ \overline{d} = ?$

$$\overline{d} = \frac{\Sigma f_i d_i}{\Sigma f_i}$$

$$= \frac{18}{15}$$

$\therefore\ \overline{d} = 1.2$

$\overline{d} = \mathbf{1.2}$.

9.

$$D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} 1 & 1 \\ 3 & -2 \end{vmatrix} = 1 \times (-2) - 1 \times 3$$

$$= -2 - 3 = -5$$

$D = -\mathbf{5}$.

10.

Substitute $m = \frac{5}{2}$.

$\text{LHS} = 2m^2 - 5m$

$$= 2\left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right)$$

$$= 2 \times \frac{25}{4} - \frac{25}{2}$$

$$= \frac{25}{2} - \frac{25}{2} = 0$$

$\text{RHS} = 0$

$m = \mathbf{\frac{5}{2}}$ **is the root** of the given quadratic equation.

11.

$$P(A) = \frac{n(A)}{n(S)} \qquad \therefore\ \frac{3}{4} = \frac{24}{n(S)}$$

$$\therefore\ n(S) = \frac{24 \times 4}{3} \qquad \therefore\ n(S) = 32$$

$n(S) = \mathbf{32}$.

12.

The mean $(\overline{X}) = \dfrac{\Sigma f_i x_i}{\Sigma f_i}$

$$= \frac{3880}{100} = 38.80$$

The mean $(\overline{X})$ is **38.80**.

13.

Substitute $y = 2$ in the equation $4x + 3y = 18$.

$4x + 3(2) = 18 \quad \therefore\ 4x + 6 = 18 \quad \therefore\ 4x = 18 - 6$

$\therefore\ 4x = 12 \quad \therefore\ x = 3.$

The value of x is **3**.

14.

The first term $= a = t_1 = 7,\ d = -5.$

$t_2 = t_1 + d = 7 - 5 = 2.$

$t_3 = t_2 + d = 2 - 5 = -3.$

The second term is **2** and the third term is $-$**3**.

15.

MV $=$ FV $+$ Premium ... (Premium is on FV)

$= ₹\,10 + 20\%$ of $₹\,10 = ₹\,10 + \dfrac{20}{100} \times ₹\,10 = ₹\,10 + ₹\,2 = ₹\,12$

The MV of the share is **₹ 12**.

16.

To convert $\dfrac{1}{5}$ into percentage.

$$\frac{\frac{1}{5} \times 100}{100} = \frac{20}{100} = 20\%$$

$\dfrac{1}{5}$ is written in percentage as **20%**.

17.

$\dfrac{x}{7} - \dfrac{y}{8} = 1.$

$\therefore\ \dfrac{x}{7} \times 56 - \dfrac{y}{8} \times 56 = 1 \times 56$ ... (Multiplying the equation by 56)

$\therefore\ 8x - 7y = 56.$

$\mathbf{8x - 7y = 56}$.

18.

$d = t_n - t_{n-1} = t_5 - t_4 = 14 - 12 = 2$

The common difference $(d) = \mathbf{2}$.

19.

CGST = ₹45.

$\text{CGST} = \frac{1}{2} \times \text{GST} \qquad \therefore \frac{1}{2} \times \text{GST} = 45 \qquad \therefore \text{GST} = 45 \times 2 = ₹90$

GST is ₹**90**.

20.

$S = \{H, T\}$

$n(S) = \mathbf{2}$.

Sure shots (2 Marks) Solutions

21.

$$\begin{vmatrix} 2\sqrt{3} & 9 \\ 2 & 3\sqrt{3} \end{vmatrix} = 2\sqrt{3} \times \boxed{\mathbf{3\sqrt{3}}} - 9 \times \boxed{\mathbf{2}}$$

$$= \boxed{\mathbf{18}} - 18 = \boxed{\mathbf{0}}$$

22.

Colour	Number of bicycles	Measure of the central angle
White	12	$\boxed{\frac{\mathbf{12}}{\mathbf{36}}} \times 360° = \boxed{\mathbf{120}°}$
Black	10	$\frac{10}{36} \times 360° = 100°$
Blue	6	$\frac{6}{36} \times 360° = \boxed{\mathbf{60}°}$
Red	8	$\frac{8}{360} \times 360° = \boxed{\mathbf{80}°}$
Total	36	360°

23.

$-\frac{3}{4}$ is a root of the quadratic equation $4x^2 - 17x + k = 0$.

Substitute $x = -\frac{3}{4}$ in the equation.

$\therefore 4 \times \left(-\frac{3}{4}\right)^2 - 17 \times \boxed{-\frac{\mathbf{3}}{\mathbf{4}}} + k = 0$

$\therefore \boxed{\frac{\mathbf{9}}{\mathbf{4}}} + \frac{51}{4} + k = 0$

$\therefore \boxed{\mathbf{15}} + k = 0$

$\therefore k = \boxed{\mathbf{-15}}$

24.

$5x + 4y = 14$ ... (1) $4x + 5y = 13$ ... (2)

Adding equations (1) and (2),

$$\begin{aligned} 5x + 4y &= 14 \quad \text{... (1)} \\ 4x + 5y &= 13 \quad \text{... (2)} \\ \hline 9x + 9y &= 27 \end{aligned}$$

$\therefore x + y = 3$ ... (Dividing both the sides by 9) ... (3)

Subtracting equation (2) from equation (1),

$$\begin{aligned} 5x + 4y &= 14 \quad \text{... (1)} \\ 4x + 5y &= 13 \quad \text{... (2)} \\ - \quad - \quad & \quad - \\ \hline x - y &= 1 \end{aligned}$$ ... (4)

Ans. $x + y = \mathbf{3}$; $x - y = \mathbf{1}$.

25.

Comparing $3x^2 - 4x - 4 = 0$ with $ax^2 + bx + c = 0$, $a = 3$, $b = -4$, $c = -4$

$\Delta = b^2 - 4ac = (-4)^2 - 4(3)(-4)$

$= 16 + 48 = 64$

Here, $\Delta > 0$.

Ans. The roots are **real** and **unequal**.

26.

Here, $a = t_1 = 3$, $t_2 = 8$, $t_3 = 13$, $t_4 = 18$, ...

$d = t_2 - t_1 = 8 - 3 = 5$. We have to find t_{30}.

$t_n = a + (n-1)d$ ... (Formula)

$\therefore t_{30} = 3 + (30 - 1) \times 5$ ... (Substituting the values)

$= 3 + 29 \times 5$

$= 3 + 145$

$= 148$

Ans. The 30th term is **148**.

27.

Here, $N = 100$ $\therefore \frac{N}{2} = 50$

Ans. (a) The 50th score is in the class 40–60.

$\therefore$ **40–60** is the median class.

(b) The class interval (h) is **20**.

(c) The *cf* of the class preceding the median class is **24**.

(d) The lower limit of the median class is **40**.

28.

$a = 12,\ d = 4,\ t_n = 96,\ n = ?$

$t_n = a + (n-1)d$ ... (Formula)

$\therefore\ 96 = 12 + (n-1) \times 4$ ... (Substituting the values)

$\therefore\ 96 - 12 = (n-1) \times 4$

$\therefore\ (n-1) \times 4 = 84$

$\therefore\ n - 1 = 21$ ... (Dividing both the sides by 4)

$\therefore\ n = 21 + 1$

$\therefore\ n = 22$

Ans. The value of n is **22**.

29.

Adding the given equations,

$3x + 2y = 29$ ... (1)

$10x - 2y = 36$ ... (2)

$13x = \boxed{65}$ $\therefore\ x = \boxed{5}$

Substituting the value of x in equation (1),

$15 + 2y = 29$ $\therefore\ 2y = \boxed{14}$ $\therefore\ y = \boxed{7}$

30.

$\sqrt{3}x^2 + 4x - 7\sqrt{3} = 0$

$\therefore\ \sqrt{3}x^2 + \boxed{7x} - 3x - 7\sqrt{3} = 0$

$\therefore\ x(\sqrt{3}x + 7) - \sqrt{3}(\sqrt{3}x + 7) = 0$

$\therefore\ \boxed{(\sqrt{3}x + 7)}(x - \sqrt{3}) = 0$

$\therefore\ \sqrt{3}x + 7 = 0$ or $\boxed{x - \sqrt{3}} = 0$

$\therefore\ x = -\dfrac{7}{\sqrt{3}}$ or $x = \boxed{\sqrt{3}}$.

31.

Class	18 – 19	19 – 20	20 – 21	**21 – 22**
Class mark	18.5	19.5	**20.5**	21.5
Frequency	4	**13**	15	19
Coordinates of the point	**(18.5, 4)**	(19.5, 13)	(20.5, 15)	(21.5, 19)

32.

$$\begin{array}{l} 5x + 3y = 31 \quad \dots (1) \\ 3x + 5y = 25 \quad \dots (2) \\ \hline 8x + 8y = 56 \end{array}$$
... [Adding equations (1) and (2)]

$\therefore x + y = 7$ ... (Dividing both the sides by 8)

Subtracting equation (2) from equation (1),

$$\begin{array}{l} 5x + 3y = 31 \quad \dots (1) \\ 3x + 5y = 25 \quad \dots (2) \\ - \quad - \quad - \\ \hline 2x - 2y = 6 \end{array}$$

$\therefore x - y = 3$ ... (Dividing both the sides by 2)

Ans. The value of $(x+y)$ is **7**; the value of $(x-y)$ is **3**.

33.

$2y^2 + 27y + 13 = 0$

$2 \times 13 = 26$ → 26, 1

$\therefore 2y^2 + 26y + y + 13 = 0$

$\therefore 2y(y+13) + 1(y+13) = 0$

$\therefore (y+13)(2y+1) = 0$

$\therefore y + 13 = 0$ or $2y + 1 = 0$

$\therefore y = -13$ or $2y = -1$

$\therefore y = -\frac{1}{2}$

Ans. $\mathbf{-13, -\frac{1}{2}}$ are the roots of the given quadratic equation.

34.

NAV of one unit is ₹25.

Amount invested = ₹ 10,000

Number of units $= \frac{\text{Sum invested}}{\text{NAV}}$

$= \frac{10000}{25} = 400$

Ans. 400 units will be allotted.

35.

Let S be the sample space.

Then $S = \{\text{HH, HT, TH, TT}\}$ $\therefore n(S) = 4$

Event A of getting one head.

$\therefore A = \{\text{HT, TH}\}$ $\therefore n(A) = 2$

$P(A) = \frac{n(A)}{n(S)}$ ... (Formula)

$\therefore P(A) = \frac{2}{4}$ $\therefore P(A) = \frac{1}{2}$

Ans. The probability of event A is $\mathbf{\frac{1}{2}}$.

36.

$$\text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$= 60 + \left[\frac{100 - 70}{2(100) - 70 - 80}\right] \times 20$$

$$= 60 + \left(\frac{30}{200 - 150}\right) \times 20$$

$$= 60 + \frac{30}{50} \times 20$$

$$= 60 + 12 = 72$$

Ans. The mode is **72**.

