

SOLUTION

Q.1. (A) Choose the correct answer and write the alphabet of it in front of the sub-question number. [4]

(1) Sum of first five multiples of 3 is [1]
(a) 45 (b) 55 (c) 15 (d) 75

(2) Find the value of determinant
$$\begin{vmatrix} 3 & 2 \\ 4 & 5 \end{vmatrix}$$
. [1]
(a) 2 (b) 7 (c) -7 (d) 23

(3) Which of the following quadratic equations has roots 3 and 5?
(a) $x^2 - 15x + 8 = 0$ (b) $x^2 - 8x + 15 = 0$
(c) $x^2 + 3x + 5 = 0$ (d) $x^2 + 8x - 15 = 0$ [1]

(4) Two coins are tossed simultaneously. Write the number of sample points $n(S)$:
(a) 2 (b) 8 (c) 4 (d) 6 [1]

Ans. (1) – (a), (2) – (b), (3) – (b), (4) – (c)

(B) Solve the following sub-questions. [4]

(1) If $15x + 17y = 21$ and $17x + 15y = 11$, then find the value of $x + y$.

Solution:

$$\begin{array}{rcl} 15x + 17y = 21 & \dots & \text{(I)} \\ + \underline{17x + 15y = 11} & \dots & \text{(II)} \\ 32x + 32y = 32 & \dots & [\text{Adding equation I and II}] \end{array} \quad [1/2]$$

Ans. $\therefore x + y = 1$ (Dividing both the sides by 32) [1/2] [1]

(2) Given sequence is an A.P. Find the next two terms of this A.P.:
5, 12, 19, 26,

Solution:

$$t_1 = 5, t_2 = 12, t_3 = 19, t_4 = 26, \dots$$

$$d = t_2 - t_1 = 12 - 5 = 7$$

$$t_5 = t_4 + d = 26 + 7 = 33 \quad [1/2]$$

$$t_6 = t_5 + d = 33 + 7 = 40 \quad [1/2] [1]$$

Ans. The next two terms of the given A.P. are 33 and 40.

(3) On certain article if rate of CGST is 9%, then what is the rate of SGST and what is the rate of GST?

Solution:

$$\text{CGST} = 9\%$$

$$\text{CGST} = \text{SGST} = 9\% \quad [1/2]$$

Ans. $\text{GST} = \text{CGST} + \text{SGST} = 9\% + 9\% = 18\% \quad [1/2] [1]$

(4) If $n(S) = 2$ and $n(A) = 1$, then find $P(A)$.

Solution:

$$P(A) = \frac{n(A)}{n(S)} \quad [1/2]$$

Ans. $\therefore P(A) = \frac{1}{2} \quad [1/2] [1]$

Q.2. (A) Complete the following activities and rewrite. (Any two) [4]

(1) Complete the following table to draw the graph of the equation $x + y = 3$:

Solution:

x	3	-2	0
y	0	5	3
(x, y)	$(3, 0)$	$(-2, 5)$	$(0, 3)$

$\frac{1}{2}$ mark for
each blank

(2) Complete the following activity to find the value of discriminant of the equation $x^2 + 10x - 7 = 0$.

Solution:

Comparing $x^2 + 10x - 7 = 0$ with $ax^2 + bx + c = 0$,

$$a = 1, b = 10, c = -7 \quad [1/2]$$

$$\therefore b^2 - 4ac = 10^2 - 4 \times 1 \times (-7) \quad [1/2]$$

$$= 100 + 28 \quad [1/2]$$

$$= 128 \quad [1/2][2]$$

(3) Complete the following table using given information:

Sr. No.	FV	Share is at	MV	
1.	₹ 10	Premium of ₹ 7	₹ 17	[1/2]
2.	₹ 25	Discount of ₹ 9	₹ 16	[1/2]
3.	₹ 300	Premium of ₹ 15	₹ 315	[1/2]
4.	₹ 5	at par	₹ 5	[1/2][2]

(B) Solve the following sub-questions. (Any four)

[8]

(1) Solve the following simultaneous equations:

$$x + y = 6; x - y = 4$$

Solution:

$$x + y = 6 \quad \dots \text{(I)}$$

$$+ \underline{x - y = 4} \quad \dots \text{(II)}$$

$$2x = 10 \quad \dots \{ \text{Adding equation I and II} \}$$

[1/2]

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

[1/2]

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

$$5 + y = 6$$

$$\therefore y = 6 - 5$$

$$\therefore y = 1$$

[1/2]

Ans. $x = 5$ and $y = 1$ is the solution of the given equations.

