Time : 2 Hrs. **Marks : 40**

Q.1 A) Choose the correct alternative.

1) b 2) d 3) b 4) c

B) Solve the following questions.

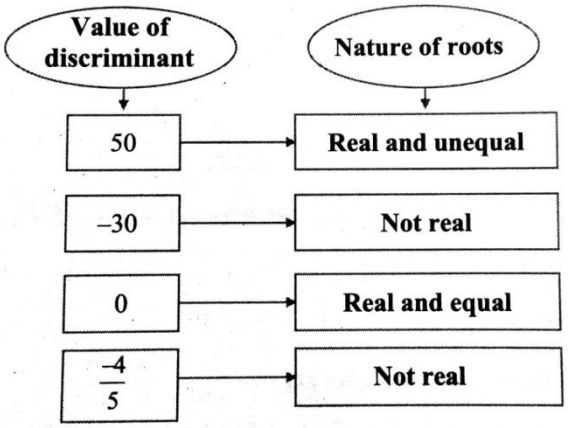
1. Mean $(\bar{x}) = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{69500}{50} = 1390$
2. Given, $t_3 = 20$, $t_4 = 24$
   $\therefore d = t_4 - t_3 = 24 - 20 = \mathbf{4}$
3. The required quadratic equation is
   $x^2 - (\alpha + \beta)x + \alpha\beta = 0$
   i.e. $x^2 - 2x - 44 = 0$
4. Substituting $y = 0$ in $x - y = 4$, we get
   $x - 0 = 4$
   $\therefore x = 4$
   $\therefore$ The point of intersection is (4, 0)

Q.2 A) Complete the following activities. (Any two)

1.

No.	FV	Share is at	MV
1	₹ 10	Premium is ₹ 7	**₹ 17**
2	₹ 25	**Discount is ₹ 9**	₹ 16
3	**₹ 5**	AT PAR	₹ 5
4	₹ 20	**Premium is ₹ 10**	₹ 30

2.



3.

Class Time required for experiment (minutes)	**20 – 22**	22 – 24	24 – 26
Class mark	**21**	**23**	25
Frequency (No. of students)	8	16	22
Co-ordinates of points	(21, 8)	**(23, 16)**	(25, 22)

B) Solve the following questions. (Any four)

1.

Class Time (hrs.)	**Class mark x_i**	**Frequency (No. of students) f_i**	**Frequency x Class mark $f_i x_i$**
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	-	$\Sigma f_i = 50$	$\Sigma f_i x_i = 218$

Mean = $\overline{X} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{218}{50} = 4.36$

∴ The mean of the time spent by the students for their studies is 4.36 hours.

2. Sample space,
S = {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6}
∴ n(S) = 12
Condition for event A : To get a head or tail and an even number.
∴ A = {H2, H4, H6, T2, T4, T6}
∴ n(A) = 6

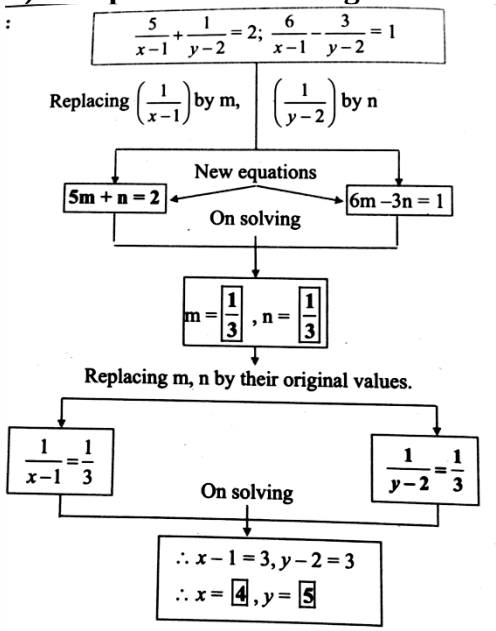
3. The given A.P. is 11, 8, 5, 2,....
Here, a = 11, d = 8 – 11 = −3
Let the n^{th} term of the given A.P. be −151.
Then, t_n = −151
Since, $t_n = a + (n – 1)d$
∴ −151 = 11 + (n – 1)(−3)
∴ −151 – 11 = (n – 1)(−3)
∴ −162 = (n – 1)(−3)
∴ $n – 1 = \frac{-162}{-3}$
∴ n – 1 = 54
∴ n = 54 + 1 = 55
∴ 55^{th} term of the given A.P. is −151.