37.

$$\begin{vmatrix} 3 & 2 \\ 4 & 5 \end{vmatrix} = 3 \times \boxed{5} - \boxed{2} \times 4$$

$$= \boxed{15} - 8 = \boxed{7}$$

38.

$$4x^2 - 5x + 3 = 0$$

Here, $a = 4$, $b = \boxed{-5}$, $c = 3$

$$b^2 - 4ac = (-5)^2 - \boxed{4} \times 4 \times 3$$

$$= \boxed{25} - 48 = \boxed{-23}$$

39.

Places	**Supply of electricity** (Thousand units)	**Measure of the central angle**
Roads	4	$\frac{4}{30} \times 360° = 48°$
Factories	12	$\boxed{\frac{12}{30}} \times 360° = 144°$
Shops	6	$\frac{6}{30} \times 360° = \boxed{72°}$
Houses	8	$\boxed{\frac{8}{30}} \times 360° = \boxed{96°}$
Total	30	360°

40.

$$\begin{vmatrix} 4 & 5 \\ m & 3 \end{vmatrix} = 22$$

$\therefore\ 4 \times 3 - 5 \times m = 22$

$\therefore\ 12 - 5m = 22$

$\therefore\ -5m = 22 - 12$

$\therefore\ -5m = 10$

$\therefore\ m = \frac{10}{-5} \qquad \therefore\ m = -2$

Ans. The value of m is $\mathbf{-2}$.

41.

$\frac{2}{3}$ is the root of the quadratic equation $kx^2 - 20x + 12 = 0$.

$\therefore$ substitute $x = \frac{2}{3}$ in the equation.

$\therefore\ k\left(\frac{2}{3}\right)^2 - 20\left(\frac{2}{3}\right) + 12 = 0$

$\therefore\ \frac{4}{9}k - \frac{40}{3} + 12 = 0$

$\therefore\ 4k - 120 + 108 = 0$ ... (Multiplying the equation by 9)

$\therefore\ 4k = 120 - 108$

$\therefore\ 4k = 12$

$\therefore\ k = \frac{12}{4}$

$\therefore\ k = 3$

Ans. The value of k is **3**.

42.

$a = t_1 = 6,\ d = -3.$

$t_2 = t_1 + d = 6 - 3 = 3,$

$t_3 = t_2 + d = 3 - 3 = 0,$

$t_4 = t_3 + d = 0 - 3 = -3,\ ...$

Ans. 6, 3, 0, $-$3, ... is the required A.P.

43.

Let S be the sample space.

Then $S = \{HH, HT, TH, TT\}$

$\therefore\ n(S) = \mathbf{4}$.

44.

The difference between the upper class limit of a class and the lower class limit of its succeding class is 1.

$\therefore\ 1 \div 2 = 0.5$.

To make the classes continuous, subtract 0.5 from the lower class limit of each class and add 0.5 to the upper class limit of each class.

Class	Continuous classes
2–3	1.5–3.5
4–5	3.5–5.5
6–7	4.5–7.5
8–9	7.5–9.5

45.

x	0	**5**	2
y	**−4**	1	**−2**
(x, y)	$(0, -4)$	**(5, 1)**	$(2, -2)$

46.

$x^2 + 7x - 1 = 0$

Comparing $x^2 + 7x - 1 = 0$ with $ax^2 + bx + c = 0$,

$a = 1,\ b = 7,\ c = \boxed{-1}$

$b^2 - 4ac = \boxed{7^2} - 4 \times 1 \times (-1)$

$= 49 + \boxed{4}$

$= \boxed{53}$.

47.

FV = ₹ 10, premium 50%. $\therefore$ premium = $\boxed{₹\,5}$

MV = $\boxed{\text{FV}}$ + Premium = ₹ 10 + ₹ 5 = ₹ 15.

The number of shares $= \dfrac{\boxed{\text{Investment}}}{\text{MV}}$

$= \dfrac{1200}{15} = \boxed{80}$

48.

$$\begin{vmatrix} 3\sqrt{6} & -4\sqrt{2} \\ 5\sqrt{3} & -2 \end{vmatrix} = 3\sqrt{6}\times(-2)-(-4\sqrt{2})\times(5\sqrt{3})$$
$$= -6\sqrt{6}+20\sqrt{6}$$
$$= 14\sqrt{6}.$$

Ans. The value of the determinant is $\mathbf{14\sqrt{6}}$.

49.

Comparing $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$ with $ax^2 + bx + c = 0$,

$a = \sqrt{3},\ b = -2\sqrt{2},\ c = -2\sqrt{3}$

Δ (discriminant) $= b^2 - 4ac$

$$= (-2\sqrt{2})^2 - 4(\sqrt{3})(-2\sqrt{3})$$
$$= 8 + 24$$
$$= 32$$

Ans. The value of the discriminant is **32**.

50.

$t_n = 5 - 11n$

Taking $n = 1,\ t_1 = 5 - 11\times1 = 5 - 11 = -6$

Taking $n = 2,\ t_2 = 5 - 11\times2 = 5 - 22 = -17$

$d = t_2 - t_1 = -17 - (-6) = -17 + 6 = -11$

Ans. The value of d is $\mathbf{-11}$.

51.

The trader collected ₹30,000 as GST.

$\therefore$ his output tax is ₹30,000.

His ITC is ₹22,000

Payable GST = Output tax − ITC

$$= ₹(30000 - 22000) = ₹8000$$

$\text{CGST} = \frac{1}{2}\times\text{GST} = \frac{1}{2}\times ₹8000 = ₹4000$

Ans. CGST payable by the trader is **₹4000**.

52.

$\Sigma f_i = 100$, $\Sigma f_i d_i = 185$, mean $(\overline{X}) = 38.85$

$$\overline{d} = \frac{\Sigma f_i d_i}{\Sigma f_i} = \frac{185}{100} = 1.85$$

Mean $(\overline{X}) = A + \overline{d}$

$\therefore\ 38.85 = A + 1.85$

$\therefore\ A = 38.85 - 1.85$

$\therefore\ A = 37.$

Ans. The assumed mean $(A) = \mathbf{37}$.

53.

Adding equations (1) and (2),

$5x + 3y = 9 \qquad \ldots (1)$

$2x - 3y = 12 \qquad \ldots (2)$

$\boxed{7x} = 21 \qquad \therefore\ x = \boxed{3}$

Substituting the value of x in equation (1),

$\boxed{5 \times 3} + 3y = 9 \qquad \therefore\ 3y = \boxed{-6} \qquad \therefore\ y = -2.$

54.

-2 is the root of the quadratic equation $2x^2 + kx - 2 = 0$.

$\therefore$ substitute $x = -2$ in the equation.

$2 \times \boxed{(-2)^2} + k \times \boxed{-2} - 2 = 0$

$\therefore\ 8 - \boxed{2k} - 2 = 0$

$\therefore\ -2k = \boxed{-6} \qquad \therefore\ k = 3.$

55.

Output tax in this example is ₹ **2,50,000**

Input tax in this example is ₹ **1,80,000**

GST payable = Output tax − ITC

$= ₹\left(250000 - \boxed{180000}\right)$

$= ₹\ \boxed{70,000}$

56.

Let the greater number be x and the smaller number be y.

From the first condition, $x+y=27$ ... (1)

Twice the greater number $=2x$.

From the second condition, $2x-y=18$ ... (2)

Adding equations (1) and (2),

$$\begin{array}{rcl} x + y &=& 27 \quad \text{... (1)} \\ 2x - y &=& 18 \quad \text{... (2)} \\ \hline 3x &=& 45 \end{array}$$

$\therefore x=\frac{45}{3}$ $\therefore x=15$

Substituting $x=15$ in equation (1),

$x+y=27$ $\therefore 15+y=27$ $\therefore y=27-15$ $\therefore y=12$

Ans. The required numbers are **15** and **12**.

57.

$x^2-2x-15=0$

$\therefore x^2-5x+3x-15=0$

$\therefore x(x-5)+3(x-5)=0$

$\therefore (x-5)(x+3)=0$

$\therefore x-5=0$ or $x+3=0$

$\therefore x=5$ or $x=-3$

Ans. **5**, **−3** are the roots of the quadratic equation.

58.

The two-digit numbers divisible by 7 are 14, 21, 28, ..., 98.

Here, $a=t_1=14$, $d=7$, $t_n=98$

$t_n=a+(n-1)d$ ... (Formula)

$\therefore 98=14+(n-1)\times 7$ ... (Substituting the values)

$\therefore 98-14=(n-1)\times 7$

$\therefore (n-1)\times 7=84$ $\therefore n-1=\frac{84}{7}$ $\therefore n-1=12$

$\therefore n=12+1$ $\therefore n=13$

Ans. The two-digit numbers divisible by 7 are **13**.

59.

FV of the share is ₹ 100. Dividend 20%.

$\therefore$ dividend on 1 share of FV ₹ 100 is ₹ 20.

On investing ₹ 80 (MV of the share), the dividend received is ₹ 20.

The rate of return $=\frac{\text{Dividend}}{\text{MV}}\times 100$

$=\frac{20}{80}\times 100=25\%$

Ans. The rate of return on investment is **25%**.

60.

Class	Class mark x_i	Frequency f_i	Class mark × Frequency $x_i f_i$
20–40	30	4	120
40–60	50	5	250
60–80	70	7	490
80–100	90	4	360
Total		$\Sigma f_i = 20$	$\Sigma x_i f_i = 1220$

$$\text{Mean} = \overline{X} = \frac{\Sigma x_i f_i}{\Sigma f_i} = \frac{1220}{20} = 61$$

Ans. The mean of the data is **61**.

Sure shots (3 Marks) Solutions

61.

$5x^2 + 13x + 8 = 0$

Comparing with $ax^2 + bx + c = 0$, we ge

$a = 5,\ b = \boxed{13},\ c = 8.$

$b^2 - 4ac = (13)^2 - 4 \times 5 \times 8$

$= 169 - 160 = \boxed{9}$

$$x = \frac{\boxed{-b} \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-\boxed{13} \pm \sqrt{9}}{2 \times 5}$$

$\therefore\ x = \frac{-13 + 3}{10}$ or $x = \frac{-\boxed{13} - 3}{10}$

$\therefore\ x = -1$ or $x = \boxed{-\frac{8}{5}}$

62.

$S = \{0, 1, 2, 3, 4, 5\}$ $\quad \therefore\ n(S) = 6.$

(a) Let A be the event that a card drawn shows a natural numb

$A = \left\{\boxed{1, 2, 3, 4, 5}\right\}$ $\quad \therefore\ n(A) = \boxed{5}$

$P(A) = \boxed{\frac{n(A)}{n(S)}}$

$\therefore\ P(A) = \frac{5}{6}$

(b) Let B be the event that a card shows a number less than 3.

$B = \{\boxed{0, 1, 2}\}$ $\quad\quad \therefore n(B) = \boxed{3}$

$P(B) = \boxed{\dfrac{n(B)}{n(S)}}$

$\therefore P(B) = \boxed{\dfrac{1}{2}}$

63.

Let the Pragati's is present age be x years.

Her age 2 years ago was $(x-2)$ years and her age 3 years from now will be $(x+3)$ years.

The numbers denoting the ages are $(x-2)$ and $(x+3)$.