[1/2] [2]

(2) Solve the following quadratic equation by factorisation method:

$$x^2 + 15x + 54 = 0$$

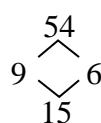
Solution:

$$x^2 + 15x + 54 = 0$$

$$\therefore x^2 + 9x + 6x + 54 = 0$$

[1]

$$\therefore x(x + 9) + 6(x + 9) = 0$$



$$\therefore (x + 9)(x + 6) = 0$$

[1/2]

$$\therefore x + 9 = 0 \text{ or } x + 6 = 0$$

Ans. $\therefore x = -9$ or $x = -6$

[1/2] [2]

(3) The first term $a = 8$ and common difference $d = 5$ are given.
Write an A.P.

Solution:

Given that $a = 8$ and $d = 5$.

$$\therefore t_1 = a = 8$$

$$t_2 = t_1 + d = 8 + 5 = 13 \quad [1/2]$$

$$t_3 = t_2 + d = 13 + 5 = 18 \quad [1/2]$$

$$t_4 = t_3 + d = 18 + 5 = 23 \quad [1/2]$$

Ans. \therefore The required A.P. is 8,13,18, 23,... [1/2] [2]

(4) Mr Rohit is a retailer. He paid GST of ₹ 6,500 at the time of purchase. He collected GST of ₹ 8,000 at the time of sale.

- Find his input tax and output tax.
- What is his input tax credit?
- Find his payable GST.
- Hence find the payable CGST and payable SGST.

Solution:

(a) Input tax = ₹ 6,500 (Tax paid at the time of purchase)

Output tax = ₹ 8,000 (Tax collected at the time of sale) [1/2]

(b) Input tax credit (ITC) = ₹ 6,500 [1/2]

(c) GST payable = output tax – ITC
= $8,000 - 6,500$
= ₹ 1,500 [1/2]

(d) CGST = SGST = $1/2$ GST
= $\frac{1}{2} \times 1,500$
= ₹ 750 [1/2] [2]

(5) Find the mean from the given values:

$$\Sigma x_i f_i = 1265; N = 50$$

Solution:

$$\Sigma x_i f_i = 1265 \text{ and } N = 50 \quad \dots \text{ (Given)}$$

$$\text{Mean} = \bar{X} = \frac{\sum x_i f_i}{N}$$

$$= \frac{1265}{50}$$

$$= 25.3$$

[1/2] [1/2]

Ans. Mean = $\bar{X} = 25.3$ [1] [2]

Q.3. (A) Complete the following activity and rewrite. (Any one) [3]

(1) Smita has invested ₹ 12,000 and purchased shares of FV ₹ 10 at a premium of ₹ 2. Find the number of shares she has purchased. Complete the given activity to get the answer.

Solution:

$$FV = ₹ 10, \text{ Premium} = ₹ 2$$

$$\therefore MV = FV + \boxed{\text{Premium}}$$

[1/2]

$$= 10 + \boxed{2} = \boxed{12}$$

[½ + ½]

$$\therefore \text{Number of shares} = \frac{\text{Total investment}}{MV}$$

$$= \frac{12,000}{\boxed{12}}$$

[1/2]

$$= \boxed{1000} \text{ shares}$$

[1/2]

Ans. Smita has purchased $\boxed{1000}$ shares. [1/2] [3]

(2) If one die is rolled once, then find the probability of each of the following events:

(a) Number on the upper face is prime.
 (b) Number on the upper face is even.

Solution:

‘S’ is the sample space.

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

[1/2]

(a) Event A: Prime number on the upper face

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

[1/2]

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

$$\therefore P(A) = \frac{3}{6} = \boxed{\frac{1}{2}} \quad [1/2 + 1/2]$$

(b) Event B: Even number on the upper face

$$B = \{2, 4, 6\}$$

$$\therefore n(B) = \boxed{3} \quad [1/2]$$

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

$$\therefore P(B) = \boxed{\frac{3}{6}} = \frac{1}{2} \quad [1/2] [3]$$

(B) Solve the following sub-questions. (Any two) [6]

(1) Two numbers differ by 3. The sum of twice the smaller number and thrice the greater number is 19. Find the numbers.

Solution:

Let the greater number be x .

Let the smaller number be y .

