Std. X (SSC) | **Maths-I** | **Time : 2 Hours**
Marks : 40 | **Preliminary Paper - 1**

Answers : Paper-1

Q. 1 (A) Choose the correct answer and write the letter of the alphabet of it : **4**

1) C) Zero 2) A) 3 3) B) 7 4) D) $\frac{1}{2}$

B) Solve the following sub-questions : **4**

1) **Ans :** Putting $x = 2$ and $y = 3$ in given equation $2x + y = 7$

$2(2) + 3 = 7$

$\therefore 4 + 3 = 7$

$\therefore \quad 7 = 7$

LHS = RHS

$\therefore$ (2, 3) is the solution of the equation $2x + y = 7$

2) **Ans :** $t_9 = 23$, $a = 7$

$t_n = a + (n - 1)\,d$

$\therefore\ t_9 = 7 + (9 - 1)\,d$

$\therefore\ 23 = 7 + 8d$

$\therefore\ 8d = 23 - 7$

$\therefore\ 8d = 16$

$\therefore\quad d = \frac{16}{2}$

$\therefore\quad d = 2$

3) **Ans :** Taxable value of an article = ₹ 45,000

GST = 18%

$\therefore$ GST = $45{,}000 \times \frac{18}{100}$ = ₹ 8,100

$\therefore$ Raju will pay ₹ 8,100 as GST on an article

4) **Ans :** As we have to form two-digit numbers, 0 cannot be at ten place.

$\therefore$ S = {10, 12, 13, 20, 21, 23, 30, 31, 32}

$\therefore$ n(S) = 9

Q. 2 (A) Complete and write *any* TWO given activities and rewrite it : **4**

1) Complete the following activity to find the value x :

Activity : $6x + 4y = 8$ ... (I)

$+\quad 3x - 4y = 10$ ... (II)

$\mathbf{9}x = \mathbf{18}$

$\therefore \quad x = \frac{18}{9}$

$\therefore \quad x = \mathbf{2}$

2) **Solution :** My $ax^2 + bx + c = 0$ form is :

$-3x + 12 = 2x^2$

$\mathbf{-2x^2 - 3x + 12 = 0}$

My values of a, b, c are :

$a = \mathbf{-2}$, $b = \mathbf{-3}$, $c = \mathbf{12}$

3) **Solution :**

Input tax (ITC) = ₹ **12,500**

Output tax = ₹ **14,750**

GST Payable = Output tax – **Input tax (ITC)**

= 14,750 – 12,500

$\therefore$ Payable GST = ₹ **2,250**

B) Solve the following sub-questions (*any four*) : **8**

1) **Ans :** Given equations

$5x + 3y = -11$;

$2x + 4y = -10$

$D_x = \begin{vmatrix} -11 & 3 \\ -10 & 4 \end{vmatrix} = (-11) \times 4 - (-10) \times 3 = -44 - (-30)$

$= -44 + 30 = -14$

$D_y = \begin{vmatrix} 5 & -11 \\ 2 & -10 \end{vmatrix} = 5 \times (-10) - 2 \times (-11) = -50 - (-22)$

$= -50 + 22 = -28$

2) **Ans :** Let $\alpha = -6$ and $\beta = 5$

$\alpha + \beta = -6 + 5 = -1$

$\alpha\beta = -6 \times 5 = -30$

The required quadratic equation is

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

$\therefore \quad x^2 + (-1)x + (-30) = 0$

$\therefore \quad x^2 - x - 30 = 0$

$x^2 - x - 30 = 0$ is the required quadratic equations.

3) **Ans :** Here, $a = 7$, $d = 3$

$t_n = a + (n - 1)\, d$ ... formula

$\therefore \quad t_{10} = 7 + (10 - 1) \times 3$

$\therefore \quad t_{10} = 7 + 9 \times 3$

$\therefore \quad t_{10} = 7 + 27$

$\therefore \quad t_{10} = 34$

4) **Ans :** Marked Price = ₹ 5,000, Discount = 10%, GST =12%.

Discount = $5000 \times \frac{10}{100}$ = ₹ 4,500

GST = $4500 \times \frac{12}{100}$ = ₹ 540

Invoice amount = ₹ 4,500 + ₹ 540 = ₹ 5040.

5) **Ans :** Total Expenditure = ₹ 12,000 + ₹ 9,000 + ₹ 6,000 + ₹ 3,000
= ₹ 30,000

$$\text{Central angle for food} = \frac{\text{Expenditure on food}}{\text{Total Expenditure}} \times 360$$
$$= \frac{9,000}{30,000} \times 360$$
$$= 108^0$$

Q. 3 (A) Complete *any* <u>ONE</u> activity and rewrite it : **3**

1) **Solution :** Let us find the investment required or one share.

