Linear Equations in One Variable: Exercise 2.4

Q.1 Amina thinks of a number and subtracts $\frac{5}{2}$ from it. She multiplies the result by 8. The result now obtained is 3 times the same number she thought of. What is the number?

Sol. Let x be the number of Amina.

Since, this number is subtracted by $\frac{5}{2}$ and obtained result is multiplied by 8 then final obtained result is 3 times the same number Amina thought of.

So, $8x\left(x-\frac{5}{2}\right)=3x$

$8x - 20 = 3x$

Now, transposing $3x$ from RHS to LHS and -20 from LHS to RHS,

$8x - 3x = 20$

$5x = 20$

On dividing by 5 on both the sides of the equation,

$x = 4$

Thus, the required number = 4

Q.2 A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number. What are the numbers?

Sol. Let x be the first number and 5x will be the other number.

Since, If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number.

So, $21 + 5x = 2(x + 21)$

$21 + 5x = 2x + 42$

Now, transposing $2x$ from RHS to LHS and 21 from LHS to RHS,

$5x - 2x = 42 - 21$

$3x = 21$

On dividing both the sides of the equation by 3,

$x = 7$

And other number, $5x = 5 \text{ x } 7 = 35$

Therefore, the required numbers are 7 and 35 respectively.

Q.3 Sum of the digits of a two-digit number is 9. When we interchange the digits, it is found that the resulting new number is greater than the original number by 27. What is the two-digit number?

Sol. Let x be the digit at ten's place and $(9 - x)$ be the digit at one's place.

So, original number = $10x + (9 - x)$

$= 9x + 9$

Now, new number on interchanging the digits = $10(9 - x) + x$

$= 90 - 9x$

Since, if we interchange the digits, it is found that the resulting new number is greater than the original number by 27.

So, $90 - 9x = 9x + 9 + 27$

$90 - 9x = 9x + 36$

Now, transposing $9x$ from LHS to RHS and 36 from RHS to LHS,

$90 - 36 = 18x$

$54 = 18x$

On dividing by 18 on both the sides of the equation,

$x = 3$

So, $9 - x = 9 - 3 = 6$

Therefore, the required two digit number is $9x + 9 = 9 \times 3 + 9$

$= 36.$

Q.4 One of the two digits of a two digit number is three times the other digit. If you interchange the digits of this two-digit number and add the resulting number to the original number, you get 88. What is the original number?

Sol. Let x be the digits at ten's place and $3x$ be at one's place.

So, original number will be = $10x + 3x = 13x$

If number after interchanging, then = $10 \times 3x + x$

$= 30x + x = 31x$

Given according to question, $13x + 31x = 88$

$44x = 88$

On dividing by 44 on both the sides of the equation,

$x = 2$

So, original number = $13x = 13 \times 2 = 26$

And number after interchanging will be = $31 \times 2 = 62$

Thus, the required two-digit number will be 26 or 62.

Q.5 Shobo's mother's present age is six times Shobo's present age. Shobo's age five years from now will be one third of his mother's present age. What are their present ages?

Sol. Let x years be the age of Shobo, then Shobo's mother's age will be $6x$ years.

Since, Shobo's age five years from now will be one third of his mother's present age,

So, $x + 5 = \frac{6x}{3}$

$x + 5 = 2x$

Now, transposing x from LHS to RHS,

$5 = 2x - x$

$5 = x$

$x = 5$

So, $6x = 6 \times 5 = 30$

Therefore, the present ages of Shobo is 5 years and his mother is 30 years.

Q.6 There is a narrow rectangular plot, reserved for a school, in Mahuli village. The length and breadth of the plot are in the ratio 11:4. At the rate Rs100 per metre it will cost the village panchayat Rs 75000 to fence the plot. What are the dimensions of the plot?

Sol. Let x be the common ratio between the length and breadth of the plot.

So, the length will be $11x$ and the breadth will be $4x$.