\therefore According to the first condition,

$$x - y = 3 \quad \dots \text{(I)} \quad [1/2]$$

According to the second condition,

$$3x + 2y = 19 \quad \dots \text{(II)} \quad [1/2]$$

Multiplying equation (I) by 2,

$$2x - 2y = 6 \quad \dots \text{(III)}$$

$$+ \frac{3x + 2y = 19}{5x} \quad \dots \text{(II)} \quad \text{(Adding equation II and III)}$$

$$5x = 25$$

$$\therefore x = \frac{25}{5}$$

$$\therefore x = 5 \quad [1/2]$$

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

$$5 - y = 3 \quad [1/2]$$

$$\therefore -y = 3 - 5$$

$$\therefore -y = -2$$

$$\therefore y = 2 \quad [1/2]$$

Ans. The greater number is 5 and the smaller number is 2.

[1/2] [3]

(2) Solve the given quadratic equation by using formula method:

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

Solution:

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

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

$$a = 5, b = 13, c = 8 \quad [1/2]$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad [1/2]$$

$$= \frac{-13 \pm \sqrt{13^2 - 4 \times 5 \times 8}}{2 \times 5} \quad [1/2]$$

$$= \frac{-13 \pm \sqrt{169 - 160}}{10}$$

$$= \frac{-13 \pm \sqrt{9}}{10}$$

$$= \frac{-13 \pm 3}{10} \quad [1/2]$$

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

$$\therefore x = \frac{-10}{10} \quad \text{or} \quad x = \frac{-16}{10}$$

$$\therefore x = -1 \quad \text{or} \quad x = \frac{-8}{5} \quad [1/2]$$

Ans. -1 and $-\frac{8}{5}$ are the roots of the given equation. [1/2] [3]

(3) A balloon vendor has 2 red, 3 blue and 4 green balloons. He wants to choose one of them at random to give it to Pranali. What is the probability of the event that Pranali gets:

- (a) a red balloon
- (b) a blue balloon
- (c) a green balloon

Solution:

Let the two red balloons be R_1, R_2 ; three blue balloons be B_1, B_2, B_3 and four green balloons be G_1, G_2, G_3, G_4 . [1/2]

$$\therefore S = \{R_1, R_2, B_1, B_2, B_3, G_1, G_2, G_3, G_4\} \quad [1/2]$$

$$\therefore n(S) = 9 \quad [1/2]$$

(a) Let A be the event to select a **red** balloon.

$$A = \{R_1, R_2\}$$

$$\therefore n(A) = 2$$

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

$$= \frac{2}{9}$$

[1/2]

(b) Let B be the event to select a **blue** balloon.

$$B = \{B_1, B_2, B_3\}$$

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

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

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

[1/2]

(c) Let C be the event to select a **green** balloon.

$$C = \{G_1, G_2, G_3, G_4\}$$

$$\therefore n(C) = 4$$

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

$$= \frac{4}{9}$$

[1/2] [3]

Ans. $P(A) = \frac{2}{9}$, $P(B) = \frac{1}{3}$, $P(C) = \frac{4}{9}$

(4) The following table shows the number of students of class X and the time they utilized daily for their studies. Find the mean time spent by 50 students for their studies by direct method:

Time (hrs)	No. of Students
0–2	7
2–4	18
4–6	12
6–8	10
8–10	3

Solution:

Time (hrs)	Class mark (x_i)	Frequency (f_i)	$x_i f_i$
0–2	1	7	7
2–4	3	18	54
4–6	5	12	60
6–8	7	10	70
8–10	9	3	27
Total		$\sum f_i = 50$	$\sum x_i f_i = 218$

[each correct column 1/2 mark]

$$\begin{aligned}\text{Mean} = \bar{X} &= \frac{\sum x_i f_i}{\sum f_i} & [1/2] \\ &= \frac{218}{50} \\ &= 4.36 & [1/2][3]\end{aligned}$$

Ans. The mean time spent by students is 4.36 hrs.

Q.4. Solve the following sub-questions. (Any two) [8]

(1) The sum of two roots of a quadratic equation is 5 and sum of their cubes is 35, find the equation.