MV = ₹ 50

Brokerage at 0.2% on ₹ 50 = $50 \times \frac{0.2}{100}$ = ₹ **0.10**

GST on brokerage at 18% = $0.1 \times \frac{18}{100}$ = ₹ **0.018**

Investment for one share = ₹ 50 + ₹ **0.10** + ₹ **0.018**
= ₹ **50.118**

The number of shares purchased by Aditya = $\frac{\text{Investment}}{\text{Investment for 1 share}}$

$= \frac{50118}{50.118}$ = **1000**

2) **Solution :**

A committee of two is to be formed out of 3 men and 2 women.

S = {**(M_1 M_2), (M_1 M_3), (M_1 W_1), (M_1 W_2), (M_2, M_3), (M_2, W_1), (M_2 W_2), (M_3 W_1), (M_3 W_2), (W_1, W_2)**}

n(S) = **10**

Event A : The committee should contain one man and one women

A = {(M_1 W_1), (M_1 W_2), (M_2 W_1), (M_2 W_2), (M_3 W_1), (M_3 W_2)}

n(A) = **6**

$\therefore$ P(A) = $\frac{n(A)}{n(S)} = \frac{6}{10} = \frac{\mathbf{3}}{\mathbf{5}}$

Event B : There should not be a woman in the committee.

B = {(M_1 M_2), (M_1 M_3), (M_2, M_3)}

$\therefore$ n(B) = **3**

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

B) Solve the following sub-questions (*any two*) : **6**

1) **Ans :** Given equations

$4m - 2n = -4$

$4m + 3n = 16$

Here, $a_1 = 4$, $b_1 = -2$ and $c_1 = -4$

$a_2 = 4$, $b_2 = 3$ and $c_2 = 16$

$$D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} 4 & -2 \\ 4 & 3 \end{vmatrix} = (4 \times 3) - (-2 \times 4)$$

$$= 12 + 8 = 20$$

$$D_x = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} = \begin{vmatrix} -4 & -2 \\ 16 & 3 \end{vmatrix} = (-4 \times 3) - (-2 \times 16)$$

$$= -12 + 32 = 20$$

$$D_y = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} = \begin{vmatrix} 4 & -4 \\ 4 & 16 \end{vmatrix} = (4 \times 16) - (-4 \times 4)$$

$$= 64 + 16 = 80$$

By Cramer's rule,

$$\therefore \quad x = \frac{D_x}{D} = \frac{20}{20} = 1$$

$$\therefore \quad y = \frac{D_y}{D} = \frac{80}{20} = 4$$

$\therefore$ The solution of the given simultaneous equations is (1, 4)

2) **Ans :** $m^2 + 5m + 5 = 0$

Comparing above equation with the standard form $ax^2 + bx + c = 0$

$a = 1$, $b = 5$, $c = 5$

$b^2 - 4ac = 5^2 - (4 \times 1 \times 5)$

$= 25 - 20 = 5$

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

$$= \frac{-5 \pm \sqrt{5}}{2(1)}$$

$$= \frac{-5 \pm \sqrt{5}}{2}$$

$$\therefore \quad x = \frac{-5 + \sqrt{5}}{2} \quad \text{or } x = \frac{-5 - \sqrt{5}}{2}$$

$\frac{-5 + \sqrt{5}}{2}$, $\frac{-5 - \sqrt{5}}{2}$ are the roots of the given quadratic equation.

3) **Ans :** Let 3 red balls be R_1, R_2, R_3

3 white balls be W_1, W_2, W_3

3 green balls be G_1, G_2, G_3

3 black balls be B_1, B_2, B_3

$\therefore$ Sample space :

$S = \{R_1, R_2, R_3 W_1, W_2, W_3, G_1, G_2, G_3, B_1, B_2, B_3\}$

$\therefore$ $n(S) = 12$

Let A be the event that the ball taken out is white.