Now, perimeter of the plot = 2(length + breadth)

$= 2(11x + 4x)$

$= 30x$

Since, Rs.100 per metre will cost the village panchayat Rs 75000 to fence the plot

So, 100 x Perimeter = 75000

$100 \times 30x = 75000$

$3000x = 75000$

On dividing by 3000 on both the sides of equation,

$x = 25$

So, length = $11x = (11 \times 25) = 275$

and Breadth = $4x = (4 \times 25) = 100$

Therefore, the required dimensions of the plot are 275 m X 100 m.

Q.7 Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him Rs 50 per metre and trouser material that costs him Rs 90 per metre. For every 2 meters of the trouser material he buys 3 metres of the shirt material. He sells the materials at 12% and 10% profit respectively. His total sale is Rs 36,660. How much trouser material did he buy?

Sol. Let $2x$ and $3x$ be the trouser material and shirt material bought respectively.

Selling price of trouser material per metre with 12% profit = Rs $(90 + 90 \times \frac{12}{100})$

= Rs 100.80

Selling price of shirt material per metre with 10% profit = Rs $(50 + 50 \times \frac{10}{100})$

= Rs 55

Since, His total sale is Rs 36,660.

So, 100.80 x $2x$ + 55 x $3x$ = 36660

$201.60x + 165x = 36660$

$366.60x = 36660$

On dividing by 366.60 on both the sides of equation,

$x = 100$

So, trouser material = $2x$ = 2 x 100 = 200

and shirt material = $3x$ = 3 x 100 = 300

Therefore, Hasan should buy 200 m of trouser material.

Q.8 Half of a herd of deer are grazing in the field and three fourths of the remaining are playing nearby. The rest 9 are drinking water from the pond. Find the number of deer in the herd.

Sol. Let x be the number of deer.

Therefore, number of deer grazing in the field are = $\frac{x}{2}$

And number of deer playing nearby = $\frac{3}{4}$ x No. of remaining deer

$$= \frac{3}{4} \times (x - \frac{x}{2})$$

$$= \frac{3}{4} \times (\frac{x}{2})$$

$$= \frac{3x}{8}$$

Since, rest 9 are drinking water from the pond.

So, $x - (\frac{x}{2} + \frac{3x}{8}) = 9$

$$x - \left(\frac{4x + 3x}{8}\right) = 9$$

$$x - \frac{7x}{8} = 9$$

$$\frac{8x - 7x}{8} = 9$$

$$\frac{x}{8} = 9$$

On multiplying by 8 on both the sides of the equation,

$$x = 72$$

Therefore, the total no. of deer is 72.

Q.9 A grandfather is ten times older than his granddaughter. He is also 54 years older than her. Find their present ages.

Sol. Let x be the age of granddaughter. So, the age of grandfather will be $10x$ years.

Since, grandfather is also 54 years older than his granddaughter.

So, $10x = x + 54$

Now, transposing x from RHS to LHS,

$10x - x = 54$

$9x = 54$

$x = 6$

So, age of grandfather = $10x = 10 \times 6 = 60$ years.

Therefore, the present ages of granddaughter is 6 years and grandfather is 60.

Q.10 Aman's age is three times his son's age. Ten years ago he was five times his son's age. Find their present ages.

Sol. Let x years be the age of Aman's son. So, age of Aman will be $3x$ years.

Since, ten years ago Aman was five times his son's age.

So, $(3x - 10) = 5(x - 10)$

$3x - 10 = 5x - 50$

Now, transposing $3x$ from LHS to RHS and 50 RHS to LHS,

$50 - 10 = 5x - 3x$

$40 = 2x$

On dividing by 2 on both the sides of the equation,

$20 = x$

Thus, age of Aman's son, $x = 20$

And age of Aman, 3a = 3 x 20 = 60

Hence, the present ages of Aman and his son are 60 years and 20 years respectively.