

- Q. 1. (A)** (i) (D)  
 (ii) (A)  
 (iii) (C)  
 (iv) (C).

**Q. 1. (A)** Explanation to the answers to MCQs in this question has been given below for students' guidance. Please note that, **Students are not expected to write the explanation in the examination.**

**Explanations :**

(i)  $5 \times (-4) - (3) \times (-7)$ .

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

(iii)  $\Delta = b^2 - 4ac \quad \Delta < 0$ .

(iv) The value of  $t_x - t_y = (x - y) \times d$ .

**Q. 1. (B) (i) Solution :**

If a coin and a die thrown simultaneously  $n(S) = 12$ .

**Ans.** The number of sample points is **12**.

**(ii) Solution :**

$$4x + 3y = 17 \quad \dots (2)$$

$$3x + 4y = 20 \quad \dots (1)$$

$$\begin{array}{r} - \\ - \\ - \\ \hline x - y = -3 \end{array}$$

**Ans.** The value of  $(x - y)$  is **-3**.

**(iii) Solution :**

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

Here,  $a = 1, b = 7, c = 1$

$$\Delta = b^2 - 4ac = (7)^2 - 4(1)(1) = 49 - 4 = 45$$

**Ans.** The value of the determinant is **45**.

**(iv) Solution :**

Brokerage is considered on MV.

Here,  $MV = ₹ 120$ , Rate of brokerage = 0.5%

$$\text{Brokerage} = 0.5\% \text{ of ₹ } 120 = ₹ 120 \times \frac{0.5}{100} = ₹ 0.60$$

**Ans.** The brokerage is ₹ **0.60**.

**Q. 2. (A) (i) Activity :**

Let  $S$  be the sample space

Then,  $n(S) = 52$

Event  $A$  : Card drawn is a black card.

Total black cards = **13** clubs + 13 spades

$$\therefore n(A) = \mathbf{26}$$

$$P(A) = \frac{n(A)}{n(S)} \quad \dots \text{ (Formula)}$$

$$\therefore P(A) = \frac{26}{52} \quad \therefore P(A) = \mathbf{\frac{1}{2}}$$

**(ii) Activity :**

Two-digit numbers divisible by 4 are 12, 16, 20, ..., 96.

$$a = 12, d = 4, t_n = 96$$

$$t_n = a + (n - 1)d \quad \dots \text{ (Formula)}$$

$$\therefore \mathbf{96} = \mathbf{12} + (n - 1) \times 4 \quad \dots \text{ (Substituting the values)}$$

$$\therefore 96 = 8 + \mathbf{4n} \quad \therefore 4n = \mathbf{88} \quad \therefore n = 22$$

There are 22 two-digit numbers divisible by 4.

**(iii) Activity :**

$$D = \begin{vmatrix} 3 & -2 \\ 2 & 1 \end{vmatrix} = \mathbf{7}, \quad D_x = \begin{vmatrix} 3 & -2 \\ 16 & 1 \end{vmatrix} = \mathbf{35}, \quad D_y = \begin{vmatrix} 3 & 3 \\ 2 & 16 \end{vmatrix} = 42.$$

$$x = \frac{\mathbf{35}}{\mathbf{7}} = \mathbf{5}, \quad y = \frac{\mathbf{42}}{\mathbf{7}} = \mathbf{6}.$$

**Q. 2. (B) (i) Solution :**

$$\begin{vmatrix} \frac{7}{3} & \frac{5}{3} \\ \frac{3}{2} & \frac{1}{2} \end{vmatrix} = \frac{7}{3} \times \frac{1}{2} - \frac{5}{3} \times \frac{3}{2}$$

$$= \frac{7}{6} - \frac{15}{6} = \frac{7 - 15}{6} = \frac{-8}{6} = -\frac{4}{3}$$

**Ans.**  $-\frac{4}{3}$ .

**(ii) Solution :**

$$6x^2 - x - 2 = 0$$

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

$$\therefore 2x(3x - 2) + 1(3x - 2) = 0$$

$$\therefore (3x - 2)(2x + 1) = 0$$

$$\therefore 3x - 2 = 0 \quad \text{or} \quad 2x + 1 = 0$$

$$\therefore 3x = 2 \quad \text{or} \quad 2x = -1$$

$$\therefore x = \frac{2}{3} \quad \text{or} \quad x = -\frac{1}{2}$$

**Ans.**  $\frac{2}{3}$ ,  $-\frac{1}{2}$  are the roots of the given quadratic equation.

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**(iii) Solution :**

Here,  $a = 10$ ,  $d = 3$ ,  $t_{10} = ?$

$$t_n = a + (n - 1)d \quad \dots \text{(Formula)}$$

$$\begin{aligned} \therefore t_{10} &= 10 + (10 - 1) \times 3 \quad \dots \text{(Substituting the values)} \\ &= 10 + (9) \times 3 \\ &= 10 + 27 \end{aligned}$$

