Exercise 10D

Question 33:
Let the faster pipe takes x minutes to fill the cistern
Then, the other pipe takes (x + 3) minute

$$\frac{1}{x} + \frac{1}{(x+3)} = \frac{13}{40} \implies \frac{(x+3)+x}{x(x+3)} = \frac{13}{40}$$

$$\implies 40(2x+3) = 13(x^2 + 3x)$$

$$\implies 13x^2 - 41x - 120 = 0$$

$$\implies 13x^2 - 65x + 24x - 120 = 0$$

$$\implies 13x(x-5) + 24(x-5) = 0$$

$$\implies (x-5)(13x+24) = 0$$

$$\implies x = 5 \quad \text{or} \quad x = \frac{-24}{3}$$

$$x = 5 \quad (\text{Time cannot be negative})$$

The faster pipe takes 5 minutes to fill the cistern
Then, the other pipe takes (5 + 3) minutes = 8 minutes

Question 34:
Let the age of son be x and age of man = y
1 year ago

$\therefore (y-1) = 8(x-1)$

$\Rightarrow y - 1 = 8x - 8$

$\Rightarrow y - 8x = -7$

$\Rightarrow y = -7 + 8x$

Also, $y = x^2 \Rightarrow (-7 + 8x) = x^2$

$\Rightarrow 8x - 7 = x^2$

$\Rightarrow x^2 - 8x + 7 = 0$

$\Rightarrow x^2 - 7x - x + 7 = 0$

$\Rightarrow x(x - 7) - 1(x - 7) = 0$

$\Rightarrow (x - 7)(x - 1) = 0$

$\Rightarrow x = 7 \quad \text{or} \quad x = 1$

$\quad\quad x = 7 \quad [x \neq 1]$

Age of son = 7 years

Age of man $= (-7 + 8 \times 7) = -7 + 56 = 49$ years

Question 35:
Let the age of man and son be x and y
Then, x + y = 45
Five years ago
Product of their ages = 4 times the age of man five years ago
(x - 5)(y - 5) = 4(x - 5)
⇒ y - 5 = 4
y = 9
⇒ x + 9 = 45
x = 45 - 9 = 36
Hence the ages of man and son are 36 years and 9 years respectively.

Question 36:
Let the present age of Meena be x
Then,

$$(x - 5)(x + 8) = 30$$

$$\Rightarrow x^2 + 8x - 5x - 40 = 30$$

$$\Rightarrow x^2 + 3x - 40 - 30 = 0$$

$$\Rightarrow x^2 + 3x - 70 = 0$$

$$\Rightarrow x^2 + 10x - 7x - 70 = 0$$

$$\Rightarrow x(x + 10) - 7(x + 10) = 0$$

$$\Rightarrow (x + 10)(x - 7) = 0$$

$$x = -10 \quad \text{or} \quad x = 7$$

$$x = 7 \ (\because \text{age cannot be negative})$$

Hence the present age of Meena is 7 years.

Question 37:

Let the ages of two brothers be x and 25 - x
Then,

$$\therefore x \times (25 - x) = 126$$

$$\Rightarrow 25x - x^2 = 126 \Rightarrow x^2 - 25x + 126 = 0$$

$$\Rightarrow x^2 - 18x - 7x + 126 = 0$$

$$\Rightarrow x(x - 18) - 7(x - 18) = 0$$

$$\Rightarrow (x - 18)(x - 7) = 0$$

$$x - 18 = 0 \quad \text{or} \quad x - 7 = 0$$

$$x = 18, \ x = 7$$

Hence, present ages of the two brothers is 18 years and 7 years.

Question 38:
Let the width of the path be x meters,
Then,
Area of path = 16 × 10 - (16 - 2x) (10 - 2x) = 120

$$\Rightarrow 16 \times 10 - (160 - 32x - 20x + 4x^2) = 120$$

$$\Rightarrow 160 - 160 + 32x + 20x - 4x^2 = 120$$

$$\Rightarrow -4x^2 + 52x - 120 = 0$$

$$\Rightarrow 2x^2 - 26x + 60 = 0$$

$$\Rightarrow x^2 - 13x + 30 = 0$$

$$\Rightarrow x^2 - 10x - 3x + 30 = 0 \Rightarrow x(x - 10) - 3(x - 10) = 0$$

$$\Rightarrow (x - 10)(x - 3) = 0$$

$$\Rightarrow x - 10 = 0 \quad \text{or} \quad x - 3 = 0$$

$$x = 10 \quad \text{or} \quad x = 3$$

Hence the required width is 3 meter as x cannot be 10m.

Question 39:
Let the breadth of a rectangle = x cm
Then, length of the rectangle = 2x cm

$$\therefore \text{Area} = \text{length} \times \text{breadth} = 288 \ cm^2$$

$$\Rightarrow 2x \times x = 288$$

$$\Rightarrow 2x^2 = 288$$

$$\Rightarrow x^2 = 144$$

$$\Rightarrow x = \sqrt{144} \Rightarrow x = \pm 12$$

$$\Rightarrow x = 12 \ [\because \text{breadth cannot be negative}]$$

Thus, breadth of rectangle = 12 cm
And length of rectangle = (2 × 12) = 24 cm

********** END *********