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

**Q.1 A) Choose the correct alternative.**

1) B 2) B 3) B 4) A

**B) Solve the following questions.**

1. Rate of GST = 12%

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

$\therefore$ **Rate of CGST = Rate of SGST = 6%**

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

$\therefore \frac{3}{4} = \frac{6}{n(S)}$

$\therefore n(S) = \frac{6\times4}{3} = \mathbf{8}$

3. $x^2 + 5x = -(3 - x)$

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

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

$\therefore \mathbf{x^2 + 4x + 3 = 0}$

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

$= 7 + (n - 1)6$

$= 7 + 6n - 6$

$= 6n + 1$

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

1. **Ans:** $a = 2$, $d = \boxed{2}$, $t_n = 148$

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

$\therefore \quad 148 = \boxed{2 + (n-1)2}$

$\therefore \quad 146 = 2n - \boxed{2}$

$\therefore \quad 2n = 146 + 2 = 148$

$\therefore \quad n = \frac{148}{2} = \boxed{74}$

2. $S = \{\boxed{A, B, C, D, E, O}\}$

$n(S) = \boxed{6}$

$M = \{\boxed{A, E, O}\}$

$n(M) = \boxed{3}$

3.

| x | −4 | 5 | 2 |
|---|---|---|---|
| y | 0 | 3 | 2 |
| (x, y) | (−4, 0) | (5, 3) | (2, 2) |

**B) Solve the following questions. (Any four)**

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

According to the given condition,

$t_{17} = t_{10} + 7$

$\therefore a + (17 - 1)d = a + (10 - 1)d + 7$ .... $[\because t_n = a + d]$

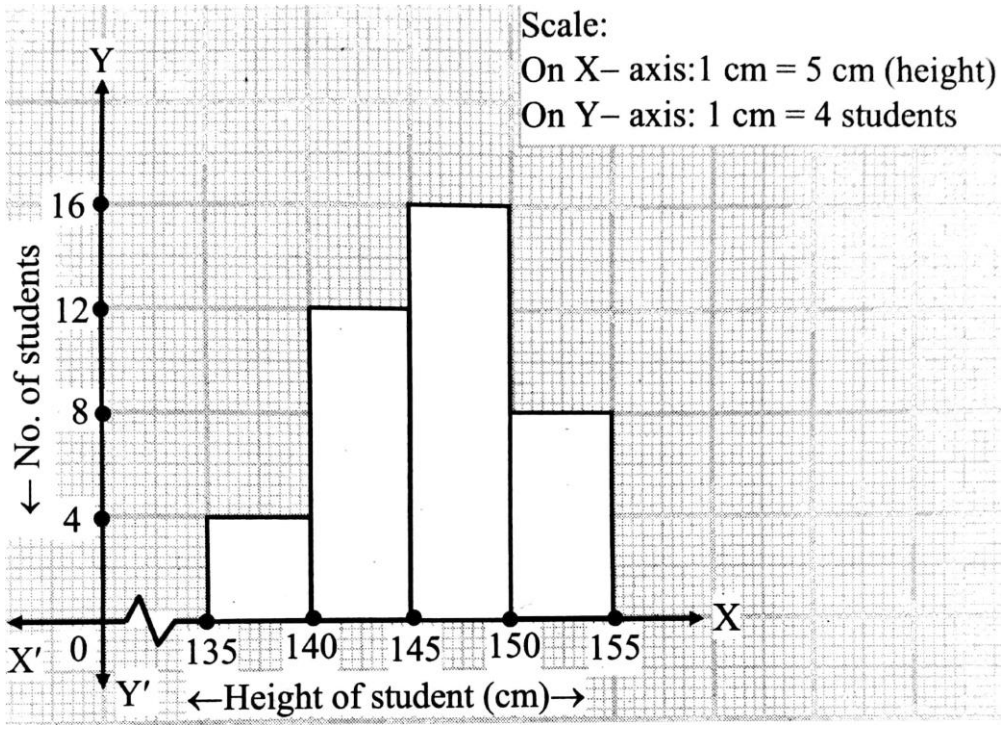
$\therefore a + 16d = a + 9d + 7$

$\therefore a + 16d - a - 9d = 7$

$\therefore 7d = 7$

$\therefore d = \frac{7}{7} = 1$

**∴ The common difference is 1.**

2. 