$\therefore$ $A = \{W_1, W_2, W_3\}$

$\therefore$ $n(A) = 3$

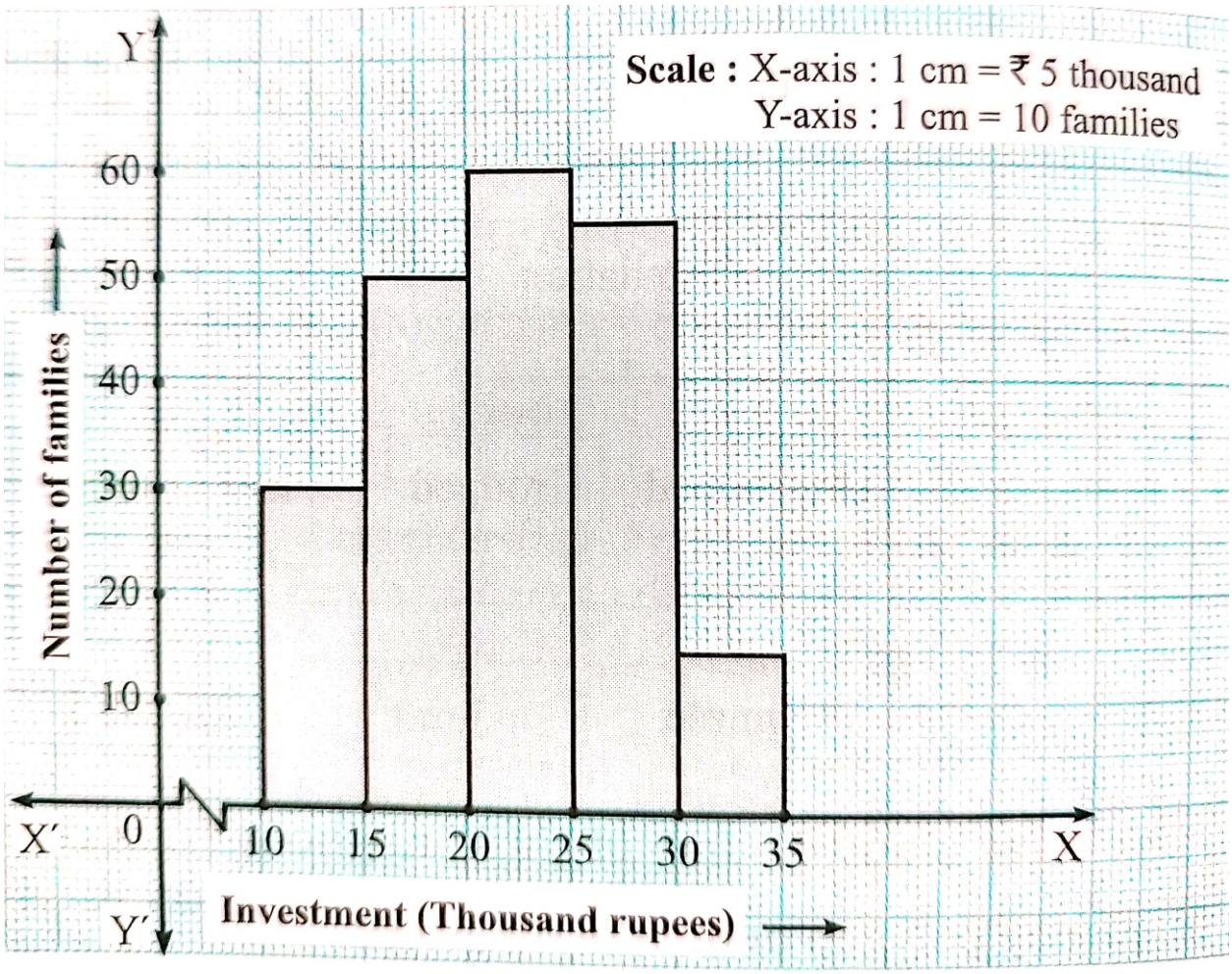
$\therefore$ $P(A) = \frac{n(A)}{n(S)} = \frac{3}{12} = \frac{1}{4}$

Let B be the event that the ball taken out is not white.

$\therefore$ $B = \{\{R_1, R_2, R_3, G_1, G_2, G_3, B_1, B_2, B_3\}$

$\therefore$ $P(B) = \frac{n(B)}{n(S)} = \frac{9}{12} = \frac{3}{4}$

4) **Ans :**



Q. 4 Solve the following sub-questions (*any two*) : **8**

1) **Ans :** Let the four consecutive natural number be x, $(x+1)$, $(x+2)$, $(x+3)$