From the given condition,

$(x-2)(x+3) = 84$

$\therefore x(x+3) - 2(x+3) = 84$

$\therefore x^2 + 3x - 2x - 6 - 84 = 0$

$\therefore x^2 + x - 90 = 0$

$\therefore x^2 + 10x - 9x - 90 = 0$

$\therefore x(x+10) - 9(x+10) = 0$

$\therefore (x+10)(x-9) = 0$

$\therefore x + 10 = 0 \quad$ or $\quad x - 9 = 0$

$\therefore x = -10 \quad$ or $\quad x = 9$

But the age cannot be negative.

$\therefore x = -10$ is unacceptable.

$\therefore x = 9$

Ans. Pragati's present age is **9 years**.

64.

The even numbers between 1 and 350 are 2, 4, 6, 8, ..., 348.

Here, $a = t_1 = 2$, $d = t_2 - t_1 = 4 - 2 = 2$, $t_n = 348$.

First we find n.

$t_n = a + (n-1)d$ ... (Formula)

$\therefore 348 = 2 + (n-1) \times 2$ ... (Substituting the values)

$\therefore 348 - 2 = (n-1) \times 2$

$\therefore (n-1) \times 2 = 346 \quad \therefore n - 1 = \frac{346}{2} \qquad \therefore n - 1 = 173$

$\therefore n = 173 + 1 \quad \therefore n = 174$

Now, $S_n = \frac{n}{2}(t_1 + t_n)$ ... (Formula)

$\therefore S_{174} = \frac{174}{2}(2 + 348)$ ... (Substituting the values)

$\therefore S_{174} = 87 \times 350 = 30450.$

Ans. The sum of all even numbers between 1 and 350 is **30450**.

65.

The printed price of washing machine is ₹40,000. 5% discount.

$\therefore$ discount $= \frac{5}{100} \times 40000 =$ ₹2000

$\therefore$ actual SP of the washing machine is ₹$(40000 - 2000) =$ ₹38000

₹38,000 is the taxable value.

GST 28 %

$\therefore$ GST $= \frac{28}{100} \times 38000 =$ ₹10640

CGST = SGST $= \frac{1}{2} \times$ GST

$\therefore$ CGST = SGST $= \frac{1}{2} \times 10640 =$ ₹5320

The actual cost of washing machine to Prasad = ₹38000 + ₹10640 (GST) = ₹48640.

Ans. Purchase price of washing machine for Prasad is **₹48,640.**

CGST is ₹**5320;** SGST is ₹**5320**.

66.

Class Daily sale (₹)	**Class mark** x_i	$d_i = x_i - A$ $= x_i - 2250$	**Frequency (Number of vendors)** f_i	**Frequency × deviations** $f_i d_i$
1000–1500	1250	− 1000	15	− 15000
1500–2000	1750	− 500	20	− 10000
2000–2500	$2250 \to A$	0	35	0
2500–3000	2750	500	30	15000
Total			$\Sigma f_i = 100$	$\Sigma f_i d_i = -10000$

Here, $\Sigma f_i d_i = -10000$, $\Sigma f_i = 100$

$$\overline{d} = \frac{\Sigma f_i d_i}{\Sigma f_i} = \frac{-10000}{100} = -100$$

$$\text{Mean} = \overline{X} = A + \overline{d}$$

$$= 2250 - 100 = 2150$$

Ans. The mean of sale is ₹**2150**.

67.

(a) **175** students show inclination towards mathematics.

$$\left(\frac{126^\circ}{360^\circ} \times 500 = 175\right).$$

(b) **75** students show inclination towards social science.

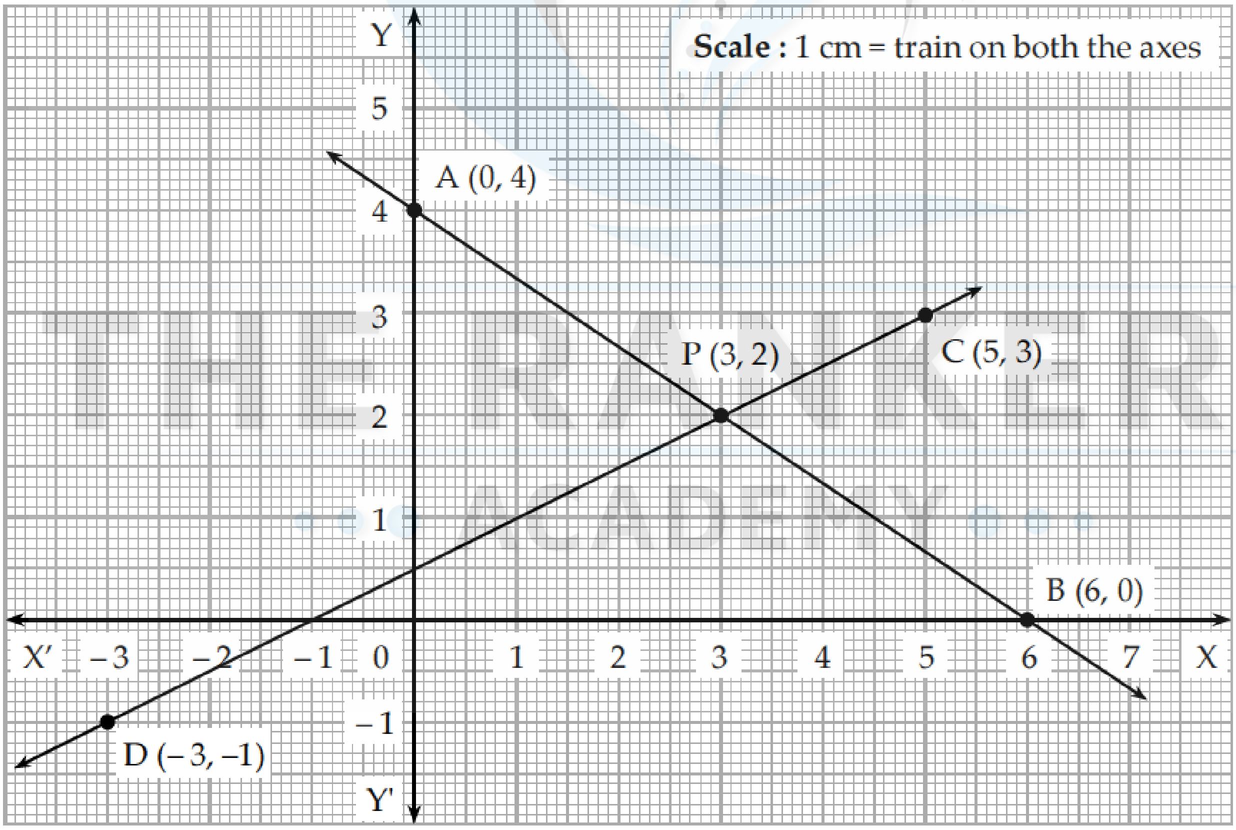
$$\left(\frac{54^\circ}{360^\circ} \times 500 = 75\right).$$

(c) Central angle for languages is 108° and that for science is 72°. The difference is $(108^\circ - 72^\circ) = 36^\circ$.

36° represents 50 students.

50 more students are inclined towards languages than science.

68.



Let P be the point of intersection of the lines AB and CD.

The coordinates of the point P are (3, 2).

69.

FV = ₹ 100; Number of shares = 150; MV = ₹ 125.

The sum invested = MV × Number of shares

= **₹ 125** × **150** = ₹ 18750

Dividend per share = FV × Rate of dividend

= **₹ 100** × $\frac{\mathbf{8}}{100}$ = ₹ 8

Total dividend = 150 × 8 = **₹ 1200**

$$\text{Rate of return} = \frac{\text{Dividend income}}{\text{Sum invested}} \times 100$$

$$= \frac{1200}{18750} \times 100 = \mathbf{6.4\%}$$

70.

Marks	Class mark (x_i)	Frequency (f_i)	$f_i x_i$
0–10	5	**3**	15
10–20	15	10	**150**
20–30	25	20	500
30–40	**35**	5	175
40–50	45	2	90
Total		$\Sigma f_i = 40$	$\Sigma f_i x_i =$ **930**

$$\text{Mean} = \overline{X} = \frac{\Sigma f_i x_i}{\Sigma f_i} \quad \text{... (Formula)}$$

$$= \frac{930}{40} \quad \text{... (Substituting the values)}$$

∴ mean = **23.25**.

71.

Let the father's present age be x years and the son's present age be y years.

Twice the age of son = $2y$ years.

From the first condition,

$x + 2y = 70$ ... (1)

Double the age of father = $2x$ years

From the second condition,

$2x + y = 95$ ... (2)

Multiplying equation (1) by 2,

$2x+4y=140$ ... (3)

Subtracting equation (2) from equation (3),

$$\begin{array}{rrrl} 2x + & 4y = & 140 & \text{... (3)} \\ 2x + & y = & 95 & \text{... (2)} \\ - \quad - & & - & \\ \hline & 3y = & 45 & \end{array}$$

$\therefore y=15$ ... (Dividing both the sides by 3)

Substituting $y=15$ in equation (1),

$x+2y=70$

$\therefore x+2(15)=70$

$\therefore x+30=70$

$\therefore x=70-30$

$\therefore x=40$

Ans. The father's present age is **40 years** and the son's present age is **15 years**.

72.

Let α and β be the roots of the quadratic equation.

From the given information,

$\alpha+\beta=5$ ... (1) and $\alpha^3+\beta^3=35$ ... (2)

$\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)$ ... (Identity)

$=(5)^3-3\alpha\beta(5)$ ... [From (1)]

$=125-15\alpha\beta$

$\therefore 125-15\alpha\beta=35$ ... [From (2)]

$\therefore 15\alpha\beta=125-35$

$\therefore 15\alpha\beta=90$

$\therefore \alpha\beta=6$ ... (Dividing by 15) ... (3)

The required quadratic equation is

$x^2-(\alpha+\beta)x+\alpha\beta=0$

$\therefore x^2-5x+6=0$ ... [From (1) and (3)]

Ans. The required equation is $\boldsymbol{x^2-5x+6=0}$.

73.

Let the three parts of 207, which are in A.P. be $a-d$, a and $a+d$.