$$\therefore t_{10} = 37$$

**Ans.**  $t_{10}$  is **37**.

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**(iv) Solution :**

FV = ₹ 5, Premium = ₹ 20

MV = FV + Premium = ₹ 5 + ₹ 20 = ₹ 25

Sum invested = Number of shares  $\times$  MV

$$\therefore 20000 = \text{Number of shares} \times 25$$

$$\therefore \text{number of shares} = \frac{20000}{25} = 800$$

**Ans.** Suresh will get **800 shares**.

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**(v) Ans.**

Class	cf (less than type)	Frequency
0-10	6	<b>6</b>
10-20	18	$18 - 6 = \mathbf{12}$
20-30	28	$28 - 18 = \mathbf{10}$
30-40	30	$30 - 28 = \mathbf{2}$

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**Q. 3. (A) (i) Activity :**

$$x^2 - 5x - 1 = 0$$

Here,  $a = 1$ ,  $b = \boxed{-5}$ ,  $c = -1$

$$\alpha + \beta = \frac{-b}{a} = \frac{-(-5)}{1} = 5$$

$$\alpha\beta = \frac{c}{a} = \frac{-1}{1} = \boxed{-1}$$

$$\begin{aligned} \alpha^3 + \beta^3 &= (\alpha + \beta)^3 - \boxed{3\alpha\beta(\alpha + \beta)} \quad \dots \text{(Formula)} \\ &= (5)^3 - 3 \times (-1) \times 5 \\ &= 125 + \boxed{15} = \boxed{140} \end{aligned}$$

**(ii) Activity :**

Marks	Class mark ( $x_i$ )	Frequency ( $f_i$ )	$f_i x_i$
0-10	5	<input type="text" value="3"/>	15
10-20	15	10	<input type="text" value="150"/>
20-30	25	20	500
30-40	<input type="text" value="35"/>	5	175
40-50	45	2	90
Total		$\Sigma f_i = 40$	$\Sigma f_i x_i = \boxed{930}$

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

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

$$\therefore \text{Mean} = \boxed{23.25}$$

**Q. 3. (B) (i) Solution :**

$$3x - y = 2$$

$$\therefore 3x = y + 2$$

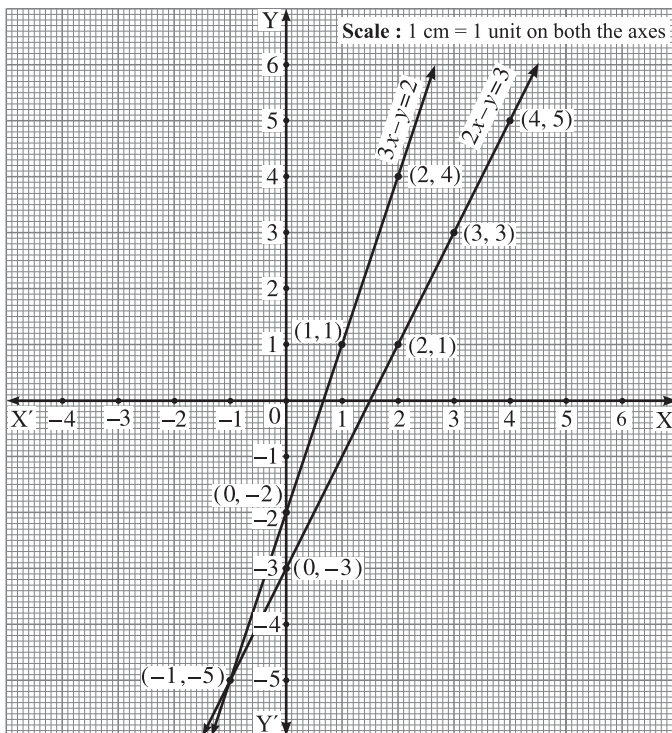
$$\therefore y = 3x - 2$$

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

$$2x - y = 3$$

$$\therefore y = 2x - 3$$

$x$	0	2	3	4
$y$	-3	1	3	5
$(x, y)$	(0, -3)	(2, 1)	(3, 3)	(4, 5)



The coordinates of the point of intersection are  $(-1, -5)$ .