4. FV = Rs. 100, MV = Rs. 120, Dividend = 15% per share
Let the rate of return be x %
∴ $\frac{15}{120} = \frac{x}{100}$
∴ $x = \frac{15 \times 100}{120} = \frac{25}{2} = 12.5\%$
∴ The rate of return for Shriyash is 12.5 %.

5. **Sol:** $3x^2 – 29x + 40 = 0$
∴ $3x^2 – 24x – 5x + 40 = 0$
∴ $3x(x – 8) – 5(x – 8) = 0$
∴ $(x – 8)(3x – 5) = 0$
∴ $x – 8 = 0$ or $3x – 5 = 0$
∴ $x = 8$ or $3x = 5$
∴ $x = 8$ or $x = \frac{5}{3}$

∴ The roots of the given quadratic equation are 8 and $\frac{5}{3}$.

Q.3 A) Complete the following activities. (Any one)

1. 

2. Measure of central angle $(\theta) = \frac{\text{Number of scores in the components}}{\text{Total number of scores}} \times 360°$

i. Central angle for cricket $(\theta) = \boxed{81°}$

$\therefore \quad 81° = \frac{\text{Students who like cricket}}{1000} \times 360°$

$\therefore$ Students who like cricket $= \frac{81 \times 1000}{360}$

$= \boxed{225}$

ii. Central angle for football $(\theta) = \boxed{63°}$

$\therefore \quad 63° = \frac{\text{Students who like football}}{1000} \times 360°$

$\therefore$ Students who like football $= \frac{63 \times 1000}{360}$

$= \boxed{175}$

iii. Central angle for other games $(\theta) = \boxed{72°}$

$\therefore \quad 72° = \frac{\text{Students who like other games}}{1000} \times 360°$

$\therefore$ Students who like other games $= \frac{72 \times 1000}{360}$

$= \boxed{200}$

B) Solve the following questions. (Any two)

1. Here, we take A = 2500 and g = 1000

Class Weekly wages (₹)	Class mark x_i	$d_i = x_i - A = x_i - 2500$	$u_i = \frac{d_i}{g} = \frac{d_i}{1000}$	Frequency (No. of workers) f_i	$f_i u_i$
1000 – 2000	1500	– 1000	–1	25	–25
2000 – 3000	2500 → A	0	0	45	0
3000 – 4000	3500	1000	1	50	50
4000 – 5000	4500	2000	2	30	60
Total	–	–	–	$\Sigma f_i = 150$	$\Sigma f_i u_i = 85$

$$\bar{u} = \frac{\Sigma f_i u_i}{\Sigma f_i} = \frac{85}{150} = 0.57$$

Mean $= \bar{X} = A + \bar{u}g$

$= 2500 + 0.57\ (1000)$

$= 2500 + 570$

$= 3070$

$\therefore$ The mean of the weekly wages is Rs. 3070.