$a-d+a+a+d=207$ ... (Given)

$\therefore 3a=207$

$\therefore\ a=\frac{207}{3}$

$\therefore\ a=69$ ... (1)

The product of $(a-d)$ and a is 4623 ... (Given)

$\therefore\ (a-d)\times a=4623$

$\therefore\ (69-d)\times 69=4623$ ... (Substituting $a=69$)

$\therefore\ 69-d=\frac{4623}{69}$

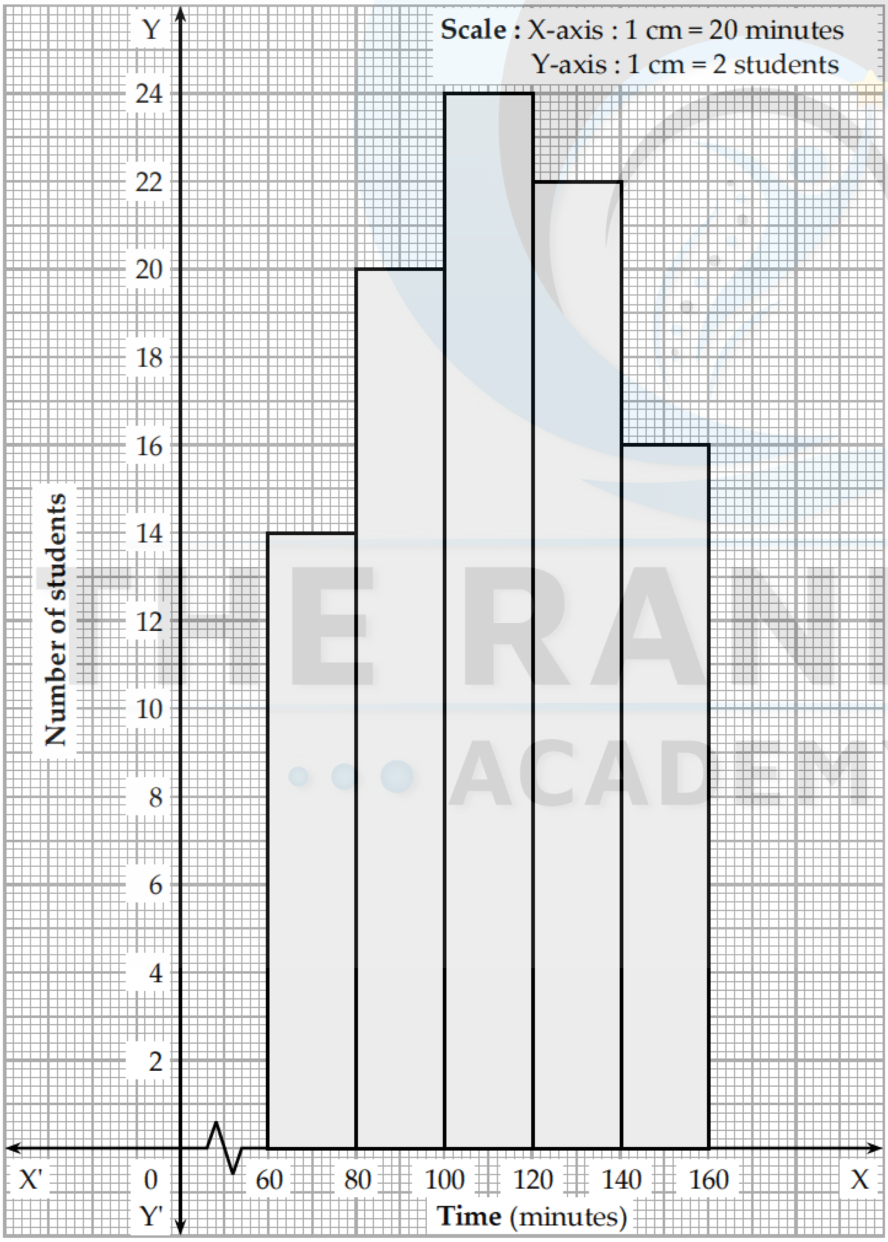
$\therefore\ 69-d=67$

$\therefore\ 69-67=d \qquad \therefore\ d=2.$

Now, $a-d=69-2=67$, $a=69$, $a+d=69+2=71$.

Ans. The required three parts of 207 are **67**, **69** and **71**.

74.



75.

Step 1 : Comparing $x^2+2\sqrt{3}x+3=0$ with $ax^2+bx+c=0$, $a=1$, $b=2\sqrt{3}$, $c=3$.

Step 2 : $b^2-4ac=(2\sqrt{3})^2-4(1)(3)=12-12=0$.

Step 3 : $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ ... (Formula)

Step 4 : $x=\dfrac{-2\sqrt{3}\pm\sqrt{0}}{2\times 1}=\dfrac{-2\sqrt{3}}{2}=-\sqrt{3}$

Here, the value of $b^2-4ac=0$.

$\therefore$ the roots are real and equal

Ans. $-\sqrt{3}$, $-\sqrt{3}$ are the roots of the given quadratic equation.

76.

The box contains 90 cards.

$\therefore S=\{1, 2, 3, 4, ..., 89, 90\}$ $\therefore n(S)=90$

Event A : The card drawn is a two-digit even number.

$\therefore A=\{10, 12, 14, ..., 86, 88, 90\}$ $\therefore n(A)=41$

$P(A)=\dfrac{n(A)}{n(S)}$ $\therefore P(A)=\dfrac{41}{90}$

Event B : The card drawn is a perfect square number.

$\therefore B=\{1, 4, 9, 16, 25, 36, 49, 64, 81\}$ $\therefore n(B)=9$

$P(B)=\dfrac{n(B)}{n(S)}$ $\therefore P(B)=\dfrac{9}{90}$ $\therefore P(B)=\dfrac{1}{10}$

Ans. The probability of event A is $\mathbf{\dfrac{41}{90}}$. The probability of event B is $\mathbf{\dfrac{1}{10}}$.

77.

Comparing $\sqrt{3}x^2+\sqrt{2}x-2\sqrt{3}=0$ with $ax^2+bx+c=0$,

$a=\sqrt{3}$, $b=\sqrt{2}$, $c=\boxed{-2\sqrt{3}}$.

$\Delta=b^2-4ac=\boxed{(\sqrt{2})^2}-4\times\boxed{\sqrt{3}}\times(-2\sqrt{3})$

$=2+\boxed{24}=26$

$\Delta>0$.

The roots are **real** and **unequal**.

78.

Here, $a = 10,\ d = 5,\ S_{30} = ?$

$$S_n = \frac{n}{2}\left[\boxed{2a} + (n-1)d\right]$$

$$\therefore S_{30} = \frac{30}{2}\left[20 + (30-1)\times \boxed{5}\right]$$

$$= \boxed{15} \times \left[20 + \boxed{145}\right]$$

$$= 15 \times \boxed{165} = \boxed{2475}$$

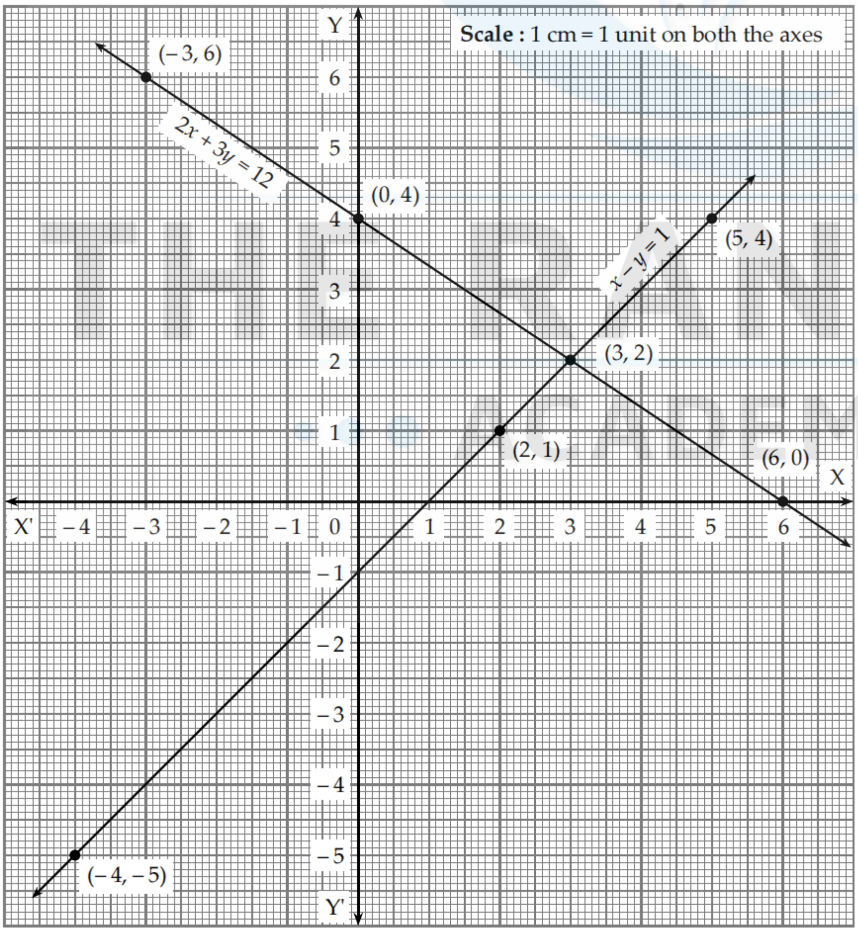
79.

$2x + 3y = 12 \qquad \therefore 3y = 12 - 2x \qquad \therefore y = \frac{12-2x}{3}$

x	-3	0	3	6
y	6	4	2	0
(x, y)	$(-3, 6)$	$(0, 4)$	$(3, 2)$	$(6, 0)$

$x - y = 1 \qquad \therefore x - 1 = y \qquad \therefore y = x - 1$

x	-4	2	3	5
y	-5	1	2	4
(x, y)	$(-4, -5)$	$(2, 1)$	$(3, 2)$	$(5, 4)$



The coordinates of the point of intersection are (3, 2).

Ans. The solution of the given simultaneous equations is $x=\mathbf{3}$ and $y=\mathbf{2}$.

80.

The given equation is $y^2-2y-7=0$.

Here, $a=1$, $b=-2$, $c=-7$.

$$\alpha+\beta=-\frac{b}{a}=-\frac{-2}{1}=2 \quad \text{... (1)}$$

$$\alpha\beta=\frac{c}{a}=\frac{-7}{1}=-7 \quad \text{... (2)}$$

(a) $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$ (Identity)

$=(2)^2-2(-7)$ ... [From (1) and (2)]

$=4+14=18.$

(b) $\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)$ ... (Identity)

$=(2)^3-3(-7)(2)$ ... [From (1) and (2)]

$=8+42=50$

Ans. (a) $\alpha^2+\beta^2=\mathbf{18}$ (b) $\alpha^3+\beta^3=\mathbf{50}$.

81.

The numbers between 1 and 145 divisible by 4 are 4, 8, 12, ..., 140, 144.

This is an A.P. with the first term $a=t_1=4$, $d=4$, $t_n=144$.

Let us find the value of n.

$t_n=a+(n-1)d$ ... (Formula)

$\therefore\ 144=4+(n-1)\times 4$ ... (Substituting the values)

$\therefore\ 144=4+4n-4$

$\therefore\ 4n=144$

$\therefore\ n=\frac{144}{4}$

$\therefore\ n=36$

Now, we find the sum of these 36 terms.

$S_n=\frac{n}{2}[t_1+t_n]$ ... (Formula)

$\therefore\ S_{36}=\frac{36}{2}[4+144]$ ... (Substituting the values)

$=18\times 148$

$=2664$

Ans. The required sum is **2664**.

82.

FV = ₹10, MV = ₹25, Number of shares = 100.

(a) The sum invested = MV × Number of shares

$= ₹25 \times 100$

$= ₹2500.$

(b) Dividend per share = FV × Rate of dividend

$= ₹10 \times \frac{20}{100}$

$= ₹2.$

∴ total dividend received = Dividend per share × Number of shares

$= ₹2 \times 100$

$= ₹200.$

(c) Rate of return $= \frac{\text{Dividend income}}{\text{Sum invested}} \times 100$

$= \frac{200}{2500} \times 100$

$= 8\%$

Ans. (a) The sum invested is **₹2500**. (b) Dividend received is **₹200.**

(c) Rate of return is **8%**.