3. Here, Face Value of share = Rs. 100,
Premium = Rs. 30, brokerage = 0.3%
MV = FV + Premium
= 100 + 30 = Rs. 130
Brokerage = 0.3% of MV
$= \frac{0.3}{100} \times 130 =$ Rs. 0.39
Purchase price of a share = MV + Brokerage
= 130 + 0.39 = Rs. 130.39
**∴ Purchase price of a share is Rs. 130.39**

4. Total number of pens in the box = 5 + 8 + 3 = 16
∴ n(S) = 16
Let A be the event that Rutuja Picks a blue pen.
Total number of blue pens = 8
∴ n(A) = 8
∴ P(A) = $\frac{n(A)}{n(S)} = \frac{8}{16}$
**∴ P(A) = $\frac{1}{2}$**

5. $\begin{vmatrix} 4 & 5 \\ m & 3 \end{vmatrix} = 4(3) - 5(m) = 12 - 5\,m$
But, $\begin{vmatrix} 4 & 5 \\ m & 3 \end{vmatrix} = 22$ ...[Given]
∴ 12 – 5m = 22
∴ −5m = 22 – 12
∴ −5m = 10
∴ m = $\frac{10}{-5} = -2$

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

1. Let the amount of GST be Rs. x.
Total value of remote controlled toy car = Rs. 1770
∴ Taxable value of remote controlled toy car = Rs. (1770 – x)
Now, GST = **18%** of taxable value
∴ x = $\frac{18}{100} \times (1770 - x)$
∴ 100x = 18(1770 – x)

$\therefore 100x = 18 \times 1770 - 18x$

$\therefore 100x + 18x = 18 \times 1770$

$\therefore 118x = 18 \times 1770$

$\therefore x = \frac{18 \times 1770}{118} = 18 \times 15 = \mathbf{270}$

$\therefore$ GST = **Rs. 270**

$\therefore$ Taxable value of remote controlled toy car = Rs.(1770 – x) = Rs. (1770 – 270) = **Rs. 1500**

But, CGST = SGST = $\frac{GST}{2}$

$\therefore$ CGST = SGST = $\frac{270}{2} = \mathbf{Rs.\,135}$

2. By filling the following boxes find the quadratic equation whose roots are $1 - 3\sqrt{5}$ and $1 + 3\sqrt{5}$.

Let $\alpha = 1 + 3\sqrt{5}$ and $\beta = 1 + 3\sqrt{5}$

$\therefore \alpha + \beta = \mathbf{2}$

$1 - 9 \times 5$

and $\propto \beta = \mathbf{-44}$

$\therefore$ The required quadratic equation is

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

$\therefore x^2 - \mathbf{2x} - 44 = 0$

**B) Solve the following questions. (Any two)**

1. **Sol:** $kx(x-2) + 6 = 0$

$\therefore kx^2 - 2kx + 6 = 0$

Comparing the above equation with $ax^2 + bx + c = 0$, we get

$a = k, b = -2k, c = 6$

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

$= (-2k)^2 - 4 \times k \times 6$

$= 4k^2 - 24k$

$\therefore \Delta = 4k(k-6)$

Since, the roots are real and equal.

$\therefore \Delta = 0$

$\therefore 4k(k-6) = 0$

$\therefore k(k-6) = 0$

$\therefore k = 0$ or $k - 6 = 0$

But, if $k = 0$ then quadratic coefficient becomes zero.

$\therefore k \neq 0$

$\therefore \mathbf{k = 6}$

2.

| Class Average Speed of Vehicles (Km/hr) | Continuous classes | Frequency (No. of vehicles) $f_i$ | Cumulative frequency (less than) |
|---|---|---|---|
| 60 – 64 | 59.5 – 64.5 | 10 | 10 |
| 65 – 69 | 64.5 – 69.5 | 34 | 44 |
| 70 – 74 | 69.5 – 74.5 | 55 | $99 \rightarrow cf$ |
| 75 – 79 | 74.5 – 79.5 | $85 \rightarrow f$ | 184 |
| 80 – 84 | 79.5 – 84.5 | 10 | 194 |
| 85 – 89 | 84.5 – 89.5 | 6 | 200 |
| Total | – | 200 | – |

Here, total frequency $= \Sigma f_i = N = 200$

$\therefore \frac{N}{2} = \frac{200}{2} = 100$

Cumulative frequency which is just greater than (or equal) to 100 is 184.

∴ The median class is 74.5 – 79.5

Now, L = 74.5, f = 85, cf = 99, h = 5

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

$= 74.5 + \left(\frac{100-99}{85}\right) 5$

$= 74.5 + 0.059 = 74.559 \approx 75$

**∴ The median of the given data is 75 km/hr (approx.).**

3. **Sol:** There are 52 playing cards.

∴ n(S) = 52

i. Let A be the event that the card drawn is a black card.

∴ n(A) = 26

∴ $P(A) = \frac{n(A)}{n(S)} = \frac{26}{52} = \frac{1}{2}$

ii. Let B be the event that the card drawn is a face card.