**Ans.** The solution of the given simultaneous equation is  $x = -1, y = -5$ .

**(ii) Solution :**  $5x^2 + 13x + 8 = 0$

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

$$a = 5, b = 13, c = 8$$

$$b^2 - 4ac = (13)^2 - 4(5)(8) = 169 - 160 = 9$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-13 \pm \sqrt{9}}{2 \times 5} = \frac{-13 \pm 3}{10}$$

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

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

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

**Ans.**  $-1, -\frac{8}{5}$  are the roots of the given quadratic equation.

**(iii) Solution :**

Let the FV of each type of share be ₹ 100.

Company A : dividend 16%, MV = ₹ 80.

$\therefore$  on investing ₹ 80 for a share, the dividend is ₹ 16.

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

$$= \frac{16}{80} \times 100 = 20\% \quad \dots (1)$$

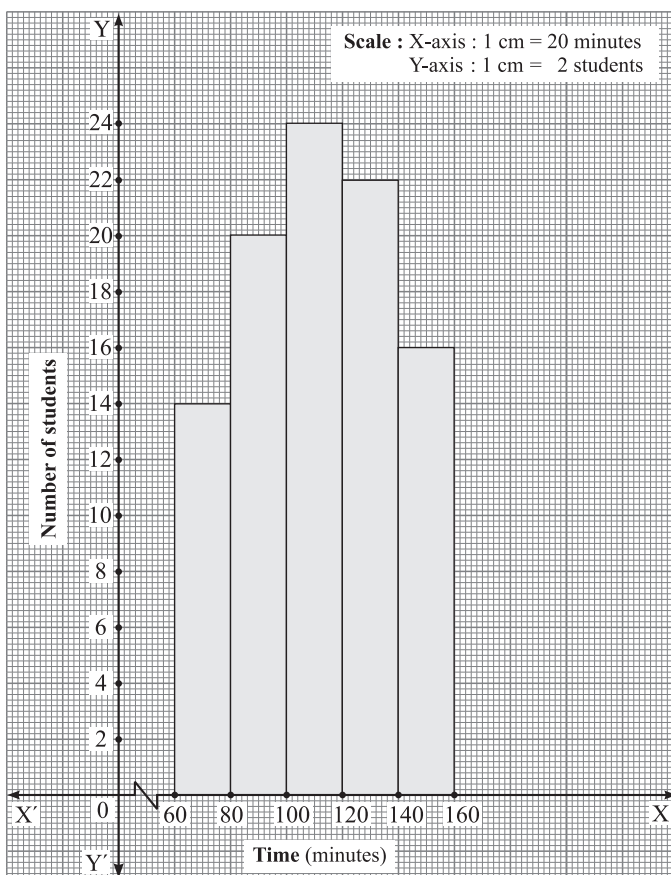
Company B : dividend 20%, MV = ₹ 120.

∴ on investing ₹ 120 for a share, the dividend is ₹ 20.

$$\begin{aligned}\text{Rate of return} &= \frac{\text{Dividend income}}{\text{Sum invested}} \times 100 \\ &= \frac{20}{120} \times 100 \approx 16.67\% \quad \dots (2)\end{aligned}$$

**Ans.** The investment in **Company A** is more profitable. [From (1) and (2)]

**(iv) Solution :**



**Q. 4. (i) Solution :**

Let the speed of the boat in still water be  $x$  km/h and the speed of the stream be  $y$  km/h.

∴ speed of the boat upstream =  $(x - y)$  km/h and

the speed of the boat downstream =  $(x + y)$  km/h.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{From the first condition, } \frac{30}{x-y} + \frac{44}{x+y} = 10 \quad \dots (1)$$

$$\text{From the second condition, } \frac{40}{x-y} + \frac{55}{x+y} = 13 \quad \dots (2)$$

Substituting  $a$  for  $\frac{1}{x-y}$  and  $b$  for  $\frac{1}{x+y}$ , we get

$$30a + 44b = 10 \quad \dots (3) \quad \text{and} \quad 40a + 55b = 13 \quad \dots (4)$$

Multiplying equation (3) by 4 and equation (4) by 3,

$$120a + 176b = 40 \quad \dots (5)$$

$$\begin{array}{r} - \\ 120a + 165b = 39 \quad \dots (6) \end{array}$$

$$\begin{array}{r} - \\ - \\ \hline 11b = 1 \quad \dots \text{[Subtracting equation (6) from equation (5)]} \end{array}$$

$$\therefore b = \frac{1}{11}$$

Substituting  $b = \frac{1}{11}$  in equation (3),

$$30a + 44 \times \frac{1}{11} = 10 \quad \therefore 30a + 4 = 10$$

$$\therefore 30a = 6 \quad \therefore a = \frac{6}{30}$$

$$\therefore a = \frac{1}{5}$$

Resubstituting the values of  $a$  and  $b$ , we get

$$a = \frac{1}{x-y} = \frac{1}{5} \quad \therefore x - y = 5 \quad \dots (7)$$

$$\text{and } b = \frac{1}{x+y} = \frac{1}{11} \quad \therefore x + y = 11 \quad \dots (8)$$