Solution:

Let α and β are the roots of the equation.

$$\therefore \alpha + \beta = 5 \text{ and } \alpha^3 + \beta^3 = 35 \quad [1/2 + 1/2]$$

$$\alpha^3 + \beta^3 = (\alpha + \beta)^3 - 3\alpha\beta(\alpha + \beta) \quad [1]$$

$$\therefore 35 = (5)^3 - 3\alpha\beta \times 5 \quad [1/2]$$

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

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

$$\therefore \alpha\beta = \frac{90}{15}$$

$$\therefore \alpha\beta = 6 \quad [1/2]$$

The required quadratic equation is

$$x^2 - (\alpha + \beta)x + \alpha\beta = 0 \quad [1/2]$$

$$\text{Ans.} \therefore x^2 - 5x + 6 = 0$$

[1/2] [4]

(2) If p times the p^{th} term of an A.P. is equal to q times q^{th} term, then show that $(p + q)^{\text{th}}$ term of that A.P. is zero. ($p \neq q$)

Solution:

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

$$p \times t_p = q \times t_q \quad \dots \quad (\text{given}) \quad [1/2]$$

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

$$\therefore t_p = a + (p - 1)d \quad \text{and} \quad t_q = a + (q - 1)d$$

$$\therefore p[a + (p - 1)d] = q[a + (q - 1)d] \quad [1/2]$$

$$\therefore p[a + (p - 1)d] - q[a + (q - 1)d] = 0$$

$$\therefore ap + p(p - 1)d - aq - q(q - 1)d = 0 \quad [1/2]$$

$$\therefore ap - aq + p(p - 1)d - q(q - 1)d = 0$$

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

$$\therefore a(p - q) + d[(p^2 - p) - (q^2 - q)] = 0$$

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

$$\therefore a(p - q) + d[(p^2 - q^2) - (p - q)] = 0$$

$$\therefore a(p - q) + d[(p + q)(p - q) - (p - q)] = 0 \quad [1/2]$$

$$\therefore a(p - q) + d[(p - q)(p + q - 1)] = 0$$

$$\therefore (p - q)[a + d(p + q - 1)] = 0 \quad [1/2]$$

But $(p - q) \neq 0$

$$\therefore a + d(p + q - 1) = 0 \quad \dots(\text{I}) \quad [1/2]$$

$$\text{But } t_{(p+q)} = a + d(p + q - 1) \quad \dots(\text{II}) \quad [1/2]$$

\therefore From (I) and (II),

$$t_{(p+q)} = 0 \quad [1/2] \quad [4]$$

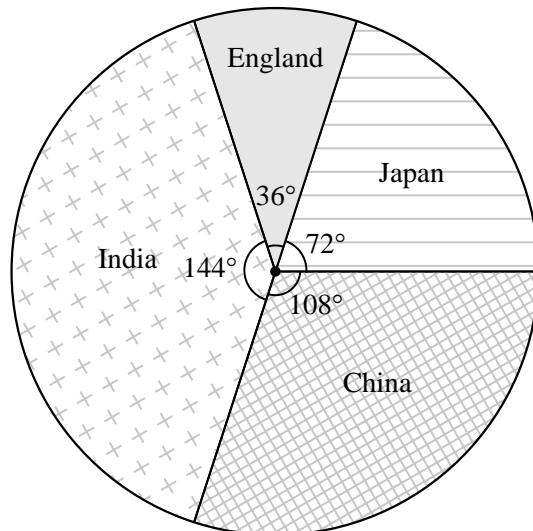
(3) Draw a pie diagram to represent the world population given in the following table:

Country	Japan	England	India	China
Percentage of World Population	20	10	40	30

Solution:

Country	% of population	Measure of central angle
Japan	20	$360^\circ \times \frac{20}{100} = 36^\circ \times 2 = 72^\circ$
England	10	$360^\circ \times \frac{10}{100} = 36^\circ \times 1 = 36^\circ$
India	40	$360^\circ \times \frac{40}{100} = 36^\circ \times 4 = 144^\circ$
China	30	$360^\circ \times \frac{30}{100} = 36^\circ \times 3 = 108^\circ$
Total	100	360°