From the given condition,

$x \times (x+1) \times (x+2) \times (x+3) = 840$

$\therefore$ $x \times (x+3) \times (x+1) \times (x+2) = 840$

$\therefore$ $(x^2 + 3x)[x(x+2) + 1(x+2)] = 840$

$\therefore$ $(x^2 + 3x)[x^2 + 2x + x + 2] = 840$

$\therefore$ $(x^2 + 3x)[x^2 + 3x + 2] = 840$

Let $x^2 + 3x = m$

$\therefore$ $m(m+2) = 840$

$\therefore\ m^2 + 2m = 840$
$\therefore\ m^2 + 2m - 840 = 0$
$\therefore\ m^2 + 30m - 28m - 840 = 0$
$\therefore\ m\,(m + 30) - 28(m + 30) = 0$
$\therefore\ (m + 30)\,(m - 28) = 0$
$\therefore\ m + 30 = 0$ OR $m - 28 = 0$
$\therefore\ m = -30$ OR $m = 28$
Natural number can not be negative
$\therefore\ m \neq -30$ $\therefore\ m = 28$
Putting $m = x^2 + 3x$
$\therefore\ x^2 + 3x = 28$
$\therefore\ x^2 + 3x - 28 = 0$
$\therefore\ x^2 + 7x - 4x - 28 = 0$
$\therefore\ x(x + 7) - 4(x + 7) = 0$
$\therefore\ (x + 7)\,(x - 4) = 0$
$\therefore\ x + 7 = 0$ OR $x - 4 = 0$
Natural numbers can not be negative
$\therefore\ x \neq -7$ but $x = 4$
$\therefore$ The four consecutive natural numbers are 4, 5, 6 and 7 respectively.

2) **Ans :** The smallest three-digit number is100.
The largest three-digit number is 999.
The first three-digit number divisible by 3 is 102.
The last three-digit number divisible by 3 is 999.
$\therefore$ Arithmetic Progression is 102, 105, 108,..., 999
Here, $a = 102$, $d = 3$ $t_n = 999$
$t_n = a + (n - 1)\,d$
$\therefore\ 999 = 102 + (n - 1)\,3$
$\therefore\ 999 = 102 + 3n - 3$
$\therefore\ 999 = 99 + 3n$
$\therefore\ 999 - 99 = 3n$
$\therefore\ 3n = 900$

$$\therefore\ n = \frac{900}{3}$$

$$\therefore\ n = 300$$

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

$$\therefore\ S_{300} = \frac{300}{2}\,[2 \times 102 + (300 - 1) \times 3]$$

$$= 150\,[\,204 + 299 \times 3]$$

$$= 150 \times 1101$$

$\therefore\ S_{300} = 165150$
$\therefore$ There are 300 three-digit numbers divisible by 3, and their sum is 165150.

3) **Ans :** Total number of customers are130

$\therefore$ $10 + 60 + x + 20 + 15 = 130$

$\therefore$ $105 + x = 130$

$\therefore$ $x = 130 - 105$

$\therefore$ $x = 25$

Weight of sweet (gram)	0-250	250-500	500-750	750-1000	1000-1250
No. of customers	$10 \rightarrow f_0$	$60 \rightarrow f_1$	$25 \rightarrow f_2$	20	15

From the above table, maximum number of customers is in the class 250-500.

Here, $f_1 = 60$. The Modal class is 250 - 500.

L = 250, $h = 250$, $f_1 = 60$, $f_0 = 10$, $f_2 = 25$

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

$$= 250 + \left[\frac{60 - 10}{2(60) - 10 - 25}\right] \times 250$$

$$= 250 + \left(\frac{50}{120 - 35}\right)$$

$$= 250 + \frac{50}{85} \times 250$$

$$= 250 + \frac{12500}{85}$$

$$= 250 + 147.06$$

Mode = 397.06

$\therefore$ The mode of the demand of sweet is 397.06 grams

Q. 5 Solve the following sub-questions (*any one*) : **3**

1) **Ans :** $2x + 3y = 11$ ...(I)

$2x - 4y = -24$ ...(II)

Subtracting equation (II) from (I)

$2x + 3y = 11$

$- \quad 2x - 4y = -24$

(-) (+) (-)

$7y = 35$

$\therefore$ $y = 5$

Putting $y = 5$ in equation (I)

$\therefore$ $2x + 3(5) = 11$

$\therefore$ $2x + 15 = 11$

$\therefore$ $2x = 11 - 15$

$\therefore$ $2x = -4$

$\therefore$ $x = -2$

Hence, $x = -2$, $y = 5$

Also, $y = mx + 3$

$\therefore\ 5 = -2m + 3$

$\therefore\ -2m = 5 - 3$

$\therefore\ -2m = 2$

$\therefore\ 2m = -2$

$\therefore\ m = -1$

Therefore, the value of m is -1.

2) **Ans :** i)

Salesman	**Percentage**	**Measure of Central angle**
A	25%	$\frac{25}{100} \times 360 = \mathbf{90^0}$
B	35%	$\frac{35}{100} \times 360 = \mathbf{126^0}$
C	22%	$\frac{22}{100} \times 360 = \mathbf{79.2^0}$
D	18%	$\frac{18}{100} \times 360 = \mathbf{64.8^0}$
Total	**100%**	$\mathbf{360^0}$

ii) Sales of the salesman B

$$\text{Central angle} = \frac{\text{Sales of Salesman B}}{\text{Total Sales}} \times 360$$

$$126^0 = \frac{\text{Sales of Salesman B}}{72{,}000} \times 360$$

$$\text{Sales of Salesman B} = \frac{126 \times 72{,}000}{360}$$

Sales of Salesman B = ₹ 25,200