83.

The opposite angles of a cyclic quadrilateral are supplementary.

$\therefore m\angle A + m\angle C = 180°$

$\therefore \angle A + \angle C = 180$ ... (1)

From the given condition,

$\therefore m\angle A = 2\ m\angle C$

i.e. $\angle A = 2\angle C$ ... (2)

Substituting the values of $\angle A$ from (2) in (1),

$\angle A + \angle C = 180$

$\therefore 2\angle C + \angle C = 180$

$\therefore 3\angle C = 180 \quad \therefore \angle C = \frac{180}{3} \quad \therefore \angle C = 60$

$\angle A = 2\angle C = 2 \times 60 = 120$

Ans. $m\angle A = \mathbf{120°}$, $m\angle C = \mathbf{60°}$.

84.

Age (years)	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35
Number of patients	36	$32 \to f_0$	$50 \to f_1$	$38 \to f_2$	24	20

Here, the maximum frequency (50) is in the class 15 – 20.

$\therefore$ the modal class is 15 – 20.

$L = 15,\ f_1 = 50,\ f_0 = 32,\ f_2 = 38,\ h = 5.$

$$\text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h \qquad \text{... (Formula}$$

$$= 15 + \left[\frac{50 - 32}{2(50) - 32 - 38}\right] \times 5$$

$$= 15 + \left(\frac{18}{100 - 70}\right) \times 5$$

$$= 15 + \frac{18}{30} \times 5$$

$$= 15 + 3$$

$$= 18$$

Ans. The mode of ages of patients is **18 years**.

85.

Sr. No.	HSN code	Name of Product	Quantity	Rate	Taxable amount (₹)	CGST Rate	CGST Tax ₹	SGST Rate	SGST Tax ₹	Total (₹)
1.	8507	Mobile battery	1	₹ 200	**200**	6%	12	**6%**	12	224
2.	8518	Head phone	1	₹ 750	750	9%	**67.50**	9%	67.50	**885**
				Total ₹			**79.50**		79.50	**1109**

86.

Let the number of blue balls be x.

$\therefore\ n(B) = x.$

The number of red balls $= 8$. $\quad \therefore\ n(R) = 8$

The total number of balls $= (x + 8)$ $\quad \therefore\ n(S) = (x + 8).$

The probability of getting a red ball,

$$P(R) = \boxed{\frac{n(R)}{n(S)}} \qquad \text{... (Formula)}$$

$\therefore\ P(R)=\frac{8}{x+8}$ ... (1)

The probability of getting a blue ball,

$P(B)=\frac{n(B)}{n(S)}$ $\therefore\ P(B)=\boxed{\frac{x}{x+8}}$ ... (2)

From the given condition,

$\frac{P(R)}{P(B)}=\boxed{\frac{2}{3}}$ ... (3)

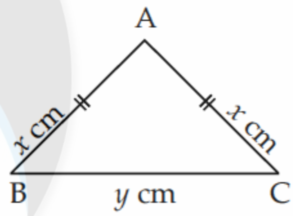
From (1), (2) and (3),

$\boxed{\frac{8}{x+8}}\div\frac{x}{x+8}=2:3$

$\therefore\ \boxed{\frac{8}{x}}=\frac{2}{3}$ $\therefore\ x=\boxed{12}$

87.

Let the length of congruent sides be x cm each and the length of the base be y cm.



4 less than twice the length of congruant sides $=2x-4$

$\therefore\ y=2x-4.$ ... (1)

The parimeter of the triangle = the sum of the lengths of all the sides.

$=(x+x+y)$ cm

The perimeter is given to be 28 cm.

$\therefore\ x+x+y=28$ $\therefore\ 2x+y=28$ ... (2)

Substituting the value of y from equation (1) in equation (2),

$2x+y=28$

$\therefore\ 2x+2x-4=28$ $\therefore\ 4x=28+4$ $\therefore\ 4x=32$

$\therefore\ x=8$

Substituting $x=8$ in equation (1),

$y=2x-4$ $\therefore\ y=2\times8-4$ $\therefore\ y=16-4$ $\therefore\ y=12$

Ans. The lengths of the sides of the triangle are **8 cm**, **8 cm** and **12 cm**.

88.

Let the divisor be x. Then the quotient is $(4x-3)$.

Dividend $=$ divisor $\times$ quotient $+$ remainder.

$\therefore\ 546 = x(4x-3)+6$

$\therefore\ 546 = 4x^2-3x+6 \qquad \therefore\ 4x^2-3x+6=546$

$\therefore\ 4x^2-3x+6-546=0 \qquad \therefore\ 4x^2-3x-540=0$

$\therefore\ 4x^2-48x+45x-540=0$

$$4\times(-540) = 4\times(-12)\times 45 \rightarrow -48+45$$

$\therefore\ 4x(x-12)+45(x-12)=0$

$\therefore\ (x-12)(4x+45)=0 \qquad \therefore\ x-12=0$ or $4x+45=0$

$\therefore\ x=12$ or $4x=-45 \qquad \therefore\ x=-\frac{45}{4}$

$-\frac{45}{4}$ is not a natural number. $\therefore\ x=-\frac{45}{4}$ is unacceptable.

$\therefore\ x=12,\ 4x-3=4\times 12-3=48-3=45$

Ans. The qotient is **45** and the divisor is **12**.

89.

The number on the cards are from 0 to 9.

$\therefore\ S=\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \qquad \therefore\ n(S)=10$

(a) Let A be the event that the card drawn shows a prime number.

Then $A=\{2, 3, 5, 7\} \qquad \therefore\ n(A)=4$

$P(A)=\frac{n(A)}{n(S)} \qquad \therefore\ P(A)=\frac{4}{10} \qquad \therefore\ P(A)=\frac{2}{5}$

(b) Let B be the event that the card drawn shows a number more than 4.

$\therefore\ B=\{5, 6, 7, 8, 9\} \qquad \therefore\ n(B)=5$

$P(B)=\frac{n(B)}{n(S)} \qquad \therefore\ P(B)=\frac{5}{10}=\frac{1}{2}$

(c) Let C be the event that the card drawn shows a number multiple of 3.

$\therefore\ C=\{3, 6, 9\} \qquad \therefore\ n(C)=3$

$P(C)=\frac{n(C)}{n(S)} \qquad \therefore\ P(C)=\frac{3}{10}$

Ans. (a) $\mathbf{\frac{2}{5}}$ (b) $\mathbf{\frac{1}{2}}$ (c) $\mathbf{\frac{3}{10}}$

90.

Let us take 550 as the assumed mean.

Then $A=550$ and deviation $d_i = x_i - A = x_i - 550$

Class Toll (in ₹)	Class mark x_i	Deviations $d_i = x_i - A$ $d_i = x_i - 550$	Frequency (Number of vehicles) f_i	Frequency × deviation $f_i \times d_i$
300−400	350	−200	80	−16000
400−500	450	−100	110	−11000
500−600	550 → A	0	120	0
600−700	650	100	70	7000
700−800	750	200	40	8000
Total			$\Sigma f_i = 420$	$\Sigma f_i d_i = -12000$

Here, $\Sigma f_i d_i = -12000$, $\Sigma f_i = 420$

$$\overline{d} = \frac{\Sigma f_i d_i}{\Sigma f_i} = \frac{-12000}{420} \approx -28.57$$

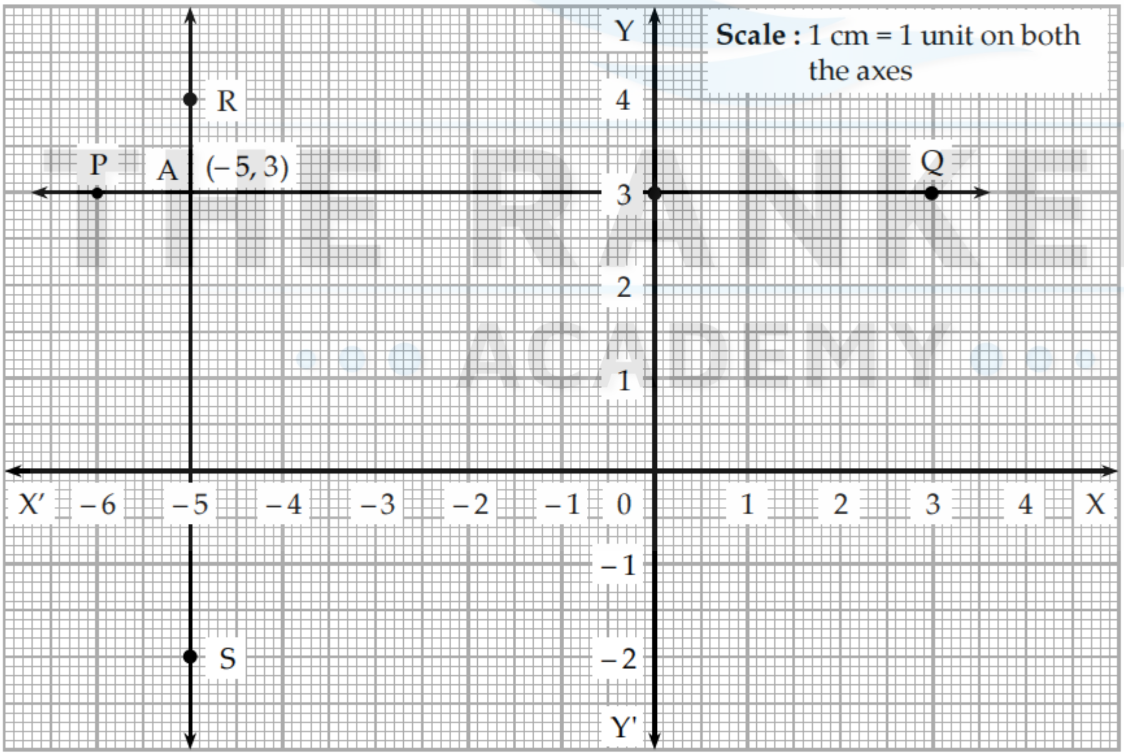
$$\text{Mean} = \overline{X} = A + \overline{d}$$

$$= 550 + (-28.57)$$

$$= 550 - 28.57 = 521.43.$$

Ans. The mean of toll is **₹521.43**.

91.



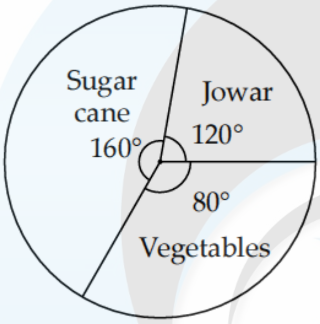
The coordinates of the point (A) of intersection of the lines PQ and RS are (−5, 3).

92.

The areas in hectares are converted into component parts of 360° in the following table :

Crop	Area in hectares	Measure of the central angle
Jowar	60	$\frac{60}{180}\times 360° = 120°$
Sugar cane	80	$\frac{80}{180}\times 360° = 160°$
Vegetables	40	$\frac{40}{180}\times 360° = 80°$
Total	180	360°

On the basis of the table, the pie diagram is drawn :



93.