∴ n(B) = 12

∴ $P(B) = \frac{n(B)}{n(S)} = \frac{12}{52} = \frac{3}{13}$

iii. Let C be the event that the card drawn bears a number between 2 to 5 including 2 and 5.
There are four such cards in each of the four suits.

∴ n(C) = 4 + 4 + 4 + 4 = 16

∴ $P(C) = \frac{n(C)}{n(S)} = \frac{16}{52} = \frac{4}{13}$

4. **Sol:** The instalments are in A.P.

Amount repaid in 12 instalments ($S_{12}$)

= Amount borrowed + total interest

= 8000 + 1360

∴ $S_{12} = 9360$

Number of instalments (n) = 12

Each instalment is less than the preceding one by ₹ 40.

∴ d = –40

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

∴ $S_{12} = \frac{12}{2}[2a + (12-1)(-40)]$

∴ $9360 = 6[2a + (11)(-40)]$

∴ $9360 = 6(2a - 440)$

∴ $\frac{9360}{6} = 2a - 440$

∴ $1560 = 2a - 440$

∴ $1560 + 440 = 2a$

∴ $2000 = 2a$

∴ $a = \frac{2000}{2}$

∴ a = 1000

∴ **Amount of the first instalment is ₹ 1000.**

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

1. **Sol:** Since, the given table has cumulative frequency distribution, we convert it into frequency distribution table.

Here, the number of men having income less than ₹100 are 12 and those less than ₹200 are 28

∴ Number of men having income between 0 and 100 = 12 – 0 = 12

and number of men having income between 100 and 200 = 28 – 12 = 16

Similarly, number of men having income between 200 – 300, 300 – 400 and 400 – 500 are calculated as follows:

| Daily income (in ₹) | Number of men ($f_i$) | Class mark ($x_i$) | $d_i = x_i - A$<br>$d_i = x_i - 250$ | $u_i = \frac{d_i}{g}$<br>$= \frac{d_i}{100}$ | $f_i u_i$ |
|---|---|---|---|---|---|
| 0 – 100 | 12 | 50 | –200 | –2 | –24 |
| 100 – 200 | 28 – 12 = 16 | 150 | –100 | –1 | –16 |
| 200 – 300 | 34 – 28 = 6 | 250 | 0 | 0 | 0 |
| 300 – 400 | 41 – 34 = 7 | 350 | 100 | 1 | 7 |
| 400 – 500 | 50 – 41 = 9 | 450 | 200 | 2 | 18 |
| Total | $\sum f_i = 50$ | | | | $\sum f_i u_i = -15$ |

**By using step-deviation method,**

$$\bar{X} = A + g \times \left(\frac{\sum f_i u_i}{\sum f_i}\right)$$

$$= 250 + 100 \times \left(\frac{-15}{50}\right)$$

$$= 250 - 30$$

$$= ₹\ 220$$

$\therefore$ **The mean of daily income is ₹ 220.**

2. **Sol:** $4x + 3y = 24$

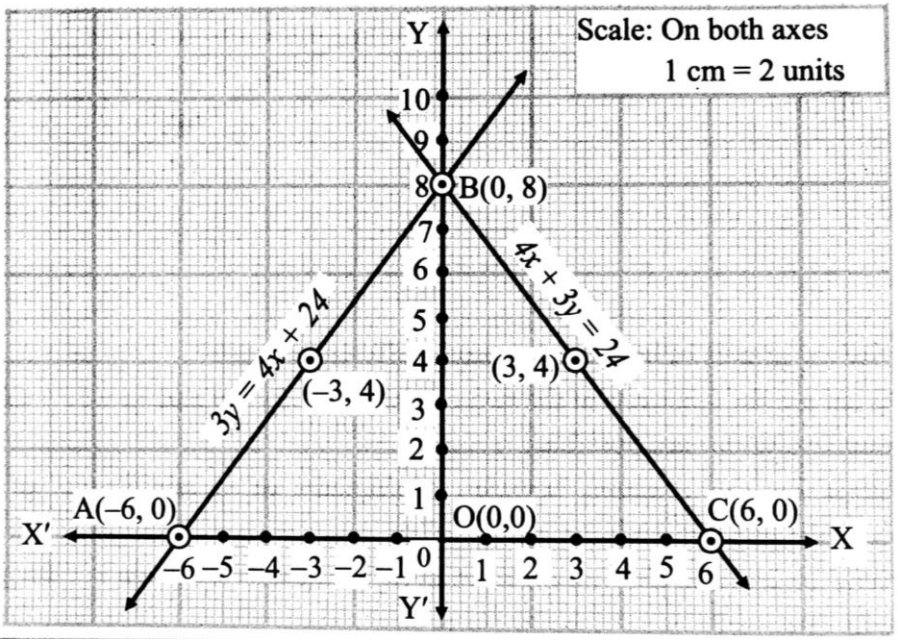
$\therefore \quad y = \frac{24 - 4x}{3}$

| $x$ | 0 | 3 | 6 |
|---|---|---|---|
| $y$ | 8 | 4 | 0 |
| $(x, y)$ | (0, 8) | (3, 4) | (6, 0) |