2. **Sol:** The given simultaneous equations are

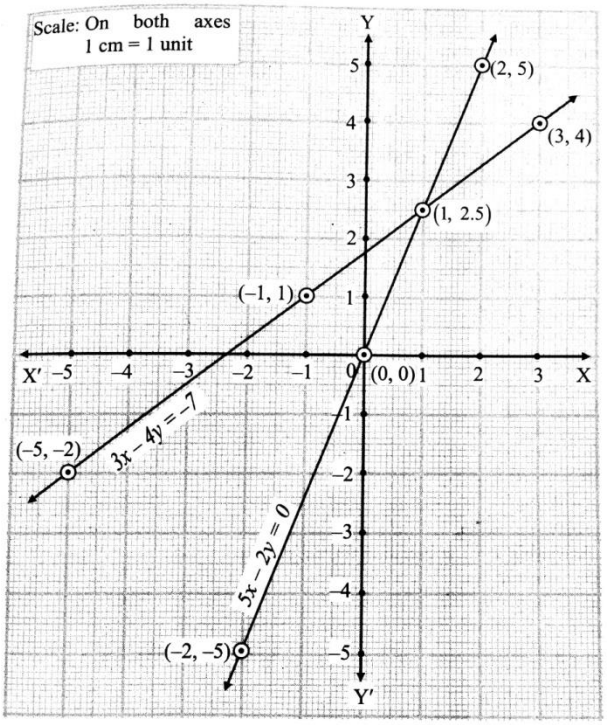
$3x - 4y = -7$ $\qquad$ $5x - 2y = 0$

$\therefore \quad 4y = 3x + 7$ $\qquad$ $\therefore \quad 2y = 5x$

$\therefore \quad y = \frac{3x+7}{4}$ $\qquad$ $\therefore \quad y = \frac{5}{2}x$

x	–1	–5	3
y	1	–2	4
(x, y)	(–1, 1)	(–5,–2)	(3, 4)

x	0	2	–2
y	0	5	–5
(x, y)	(0, 0)	(2, 5)	(–2, –5)



The two lines intersect at point $(1, 2.5)$.

$\therefore$ **$x = 1$ and $y = 2.5$ is the solution of the simultaneous equations $3x - 4y = -7$ and $5x - 2y = 0$.**

3. $x^2 + x - 20 = 0$

If $x^2 + x + k = (x + a)^2$, then

$x^2 + x + k = x^2 + 2ax + a^2$

Comparing the coefficients, we get

$I = 2a$ and $k = a^2$

$\therefore a = \frac{1}{2}$ and $k = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

Now, $x^2 + x - 20 = 0$

$\therefore \quad x^2 + x + \frac{1}{4} - \frac{1}{4} - 20 = 0$

$\therefore \quad \left(x + \frac{1}{2}\right)^2 - \left(\frac{1 + 80}{4}\right) = 0$

$\therefore \quad \left(x + \frac{1}{2}\right)^2 - \left(\frac{81}{4}\right) = 0$

$\therefore \quad \left(x + \frac{1}{2}\right)^2 = \frac{81}{4}$

Taking square root of both sides, we get

$x + \frac{1}{2} = \pm\frac{9}{2}$

$\therefore \quad x + \frac{1}{2} = \frac{9}{2}$ or $x + \frac{1}{2} = -\frac{9}{2}$

$\therefore \quad x = \frac{9}{2} - \frac{1}{2}$ or $x = -\frac{9}{2} - \frac{1}{2}$

$\therefore \quad x = \frac{8}{2} = 4$ or $x = -\frac{10}{2} = -5$

$\therefore$ **The roots of the given quadratic equation are 4 and –5.**

4. Sample space (S) = {0, 1, 2, 3, 4, 5}

n(S) = 6

i. Let A be the event that the card drawn shows a natural number.

$\therefore$ A = {1, 2, 3, 4, 5}

$\therefore$ n(A) = 5

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

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

ii. Let B be the event that the card drawn shows a number less than 1.

$\therefore$ B = {0}

$\therefore$ n(B) = 1

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

$\therefore$ $\mathbf{P(B) = \frac{1}{6}}$

iii. Let C be the event that the card drawn shows a whole number.

$\therefore$ C = {0, 1, 2, 3, 4, 5}

$\therefore$ n(C) = 6

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

$\therefore$ **P(C) = 1**

Q.4 Solve the following questions. (Any two)

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

According to first condition,

$x + y = 97$ ...(i)

Now, dividend = divisor × quotient + remainder

According to the second condition,

$x = y \times 7 + 1$

$\therefore$ $x = 7y + 1$

$\therefore$ $x - 7y = 1$ ...(ii)

Subtracting (ii) from (i), we get

$x + y = 97$

$x - 7y = 1$

$- \quad + \quad -$

$8y = 96$

$\therefore$ $y = \frac{96}{8} = 12$

Substituting $y = 12$ in (i), we get

$x + 12 = 97$

$\therefore$ $x = 97 - 12 = 85$

$\therefore$ **The two numbers are 85 and 12.**

2. **Sol:** Let the original price for the manufacturer be ₹ x.