Brokerage per share $= \boxed{\textbf{MV}} \times$ The rate of brokerage

$$= ₹5000 \times \frac{0.1}{100} = ₹\boxed{5}$$

GST on brokerage = Rate of GST × Brokerage

$$= \frac{18}{100} \times 5 = ₹\boxed{0.90}$$

The amount received after sale

$= MV - \left(\boxed{\textbf{Brokerage + GST}}\right)$

$= ₹5000 - \boxed{₹(5 + 0.90)}$

$= ₹\boxed{4994.10}$

94.

S is the sample space.

$\therefore\ n(S) = 52$

(a) Event A : The card drawn is an ace.

$\therefore\ n(A) = \boxed{4}$

$$P(A)=\boxed{\frac{n(A)}{n(S)}}$$

$$\therefore P(A)=\frac{\boxed{4}}{52}$$

$$\therefore P(A)=\frac{\boxed{1}}{13}$$

(b) Event B : The card drawn is a club.

$$\therefore n(B)=\boxed{13}$$

$$P(B)=\frac{n(B)}{n(S)}$$

$$\therefore P(B)=\frac{\boxed{1}}{4}.$$

95.

Let the number of students be x and the amount given to each student be ₹ y.

Then the total amount distributed is ₹ xy.

From the first condition,

$(x+10)(y-2)=xy$

$\therefore xy-2x+10y-20=xy$

$\therefore -2x+10y=20$

$\therefore -x+5y=10$ ... (Dividing both the sides by 2) ... (1)

From the second condition,

$(x-15)(y+6)=xy$

$\therefore xy+6x-15y-90=xy$

$\therefore 6x-15y=90$

$\therefore 2x-5y=30$ ... (Dividing both the sides by 3) ... (2)

Adding equations (1) and (2),

$-x+5y=10$ ... (1)

$2x-5y=30$ ... (2)

$x=40$ $\therefore$ the number of students is 40.

Substituting $x=40$ in equation (1),

$-x+5y=10$

$\therefore -40+5y=10$ $\therefore 5y=10+40$ $\therefore 5y=50$

$\therefore y=\frac{50}{5}$ $\therefore y=10.$

The total amount $=₹\ xy=40\times10=₹\ 400.$

Ans. The number of students is **40** and the amount distributed is ₹ **400**.

96.

Comparing $x^2-13x+k=0$ with $ax^2+bx+c=0,$

$a=1,\ b=-13,\ c=k.$

Let α and β be the roots of the given quadratic equation.

Let $\alpha>\beta$.

$\alpha+\beta=-\frac{b}{a}=-\frac{-13}{1}=13$ ... (1)

$\alpha-\beta=7$ ... (Given) ... (2)

Adding equations (1) and (2),

$\alpha+\beta=13$ ... (1)

$\alpha-\beta=7$ ... (2)

$2\alpha=20$ $\therefore \alpha=10$

Substituting $\alpha=10$ in equation (1),

$\alpha+\beta=13$

$\therefore 10+\beta=13$

$\therefore \beta=13-10$

$\therefore \beta=3.$

Now, $\alpha\times\beta=\frac{c}{a}$

$\therefore 10\times3=\frac{k}{1}$ $\therefore k=30$

Ans. The value of k is **30**.

97.

There are 30 tickets in a box.

$\therefore S=\{1, 2, 3, ..., 28, 29, 30\}$ $\therefore n(S)=30$

Event A : The ticket drawn bears an odd number.

$\therefore A=\{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29\}$

$\therefore n(A)=15$

$P(A)=\frac{n(A)}{n(S)}$ $\therefore P(A)=\frac{15}{30}$ $\therefore P(A)=\frac{1}{2}$

Event B : The ticket drawn bears a complete cube number.

$\therefore B=\{1, 8, 27\}$ $\therefore n(B)=3.$

$P(B)=\frac{n(B)}{n(S)}$ $\therefore P(B)=\frac{3}{30}$ $\therefore P(B)=\frac{1}{10}$

Ans. The probability of event A is $\frac{1}{2}$. The probability of event B is $\frac{1}{10}$.

98.

Class (Maximum temperatures °C)	**Class mark** x_i	**Frequency** (Number of towns) f_i	**Class mark × frequency** $x_i f_i$
24–28	26	4	104
28–32	30	5	150
32–36	34	7	238
36–40	38	8	304
40–44	42	6	252
Total		$N=\Sigma f_i=30$	$\Sigma x_i f_i=1048$

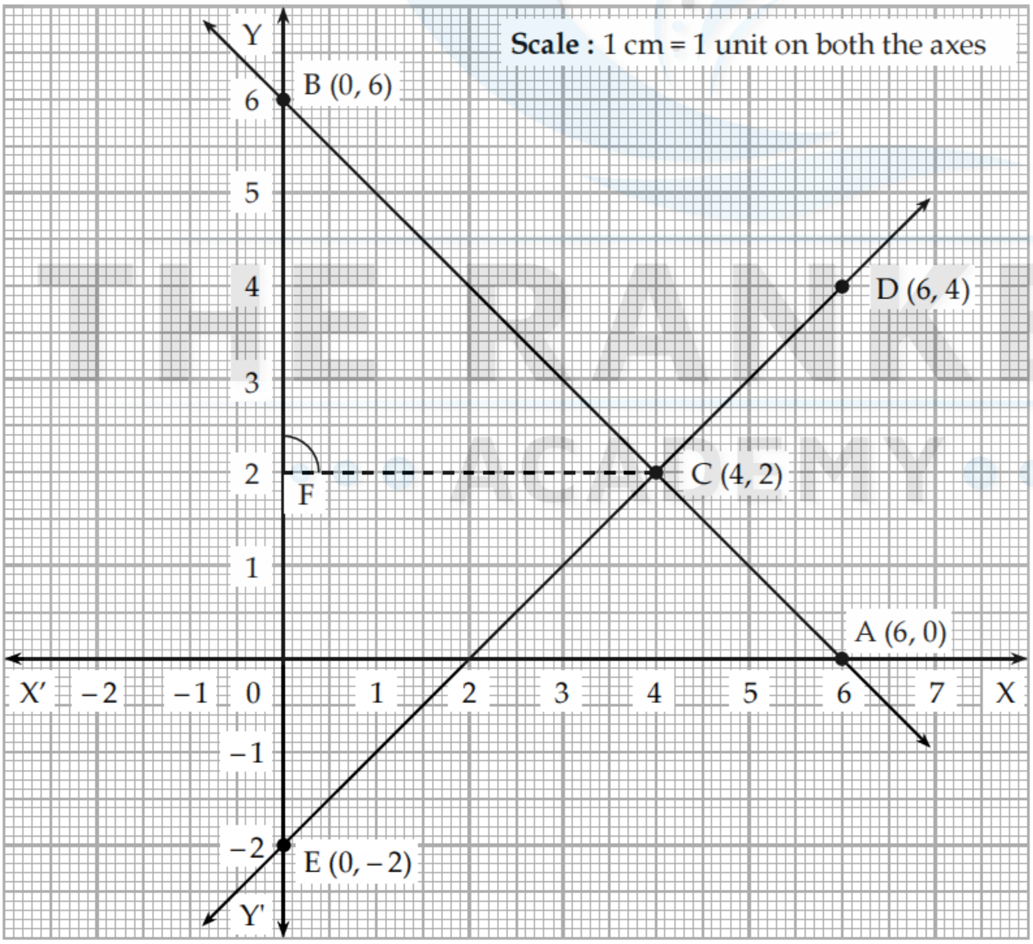
$$\text{Mean} = \overline{X} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$= \frac{1048}{30}$$

$$\approx 34.9.$$

Ans. The mean of maximum temperatures is **34.9 °C**.

99.



$\triangle$ BCE is formed by the lines AB, DE and the Y-axis.

Base BE $= d(\text{B, E}) = 6 - (-2) = 6 + 2 = 8$.

Height CF $= 4$ units.

$$A(\triangle) = \frac{1}{2} \times \text{base} \times \text{height}$$

$$\therefore A(\triangle BCE) = \frac{1}{2} \times BE \times CF$$

$$= \frac{1}{2} \times 8 \times 4 = 16 \text{ sq units.}$$

Ans. The area of the triangle formed by the lines with Y-axis is **16 sq units**.

100.

Here, total number of frequencies $N = \Sigma f_i = 100$

$$\therefore \frac{N}{2} = \frac{100}{2} = 50.$$

Cumulative frequency which is just greater than 50 is 60.

$\therefore$ the corresponding class $90 - 95$ is the median class.

$L = 90, f = 30, cf = 30, h = 5$

$$\text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

$$= 90 + \left[\frac{50 - 30}{30}\right] \times 5$$

$$= 90 + \frac{20}{30} \times 5$$

$$= 90 + 3.33 = 93.33$$

Ans. The median daily wages is **₹93.33**.

Sure shots (4 Marks) Solutions

101.

Let the digit at the units place be x and the digit at the tens place be y. Then the original number is $10y + x$.

Five times the sum of the digits $= 5(x + y)$.

From the first condition, $10y + x = 5(x + y) - 8$.

$\therefore 10y + x - 5x - 5y = -8 \quad \therefore 5y - 4x = -8 \quad \therefore -4x + 5y = -8$ ... (1)

The number obtained by interchanging the digits $= 10x + y$.

From the second condition, $10x + y = 10y + x + 27$.

$\therefore 10x + y - 10y - x = 27 \quad \therefore 9x - 9y = 27 \quad \therefore x - y = 3$ ... (2)

Multiplying equation (2) by 4, $4x - 4y = 12$ ... (3)

Adding equations (1) and (3),

$$\begin{aligned} -4x+5y &= -8 \quad \dots (1) \\ 4x-4y &= 12 \quad \dots (3) \\ \hline y &= 4 \end{aligned}$$

Substituting $y=4$ in equation (2),

$x-y=3 \quad \therefore x-4=3 \quad \therefore x=7$

The original number $=10y+x$

$=10\times4+7$

$=47$

Ans. The original number is **47**.

102.

FV $=$ ₹100, MV $=$ ₹250.

Brokerage at 2% on MV ₹250 $=250\times\frac{0.2}{100}=$ ₹0.50

GST on brokerage at 18% $=0.50\times\frac{18}{100}=$ ₹0.09

Investment for 1 share $=$ MV $+$ Brokerage $+$ GST

$=$ ₹$(250+0.50+0.09)=$ ₹250.59

Investment is ₹25,059.

(a) The number of shares purchased $=\frac{\text{Investment}}{\text{Investment for one share}}=\frac{25059}{250.59}=100$

(b) Brokerage per share $=$ ₹0.50

$\therefore$ brokerage on 100 shares $=$ ₹$0.50\times100=$ ₹50

(c) GST on brokerage $=18\%\times50=\frac{18}{100}\times50=$ ₹9

Ans. (a) **100** shares were purchased (b) Brokerage paid **₹50**

(c) GST paid for trading **₹9**.

103.

There are 3 face cards of diamond. These cards are removed.

$\therefore n(S)=52-3=49.$

(a) Let A be the event that a card drawn at random is a black face card.