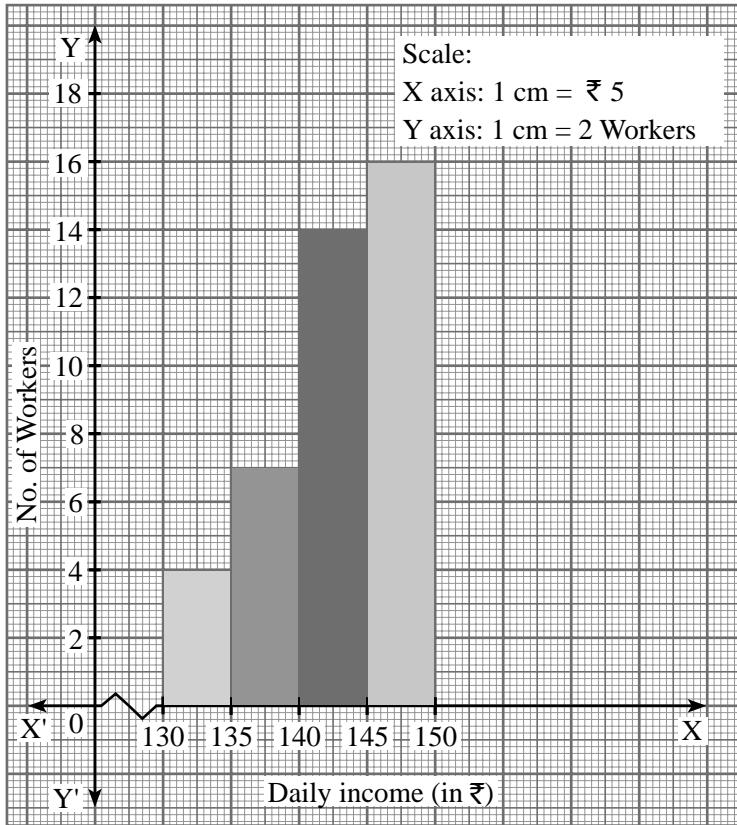
[Each correct angle 1/2 mark]



Q.5. Solve the following sub-question. (Any one)**[3]**

(1) Represent the following data using histogram:

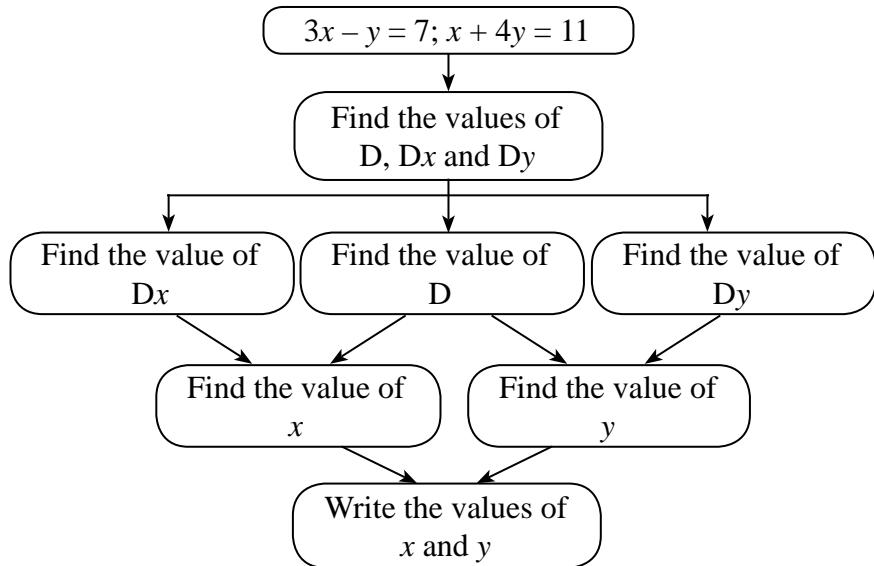
Daily Income (₹)	No. of Workers
130–135	4
135–140	7
140–145	14
145–150	16

Solution:

[for each correct bar 1/2 mark] [2]

[for correct scale] [1] [3]

(2) Observe the following flow chart and solve it:



Solution:

$$3x - y = 7; x + 4y = 11$$

$$D = \begin{vmatrix} 3 & -1 \\ 1 & 4 \end{vmatrix} = 3 \times 4 - (-1) \times 1 \\ = 12 + 1 \\ = 13 \quad [1/2]$$

$$D_x = \begin{vmatrix} 7 & -1 \\ 11 & 4 \end{vmatrix} = 7 \times 4 - (-1) \times 11 \\ = 28 + 11$$

$$D_y = \begin{vmatrix} 3 & 7 \\ 1 & 11 \end{vmatrix} = 3 \times 11 - 7 \times 1 \\ = 33 - 7 \\ = 26 \quad [1/2]$$

$$x = \frac{D_x}{D} = \frac{39}{13} = 3 \quad [1/2]$$

$$y = \frac{D_y}{D} = \frac{26}{13} = 2 \quad [1/2]$$

Ans. $x = 3, y = 2$

[1/2] [3]

★★★