Adding equations (7) and (8),

$$2x = 16 \quad \therefore x = 8$$

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

$$8 + y = 11 \quad \therefore y = 11 - 8 \quad \therefore y = 3$$

**Ans.** The speed of the boat in still water is **8 km/h** and  
the speed of the stream is **3 km/h**.

**(ii) Solution :**

Two dice are rolled simultaneously.

$\therefore$  the sample space

$$\begin{aligned} S = \{ & (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), \\ & (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), \\ & (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), \\ & (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), \\ & (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), \\ & (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6) \} \\ \therefore n(S) &= 36. \end{aligned}$$

(a) Event  $A$  : The sum of the digits on the upper faces is a prime number.

$$\therefore A = \{ (1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), \\ (4, 3), (5, 2), (5, 6), (6, 1), (6, 5) \}.$$

$$\therefore n(A) = 15.$$

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

$$\therefore P(A) = \frac{15}{36} = \frac{5}{12}.$$

(b) Event  $B$  : The sum of the digits on the upper faces is a multiple of 5.

$$\therefore B = \{(1, 4), (2, 3), (3, 2), (4, 1), (4, 6), (5, 5), (6, 4)\}.$$

$$\therefore n(B) = 7.$$

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

$$\therefore P(B) = \frac{7}{36}$$

**Ans.** (a)  $\frac{5}{12}$       (b)  $\frac{7}{36}$ .

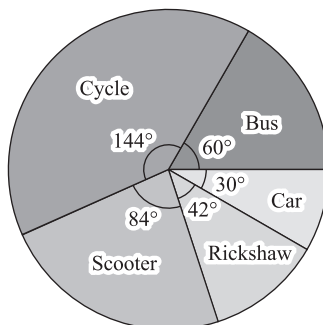
**(iii) Solution :**

The total number of students =  $20 + 48 + 28 + 14 + 10 = 120$

The number of students are converted into component parts of  $360^\circ$  in the following table :

Vehicle	Number of students	Measure of the central angle
Bus	20	$\frac{20}{120} \times 360^\circ = 60^\circ$
Cycle	48	$\frac{48}{120} \times 360^\circ = 144^\circ$
Scooter	28	$\frac{28}{120} \times 360^\circ = 84^\circ$
Rickshaw	14	$\frac{14}{120} \times 360^\circ = 42^\circ$
Car	10	$\frac{10}{120} \times 360^\circ = 30^\circ$
Total	120	$360^\circ$

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



**Q. 5. (i) Solution :**

(1) Comparing  $x^2 - \sqrt{12}x - 1 = 0$  with  $ax^2 + bx + c = 0$ ,

$$a = 1, b = -\sqrt{12}, c = -1.$$

(2)  $b^2 - 4ac = (-\sqrt{12})^2 - 4(1)(-1) = 12 + 4 = 16$

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

(4)  $x = \frac{-(-\sqrt{12}) \pm \sqrt{16}}{2 \times 1}$  ... (Substituting the values)

$$= \frac{\sqrt{12} \pm 4}{2} = \frac{\sqrt{4 \times 3} \pm 4}{2} = \frac{2\sqrt{3} \pm 4}{2} = \frac{2(\sqrt{3} \pm 2)}{2}$$

$$\therefore x = \sqrt{3} \pm 2$$

**Ans.**  $\sqrt{3} + 2, \sqrt{3} - 2$  are the roots of the given quadratic equation.

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**(ii) Solution :**

Here,  $a = 6$ . Let  $d = 7$

The A.P. is 6, 13, 20, ...

We have to find the sum of first twenty-one term,

i.e. we have to find  $S_{21}$ .

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

$$\therefore S_{21} = \frac{21}{2} [2 \times 6 + (21-1) \times 7] \quad \dots \text{(Substituting the values)}$$

$$= \frac{21}{2} [12 + 20 \times 7]$$

$$= \frac{21}{2} (12 + 140)$$

$$= \frac{21}{2} \times 152$$

$$= 1596$$

**Ans.** The sum of the first twenty-one term is **1596**.

**Justification :**

The value of  $d$  is positive and  $a = 6$ .

$\therefore$  no term of this A.P. will be negative.

$\therefore$   $-20$  cannot be the term of this A.P.

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