There are 6 black face cards.

$\therefore n(A)=6.$

$P(A)=\frac{n(A)}{n(S)}$ $\therefore P(A)=\frac{6}{49}$

(b) Let B be the event that a card drawn at random is a king.

There are 3 cards of king. (Diamond king is removed.)

$\therefore n(B)=3.$

$P(B)=\frac{n(B)}{n(S)}$ $\therefore P(B)=\frac{3}{49}$

(c) Let C be the event that a card drawn at random is a red card.

There are 26 red cards. 3 red cards of diamond are removed.

$\therefore n(C)=23.$

$P(C)=\frac{n(C)}{n(S)}$ $\therefore P(C)=\frac{23}{49}$

(d) Let D be the event that a card drawn at random is a black card.

There are 26 black cards (13 of spade and 13 of club).

$\therefore n(D)=26.$

$P(D)=\frac{n(D)}{n(S)}$ $\therefore P(D)=\frac{26}{49}$

Ans. (a) $\mathbf{\frac{6}{49}}$ (b) $\mathbf{\frac{3}{49}}$ (c) $\mathbf{\frac{23}{49}}$ (d) $\mathbf{\frac{26}{49}}$.

104.

Let the digit at the hundreds place be x and the digit at the units place be y.

The middle digit, i.e. the digit at the tens place is $\frac{x+y}{2}$.

H	T	U
x	$\frac{x+y}{2}$	y

$\therefore$ the number is $100x+10\left(\frac{x+y}{2}\right)+y$

$=100x+5x+5y+y$

$=105x+6y.$

The sum of the digits is 12. ... (Given)

$\therefore x+\frac{x+y}{2}+y=12$

$\therefore 2x+x+y+2y=24$ ... (Multiplying both the sides by 2)

$\therefore 3x+3y=24$

$\therefore x+y=8$ ... (Dividing both the sides by 3) ... (1)

Reversing the digits :

H	T	U
y	$\frac{x+y}{2}$	x

$\therefore$ the number obtained by reversing the digits

$=100y+10\left(\frac{x+y}{2}\right)+x$

$=100y+5x+5y+x$

$= 105y + 6x$

From the second condition,

$105x + 6y - (105y + 6x) = 198$

$\therefore\ 105x + 6y - 105y - 6x = 198$

$\therefore\ 99x - 99y = 198$

$\therefore\ x - y = 2$ ... (Dividing both the sides by 99) ... (2)

Adding equations (1) and (2),

$$\begin{array}{rl} x + y = 8 & \quad \text{... (1)} \\ x - y = 2 & \quad \text{... (2)} \\ \hline 2x \quad = 10 & \end{array}$$

$\therefore\ x = \frac{10}{2}$ $\quad \therefore\ x = 5$

Substituting $x = 5$ in equation (1),

$x + y = 8$

$\therefore\ 5 + y = 8 \quad \therefore\ y = 8 - 5 \quad \therefore\ y = 3.$

The number is $105x + 6y = 105 \times 5 + 6 \times 3 = 525 + 18 = 543$

Ans. The number is **543**.

105.

Here, $a = 12$, $d = 3$ months $= \frac{1}{4}$ years, i.e. $\frac{1}{4}$

Let the number of boys in the group be n. $S_n = 375$.

$S_n = \frac{n}{2}[2a + (n-1)d]$ ... (Formula)

$\therefore\ 375 = \frac{n}{2}\left[2 \times 12 + (n-1) \times \frac{1}{4}\right]$ ... (Substituting the values)

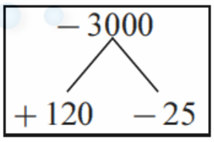
$\therefore\ 375 \times 2 = n\left(24 + \frac{n-1}{4}\right)$

$\therefore\ 750 = n\left(\frac{96 + n - 1}{4}\right)$

$\therefore\ 750 \times 4 = n\ (95 + n)$

$\therefore\ 3000 = 95n + n^2$ i.e. $n^2 + 95n - 3000 = 0$

$\therefore\ n^2 + 120n - 25n - 3000 = 0$



$\therefore\ n(n + 120) - 25(n + 120) = 0$

$\therefore\ (n + 120)(n - 25) = 0$

$\therefore\ n + 120 = 0$ or $n - 25 = 0$

$\therefore\ n = -120$ or $n = 25$

But the number of boys cannot be negative.

$\therefore\ n = -120$ is unacceptable. $\quad \therefore\ n = 25.$

Ans. The number of boys in the group is **25**.

106.

Let the purchase price of the printer be ₹ x.

GST 18% $\therefore$ GST $= x \times \frac{18}{100} = ₹\frac{18x}{100}$

$\therefore$ purchase price with GST $= ₹\left(x + \frac{18x}{100}\right) = ₹\frac{118x}{100}$

The price of printer with GST is ₹ 8260 ... (Given)

$\therefore \frac{118x}{100} = 8260$

$\therefore x = 8260 \times \frac{100}{118} = 70 \times 100 = ₹7000$ ... (Taxable value)

Input tax credit by Laxmi Electronics $= ₹(8260 - 7000)$

$= ₹1260$ ... (1)

Let the selling price of the printer be ₹ y.

GST 18% $\therefore$ GST $= y \times \frac{18}{100} = ₹\frac{18y}{100}$

$\therefore$ selling price with GST $= ₹\left(y + \frac{18y}{100}\right) = ₹\frac{118y}{100}$

The selling price of printer with GST is ₹ 10,030 ... (Given)

$\therefore \frac{118y}{100} = 10030$ $\therefore y = 10030 \times \frac{100}{118}$

$\therefore y = 85 \times 100 = ₹8500$ ... (Taxable value)

$\therefore$ GST collected on selling $= ₹(10030 - 8500) = ₹1530$ ... (2)

Output tax by Laxmi Electronics $= ₹1530$

GST payable $=$ Output tax $-$ ITC

$= ₹(1530 - 1260)$ ... [From (2) and (1)]

$= ₹270$

Now, CGST $=$ SGST $= \frac{1}{2} \times$ GST $= \frac{1}{2} \times 270 = ₹135$

Ans. The taxable value of printer in each case is **₹ 7000** and **₹ 8500**.

CGST $=$ SGST $=$ **₹ 135** to be paid by Laxmi Electronics.

107.

$15 + a + 30 + b + 15 + 10 = 100$

$\therefore a + b + 70 = 100$ $\therefore a + b = 100 - 70$ $\therefore a + b = 30$ ... (1)

Now, $a = 2b$ Substituting the value of a in equation (1),

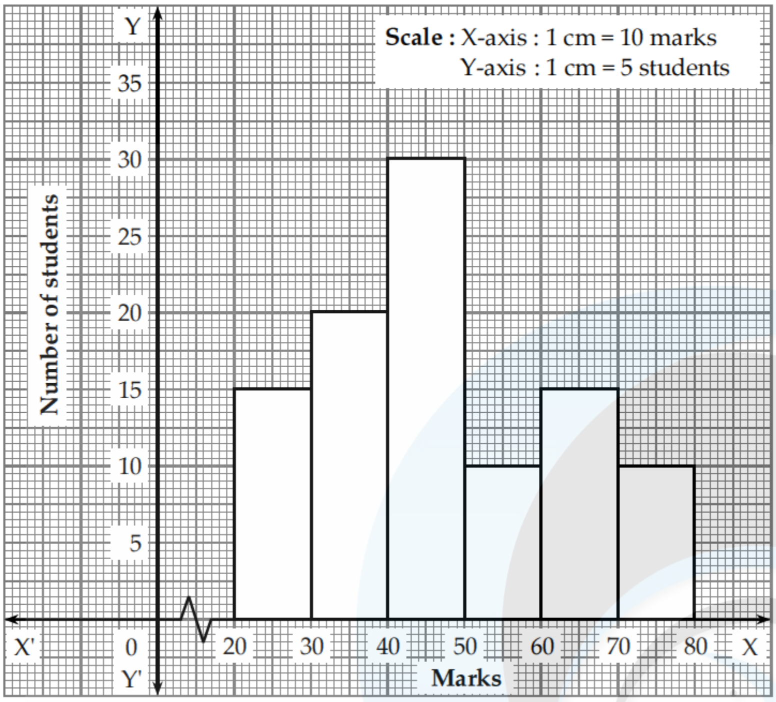
$2b + b = 30$ $\therefore 3b = 30$ $\therefore b = 10$

$a = 2b = 2 \times 10 = 20$ $\therefore a = 20$

The value of a is 20 and that of b is 10.

Tabulation for histogram :

Marks	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	Total
Number of students	15	**20**	30	**10**	15	10	100



108.

Let the purchase price of liquid soap be ₹ x.

GST 18%.

$\therefore$ GST $= x \times \frac{18}{100} = ₹\frac{18x}{100}$

$\therefore$ the purchase price with GST $= ₹\left(x + \frac{18x}{100}\right) = ₹\frac{118x}{100}$.

The purchase price of liquid soap with GST is ₹ 9440. ... (Given)

$\therefore \frac{118x}{100} = 9440$

$\therefore x = 9440 \times \frac{100}{118} = 80 \times 100 = ₹\,8000$.

$\therefore$ taxable value is ₹ 8000.

Input tax credit (ITC) by party $A = ₹\,(9440 - 8000)$

$= ₹\,1440$ ... (1)

Let the selling price of liquid soap be ₹ y.

GST 18%. $\therefore$ GST $= y \times \frac{18}{100} = ₹\frac{18y}{100}$

$\therefore$ selling price with GST $= ₹\left(y + \frac{18y}{100}\right) = ₹\frac{118y}{100}$.

The selling price of liquid soap with GST is ₹ 10620. ... (Given)

$\therefore \frac{118y}{100} = 10620$

$\therefore y = 10620 \times \frac{100}{118} = 90 \times 100 = ₹ 9000$

$\therefore$ taxable value is ₹ 9000.

GST collected on selling by Party A from Party $B = ₹(10620 - 1000)$

$= ₹ 1620$ ... (2)

$\therefore$ output tax by Party $A = ₹ 1620$

GST payable = Output tax − ITC

$= ₹(1620 - 1440)$ ... [From (2) and (1)]

$= ₹ 180$

Now, $\text{CGST} = \text{SGST} = \frac{1}{2} \times \text{GST}$

$= \frac{1}{2} \times 180 = ₹ 90$

Ans. The amount of CGST = the amount of SGST = ₹ **90** to be paid by Party A.

109.

Let the total number of marbles in the bag be x. $\therefore n(S) = x$

The probability of picking up a green marble is $\frac{1}{4}$.

$P(G) = \frac{n(G)}{n(S)} = \frac{n(G)}{x} = \frac{1}{4} \qquad \therefore n(G) = \frac{x}{4}$ ... (1)

The probability of picking up a white marble is $\frac{1}{3}$.

$P(W) = \frac{n(W)}{n(S)} = \frac{n(W)}{x} = \frac{1}{3} \qquad \therefore n(W) = \frac{x}{3}$ ... (2)

The number of yellow marbles is 10

$\therefore \frac{x}{4} + \frac{x}{3} + 10 = x$

$\therefore 3x + 4x + 120 = 12x$ ... (Multiplying both the sides by 12)

$\therefore 7x + 120 = 12x$

$\therefore 12x = 7x + 120$

$\therefore 12x - 7x = 120$

$\therefore 5x = 120$

$\therefore x = \frac{120}{5} \qquad \therefore x = 24.$

Ans. The total number of marbles in the bag is **24**.