$3y = 4x + 24$

$\therefore \quad y = \frac{4x + 24}{3}$

| $x$ | 0 | –3 | –6 |
|---|---|---|---|
| $y$ | 8 | 4 | 0 |
| $(x, y)$ | (0, 8) | (–3, 4) | (–6, 0) |




$\therefore$ The point of intersection of given lines is (0, 8).

From the graph, we get $\Delta ABC$, where BO is the height of the triangle and AC is the base.

Now, $l(AC) = 12$ cm and $l(BO) = 8$ cm

$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times l(AC) \times l(BO) = \frac{1}{2} \times 12 \times 8$

$\therefore$ **Area of $\Delta ABC = 48$ cm$^2$**

3. Let the radius of the first circle be $x$ m.

$\therefore$ the radius of the second circle = $(x + 3)$ m

According to the given condition,

$\pi x^2 + \pi (x + 3)^2 = 89\pi$

$\therefore \quad \pi[x^2 + (x + 3)^2] = 89\pi$

$\therefore \quad x^2 + (x + 3)^2 = 89$

$\therefore \quad x^2 + x^2 + 6x + 9 = 89$

$\therefore \quad 2x^2 + 6x + 9 - 89 = 0$

$\therefore \quad 2x^2 + 6x - 80 = 0$

$\therefore \quad 2(x^2 + 3x - 40) = 0$

$\therefore \quad x^2 + 3x - 40 = 0$

$\therefore \quad x^2 + 8x - 5x - 40 = 0$

$\therefore \quad x(x + 8) - 5(x + 8) = 0$

$\therefore \quad x + 8 = 0 \quad$ or $\quad x - 5 = 0$

$\therefore \quad x = -8 \quad$ or $\quad x = 5$

But, $x = -8$ is not possible because radius cannot be negative.

$\therefore \quad x = 5$

Radius of the other circle = $(x + 3) = 5 + 3 = 8$ m

$\therefore$ **Radius of first circle = 5 m,**

**Radius of second circle = 8 m**

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

1. a. The modal class is 74.5 – 79.5 because the maximum frequency is 82.

b. Total frequency = N = 200

$\therefore \frac{N}{2} = \frac{200}{2} = 100$

Cumulative frequency which is just greater than (or equal) to 100 is 102.

$\therefore$ The median class is 69.5 – 74.5

c. 44 is the cumulative frequency of the class preceding the median class.

d. Class interval (h) = upper limit of median class lower limit of median class = 74.5 – 69.5 = 5

2. **Sol:** $D_x = \begin{vmatrix} -11 & a \\ 9 & -4 \end{vmatrix} = 44 - 9a$

$D_y = \begin{vmatrix} 3 & -11 \\ b & 9 \end{vmatrix} = 27 + 11b$

$D = \begin{vmatrix} 3 & 2 \\ 7 & -4 \end{vmatrix} = -12 - 14 = -26$

By Cramer's rule, we get

$x = \frac{D_x}{D}$ and $y = \frac{D_y}{D}$

$\therefore \quad -1 = \frac{44 - 9a}{-26}$ and $-4 = \frac{27 + 11b}{-26}$

$\therefore \quad 44 - 9a = 26$ and $104 = 27 + 11b$

$\therefore \quad 9a = 18$ and $11b = 77$

$\therefore \quad \mathbf{a = 2}$ and $\mathbf{b = 7}$

Now, $D_x = \begin{vmatrix} -11 & 2 \\ 9 & -4 \end{vmatrix}$, $D_y = \begin{vmatrix} 3 & -11 \\ 7 & 9 \end{vmatrix}$, $D = \begin{vmatrix} 3 & 2 \\ 7 & -4 \end{vmatrix}$

Comparing these determinants with

$D_x = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}$, $D_y = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$, $D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$, we get

$a_1 = 3$, $b_1 = 2$, $c_1 = -11$ and

$a_2 = 7$, $b_2 = -4$, $c_2 = 9$

$\therefore \quad$ The required equations are

$\mathbf{3x + 2y = -11}$ and $\mathbf{7x - 4y = 9}$