



Exercise 10D

Question 17:

Let the tens digit be x and units digit be y

then, $10x + y = 4(x + y)$ and $10x + y = 2xy$

$$\Rightarrow y = 2x \text{ and } 10x + y = 2xy$$

Putting $y = 2x$ in $10x + y = 2xy$

$$10x + 2x = 2x \cdot 2x$$

$$4x^2 - 12x = 0 \Rightarrow 4x(x - 3) = 0$$

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

Hence, the tens digit is 3 and units digit is (2×3)

Hence the required number is 36.

Question 18:

Let the tens digit and units digits of the required number be x and y respectively.

$$\therefore xy = 14 \Rightarrow y = \frac{14}{x}$$

the number = $(10x + y)$

$$(10x + y) + 45 = (10y + x) \Rightarrow 9x - 9y = -45$$

$$\Rightarrow x - y = -5 \quad \text{--- (2)}$$

Putting $y = \frac{14}{x}$ from (1) in (2), we get

$$x - \frac{14}{x} = -5 \Rightarrow x^2 + 5x - 14 = 0$$

$$\Rightarrow x^2 + 7x - 2x - 14 = 0 \Rightarrow x(x + 7) - 2(x + 7) = 0$$

$$\Rightarrow (x + 7)(x - 2) = 0$$

$$x + 7 = 0 \text{ or } x - 2 = 0$$

$$x = -7 \text{ or } x = 2$$

$\therefore x = 2$ [\because a digit cannot be negative]

Putting $x = 2$ in (1), we get $y = 8$

The ten digit is 2 and unit digit is 7.

Hence, the required number is 27.

Question 19:

Let the total number of birds be x^2 , then

$$\begin{aligned}
& \frac{x^2}{4} + \frac{x^2}{9} + \frac{x^2}{4} + 7x + 56 = x^2 \\
& \Rightarrow 9x^2 + 4x^2 + 9x^2 + 252x + 2016 = 36x^2 \\
& \Rightarrow -14x^2 + 252x + 2016 = 0 \\
& \Rightarrow x^2 - 18x - 144 = 0 \\
& \Rightarrow x^2 - 24x + 6x - 144 = 0 \\
& \Rightarrow x(x - 24) + 6(x - 24) = 0 \\
& \Rightarrow (x - 24)(x + 6) = 0 \\
& \Rightarrow x = 24 \text{ or } x = -6 \\
& \Rightarrow x = 24
\end{aligned}$$

(\because number of birds cannot be negative)
Hence, the number of birds = $(24)^2 = 576$

Question 20:

Let there be x rows and number of student in each row be x
Then, total number of students = $x^2 + 24$

$$\begin{aligned}
& \Rightarrow x^2 + 24 = (x + 1)^2 - 25 \\
& \Rightarrow x^2 + 24 = x^2 + 1 + 2x - 25 \\
& \Rightarrow 2x = 48 \Rightarrow x = 24
\end{aligned}$$

Hence total number of student
= $[(24)^2 + 24] = 576 + 24 = 600$
Total number of students is 600.

Question 21:

Let the number of students be x , then

$$\begin{aligned}
& \frac{300}{x} - \frac{300}{(x + 10)} = 1 \Rightarrow \frac{1}{x} - \frac{1}{(x + 10)} = \frac{1}{300} \\
& \Rightarrow \frac{x + 10 - x}{x(x + 10)} = \frac{1}{300} \\
& \Rightarrow x(x + 10) = 3000 \\
& \Rightarrow x^2 + 10x - 3000 = 0 \\
& \Rightarrow x^2 + 60x - 50x - 3000 = 0 \\
& \Rightarrow x(x + 60) - 50(x + 60) = 0 \\
& \Rightarrow (x + 60)(x - 50) = 0 \\
& \Rightarrow x = -60 \text{ or } x = 50 \\
& \quad \quad \quad x = 50
\end{aligned}$$

(\because number of birds cannot be negative)

Hence the number of students is 50.

Question 22:

Let the number of pens be x

Total cost of the pens is Rs. 80

\therefore Cost of one pen = Rs $80/x$

If the number of pens is increased $x + 4$

Cost of one pen = Rs $80/(x+4)$

Difference between them = Rs 1

$$\therefore \frac{80}{x} - \frac{80}{x+4} = 1 \Rightarrow \frac{x+4-x}{x^2+4x} = \frac{1}{80}$$

$$\Rightarrow \frac{4}{x^2+4x} = \frac{1}{80} \Rightarrow x^2+4x = 320$$

$$\Rightarrow x^2+4x-320 = 0$$

$$\Rightarrow x^2+20x-16x-320 = 0$$

$$\Rightarrow x(x+20)-16(x+20) = 0$$

$$\Rightarrow (x+20)(x-16) = 0$$

$$\Rightarrow x = -20 \quad \text{or} \quad x = 16$$

$$x = 16$$

(\therefore number of pen cannot be negative)

Hence, number of pens is 16.

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