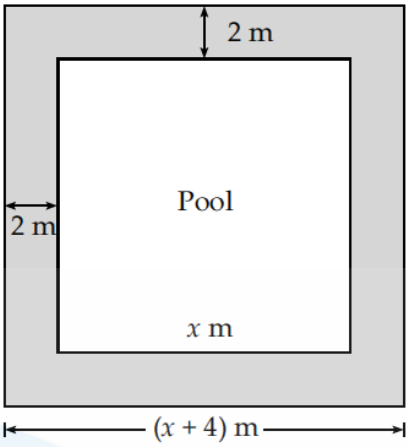
110.

Let the length of the square pool be x m.

Then the length of the footpath is

$(x+2+2)=(x+4)$ m.

The area of the footpath = the area of the outer square − the area of the pool.



$\therefore$ the area of the footpath $=(x+4)^2-x^2$

From the given condition,

$(x+4)^2-x^2=21\%$ of x^2

$\therefore x^2+8x+16-x^2=\frac{21}{100}\times x^2$

$\therefore 8x+16=\frac{21x^2}{100}$

$\therefore 800x+1600=21x^2$ ... (Multiplying both the sides by 100)

$\therefore 21x^2-800x-1600=0$

$\therefore 21x^2-840x+40x-1600=0$

$\therefore 21x(x-40)+40(x-40)=0$

$\therefore (x-40)(21x+40)=0$

$\therefore x-40=0$ or $21x+40=0$

$\therefore x=40$ or $x=-\frac{40}{21}$

$21\times1600=21\times40\times40$
$=840\times40$
-21×1600
$-840 \quad +40$

But the length cannot be negative.

$\therefore x=-\frac{40}{21}$ is unacceptable.

$\therefore x=40$

The area of the pool $=x^2=(40)^2=1600$ m^2.

Ans. The area of the pool is **1600** m^2.

111.

Let the first term of the A.P. be a and the common difference be d.

$t_n=a+(n-1)d$ ... (Formula)

$\therefore t_2=a+(2-1)d$

$\therefore t_2=a+d$ ... (1)

$t_7=a+(7-1)d$

$\therefore t_7=a+6d$ ... (2)

From the first condition,

$t_2+t_7=35$ ... (3)

$\therefore\ a+d+a+6d=35$ ... [From (1), (2) and (3)]

$\therefore\ 2a+7d=35$

$\therefore\ 2a=35-7d$

$\therefore\ a=\dfrac{35-7d}{2}$ ... (4)

The product of the 2nd and 7th terms is 250.

$\therefore\ (a+d)(a+6d)=250$

$\therefore\ \left(\dfrac{35-7d}{2}+d\right)\left(\dfrac{35-7d}{2}+6d\right)=250$ ... [From (4)]

$\therefore\ \left(\dfrac{35-7d+2d}{2}\right)\left(\dfrac{35-7d+12d}{2}\right)=250$

$\therefore\ \left(\dfrac{35-5d}{2}\right)\left(\dfrac{35+5d}{2}\right)=250$

$\therefore\ \dfrac{5}{2}(7-d)\times\dfrac{5}{2}(7+d)=250$

$\therefore\ (7-d)\ (7+d)=40$ ... $\left(\text{Multiplying both the sides by } \dfrac{4}{25}\right)$

$\therefore\ 49-d^2=40$ $\therefore\ -d^2=40-49$ $\therefore\ -d^2=-9$

$\therefore\ d^2=9$ $\therefore\ d\pm3.$

But the terms are in ascending order. $\therefore\ d=3.$

Substituting $d=3$ in equation (4),

$a=\dfrac{35-7(3)}{2}$ $\therefore\ a=\dfrac{35-21}{2}$ $\therefore\ a=\dfrac{14}{2}$ $\therefore\ a=7$

Now, $a=7$ and $d=3$.

$S_n=\dfrac{n}{2}[2a+(n-1)d]$ ... (Formula)

$\therefore\ S_{21}=\dfrac{21}{2}\left[2\times7+(21-1)\times3\right]$ ... (Substituting the values)

$=\dfrac{21}{2}\left[14+20\times3\right]=\dfrac{21}{2}\left[14+60\right]$

$=\dfrac{21}{2}\times74=21\times37$

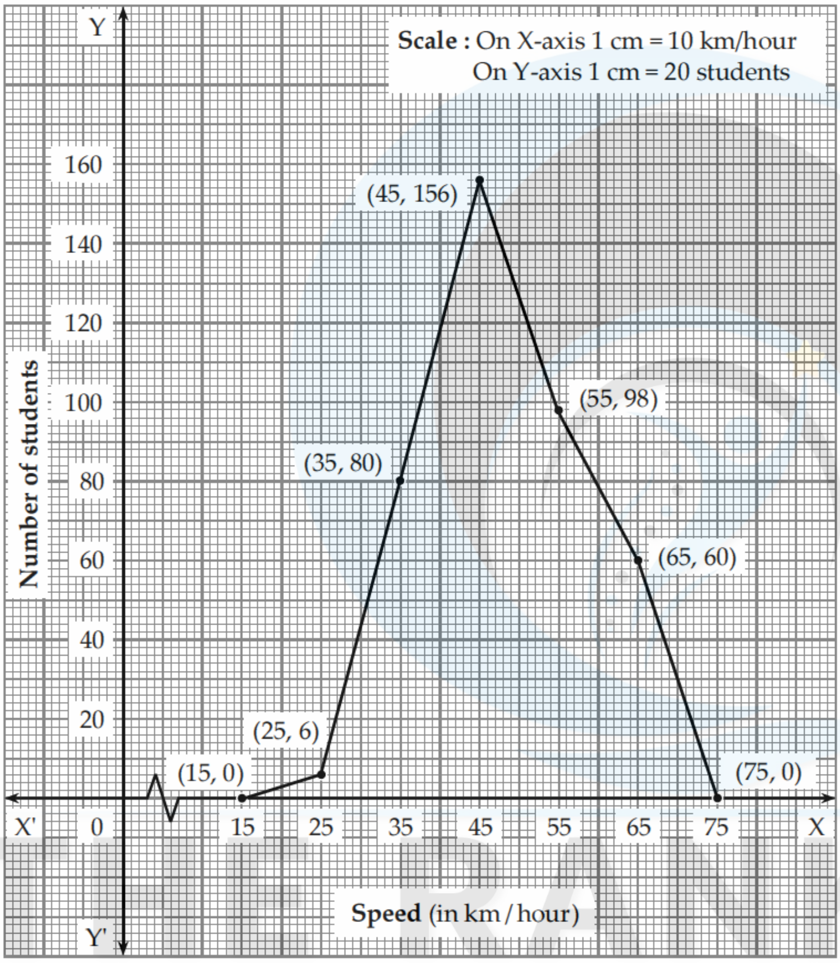
$\therefore\ S_{21}=777$

Ans. The sum of first twenty-one terms is **777**.

112.

For drawing a frequency polygon take a class preceding the lowest class with frequenc zero and a class succeeding the highest class with frequency zero.

Class [Speed (in km/h)]	Class mark	Frequency (Number of students)	Coordinates of points
10–20	15	0	(15, 0)
20–30	25	6	(25, 6)
30–40	35	80	(35, 80)
40–50	45	156	(45, 156)
50–60	55	98	(55, 98)
60–70	65	60	(65, 60)
70–80	75	0	(75, 0)



113.

Let the first term of the A.P. be a and the common difference be d.

mth term is t_m and nth term is t_n

$m\text{th term} = a + (m-1)d$ ... (Formula)

$\therefore\ a + (m-1)\ d = \frac{1}{n}$ ... (Given) ... (1)

$n\text{th term} = a + (n-1)d$ ... (Formula)

$\therefore\ a + (n-1)d = \frac{1}{m}$ ... (Given) ... (2)

Subtracting equation (2) from equation (1),

$a+(m-1)d = \frac{1}{n}$ ... (1)

$a+(n-1)d = \frac{1}{m}$ ... (2)

$-\quad -\quad\quad\quad -$

$(m-1)\ d-(n-1)d = \frac{1}{n}-\frac{1}{m}$

$\therefore\ d[m-1-(n-1)] = \frac{m-n}{mn}$

$\therefore\ d(m-1-n+1) = \frac{m-n}{mn}$

$\therefore\ d(m-n) = \frac{m-n}{mn}$

$\therefore\ d = \frac{1}{mn}$ ... [Dividing both the sides by $(m-n)$] ... (3)

Substituting $d = \frac{1}{mn}$ in equation (2),

$\therefore\ a+(n-1)d = \frac{1}{m}$

$\therefore\ a+(n-1)\times\frac{1}{mn} = \frac{1}{m}$

$\therefore\ a+\frac{n}{mn}-\frac{1}{mn} = \frac{1}{m}$

$\therefore\ a = \frac{1}{m}-\frac{n}{mn}+\frac{1}{mn}$

$\therefore\ a = \frac{n-n+1}{mn}$ $\quad\therefore\ a = \frac{1}{mn}$ ... (4)

mnth term $= a+(mn-1)d$ ... (Formula)

$= \frac{1}{mn}+(mn-1)\times\frac{1}{mn}$ ... [From (4) and (3)]

$= \frac{1}{mn}+\frac{mn-1}{mn}$

$= \frac{1+mn-1}{mn} = \frac{mn}{mn} = 1.$

$\therefore$ mnth term is **1**.

114.

Comparing equation $(p-q)x^2+(q-r)x+(r-p)=0$ with $ax^2+bx+c=0$,

$a=(p-q),\ b=(q-r),\ c=(r-p)$

The roots of the given equation are equal.

$\therefore\ b^2-4ac=0$

$\therefore\ (q-r)^2-4(p-q)\ (r-p)=0$ ... (Substituting the values of a, b and c)

$\therefore\ q^2-2qr+r^2-4(rp-p^2-qr+pq)=0$

$\therefore\ q^2-2qr+r^2-4rp+4p^2+4qr-4pq=0$

$\therefore\ 4p^2-4pq+q^2-4rp+2qr+r^2=0$

$\therefore\ (2p-q)^2-2r(2p-q)+r^2=0$

$\therefore\ (2p-q-r)^2=0$ ... $[a^2-2ab+b^2=(a-b)^2]$

$\therefore\ 2p-q-r=0$ ... (Taking square root)

$\therefore\ 2p=q+r.$

115.

To draw the frequency polygon, we take two more classes. The class preceding the first class and the class succeeding the last class, each with frequency zero.

The table to draw the frequency polygon is as follow :

Class	Class mark of marks	Frequency (Number of students)	Coordinates of points
250–300	275	0	(275, 0)
300–350	325	25	(325, 25)
350–400	375	35	(375, 35)
400–450	425	45	(425, 45)
450–500	475	40	(475, 40)
500–550	525	32	(525, 32)
550–600	575	20	(575, 20)
600–650	625	0	(625, 0)