# ATOMIC ENERGY EDUCATION SOCIETY

# DISTANCE LEARNING PROGRAMME

## CLASS 8 – MATHEMATICS

## CHAPTER 2
## LINEAR EQUATIONS IN ONE VARIABLE

## MODULE 3/4

### Solving equations having the variable on both sides

### Some Applications

## Linear Equations in One Variable

## Solving Equations having the Variable on both Sides

### Equations having the variable on both Sides

The equation $2x - 3 = x + 2$ has expressions with a variable on both sides; the expression on the LHS is $(2x - 3)$ and the expression on the RHS is $(x + 2)$.

**Example 13: Solve 2x – 3 = x + 2 and check your result**

$2x - 3 = x + 2$

$2x-3+3 = x + 2 + 3$ (adding 3 both the sides)

$2x = x + 5$

$2x - x = x + 5 - x$ (subtracting $x$ from both sides)

$x = 5$

**Checking:**

The solution is x=5

LHS= 2x-3

= 2(5)-3

=10-3

= 7

RHS= x+2

= 5+2

= 7

LHS= RHS

Hence, the answer is correct.

**Example 14: Solve $2y + \frac{5}{3} = \frac{26}{3} - y$ and check your result.**

$$2y + \frac{5}{3} = \frac{26}{3} - y$$

$$\left(2y+\frac{5}{3}\right)\times 3=\left(\frac{26}{3}-y\right)\times 3 \quad \text{(Multiplying both the sides by 3)}$$

$$6y+5=26-3y$$

$$6y+5+3y=26-3y+3y \quad \text{(Adding 3y both the sides)}$$

$$9y+5=26$$

$$9y=26-5$$

$$9y=21$$

$$y=\frac{21}{9}$$

$$y=\frac{7}{3}$$

**Checking:**

$$The\ solution\ is\ y=\frac{7}{3}$$

$$LHS=2y+\frac{5}{3}$$

$$=2\left(\frac{7}{3}\right)+\frac{5}{3}$$

$$=\frac{14}{3}+\frac{5}{3}$$

$$=\frac{19}{3}$$

$$RHS=\frac{26}{3}-y$$

$$=\frac{26}{3}-\frac{7}{3}$$

$$=\frac{19}{3}$$

LHS=RHS

Hence the solution is correct

## Some Applications

**Example 15:**

**The digits of a two-digit number differ by 3. If the digits are interchanged, and the resulting number is added to the original number, we get 143. What can be the original number?**

*Take, for example, a two-digit number, say, 56.*

*It can be written as 56 = (10 × 5) + 6.*

*If the digits in 56 are interchanged, we get 65, which can be written as (10 × 6) + 5.*

Let us take the two digit number such that the digit in the units place is $b$.

The digit in the tens place differs from $b$ by 3.

Let us take it as $b + 3$.

So the two-digit number $= 10(b + 3) + b$

$= 10b + 30 + b$

$= 11b + 30.$

With interchange of digits, the resulting two-digit number $= 10b + (b + 3)$

$= 11b + 3$

Given that, if we add these two two-digit numbers, their sum is 143

$$(11b + 30) + (11b + 3) = 143$$

$$11b + 11b + 30 + 3 = 143$$

$$22b + 33 = 143$$

$$22b = 143 - 33$$

$$22b = 110$$

$$b = \frac{110}{22}$$

$$b = 5$$

The units digit = 5

The tens digit = 5 + 3 = 8.

The required number = 85.

***Checking:*** The required number = 85.

The difference in the digits=8-5 =3

This matches with the first condition

On interchange of digits the number 85 we get is 58

85+58=143.

This matches with the second condition

Hence the answer is correct

**Example 16:**

**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 3 meters of the shirt material he buys 2 metres of the trouser material. He sells the materials at 12% and 10% profit respectively. His total sale is Rs 36,600. How much trouser material did he buy?**

Let the length of the shirt material = 3x m

the length of the trouser material = 2x m

Selling price of shirt material per metre = CP of the shirt + Profit on the shirt

$= \text{Rs } 50 + \left(\frac{12}{100}\right) \times 50 = \text{Rs } 56$

Selling price of trouser material per metre

= CP of the trouser + Profit on the trouser

$= \text{Rs } 90 + \left(\frac{10}{100}\right) \times 90 = \text{Rs } 99$

Total amount of sale = Rs 36,600

Given that,

$$(3x \times 56) + (2x \times 99) = 36600$$
$$168x + 198x = 36600$$
$$366x = 36600$$

$$x = \frac{36600}{366}$$

$$x = 100$$

Total trouser material he bought = 2x = 2×100 = 200 m.

**Example 17:**

**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.**

Let the total number of deer be x.

Number of deer grazing in the field = $\frac{x}{2}$

Number of deer playing nearby = $\frac{3}{4}\left(x - \frac{x}{2}\right)$

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

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

Number of deer drinking water = 9

According to the question,

$$\frac{x}{2} + \frac{3x}{8} + 9 = x$$

$$\left(\frac{x}{2} + \frac{3x}{8} + 9\right) \times 8 = x \times 8 \quad \text{(Multiplying both the sides by 8)}$$

$$4x + 3x + 72 = 8x$$

$$7x + 72 = 8x$$

$$7x + 72 - 8x = 8x - 8x \quad \text{(Subtracting 8x both the sides)}$$

$$-x + 72 = 0$$

$$-x = -72$$

$$x = 72$$

The number of deer in the herd =72

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