$\therefore$ GST for manufacturer = 18% of x

$$= \frac{18}{100} \times x$$

$$= \frac{18x}{100}$$

Selling price for manufacturer = ₹ $\left(x + \frac{18x}{100}\right)$

$$= ₹ \frac{118x}{100}$$

Wholesaler:

Cost price for Wholesaler = ₹ $\frac{118x}{100}$

Profit for wholesaler = 25% of $\left(\frac{118}{100}x\right)$

$$= \frac{25}{100} \times \frac{118x}{100}$$

$$= \frac{1}{4} \times \frac{118x}{100}$$

$$= ₹ \frac{118x}{400}$$

Price of CCTV including profit = ₹ $\left(\frac{118x}{100} + \frac{118x}{400}\right)$

GST = 18% of ₹ $\left(\frac{118x}{100} + \frac{118x}{400}\right)$

$$= \frac{18}{100} \times \left(\frac{118x}{100} + \frac{118x}{400}\right)$$

Selling price of wholesaler = price including profit + GST

$\therefore$ $51344.75 = \left(\frac{118}{100}x + \frac{118x}{400}\right) + \left(\frac{18}{100}\right)\left(\frac{118x}{100} + \frac{118x}{400}\right)$

$$= \left(\frac{118}{100}x + \frac{118}{400}x\right)\left(1 + \frac{18}{100}\right)$$

$\therefore$ $51344.75 = \frac{590}{400} \times \frac{118}{100} \times x$

$\therefore$ $51344.75 = 1.7405 \times x$

$\therefore$ $x = \frac{51344.75}{1.7405}$

$\therefore$ x = ₹ 29,500

$\therefore$ **Original price of CCTV for the manufacturer is ₹ 29,500.**

3. The two digit numbers that leave remainder 1 when divided by 5 are 11, 16, 21, 26, 31, ..., 96.
This sequence is an A.P. with
a = 11, d = 16 – 11 = 5 and t_n = 96
now, $t_n = a + (n - 1)d$
$\therefore$ 96 = 11 + (n – 1)5
$\therefore$ 96 – 11 = (n – 1)5
$\therefore$ 85 = 5n – 5
$\therefore$ 85 + 5 = 5n
$\therefore$ 90 = 5n
$\therefore$ n = $\frac{90}{5}$
$\therefore$ n = 18
$\therefore$ There are 18 two digit numbers which leave remainder 1 when divided by 5.

Q.5 Solve the following questions. (Any one)

1. **Sol:** Let the usual speed of the express train be x km/ hr.
Distance covered = 440 km

$\therefore$ time taken = $\frac{440}{x}$ hours.

If the speed is increased by 8 km/hr, then the time taken $= \frac{440}{x+8}$ hours.

According to the given condition,

$$\frac{440}{x} - \frac{440}{x+8} = \frac{30}{60} \quad \ldots\left[\because 30 \text{ mins} = \frac{30}{60}\text{hrs.}\right]$$

$$\therefore \quad 440\left[\frac{1}{x} - \frac{1}{x+8}\right] = \frac{1}{2}$$

$$\therefore \quad \frac{1}{x} - \frac{1}{x+8} = \frac{1}{2} \times \frac{1}{440}$$

$$\therefore \quad \frac{x+8-x}{x(x+8)} = \frac{1}{880}$$

$$\therefore \quad \frac{8}{x^2+8x} = \frac{1}{880}$$

$$\therefore \quad x^2 + 8x = 8 \times 880$$

$$\therefore \quad x^2 + 8x - 7040 = 0$$

$$\therefore \quad x^2 + 88x - 80x - 7040 = 0$$

$$\therefore \quad x(x+88) - 80(x+88) = 0$$

$$\therefore \quad (x+88)(x-80) = 0$$

$$\therefore \quad x + 88 = 0 \text{ or } x - 80 = 0$$

$$\therefore \quad x = -88 \text{ or } x = 80$$

But speed cannot be negative.

$$\therefore \quad x \neq -88 \qquad \therefore \qquad x = 80$$

$$\therefore$$ **The usual speed of the express train is 80 km/hr.**

2. Let P(C) = x
   ∴ P(B) = 2x
   and P(A) = 4x
   But P(A) + P(B) + P(C) = 1
   ∴ 4x + 2x + x = 1
   ∴ 7x = 1
   ∴ $x = \frac{1}{7}$
   ∴ P(C) = $\frac{1}{7}$, P(B) = $\frac{2}{7}$, P(A) = $\frac{4}{7}$