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Class 8 - ICSE MATHEMATICS

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ICSE Class 8 Maths
Linear Equations in One Variable
Notes

Equation

An equation is a mathematical statement that is made up of two expressions connected by an equal sign.

For example, 3x – 5 = 16 is an equation.

Linear Equation

A linear equation is an equation in which the highest power of the variable is always 1. It is also known as a one-degree equation.

The standard form of a linear equation in one variable is of the form Ax + B = 0.

Here, x is a variable, A is a coefficient and B is constant.

For example, 2x + 5 = 10, 3x – 7 = 4, $4y + \frac{2}{5} = \frac{1}{3}$, etc. are equations.

Solution of a linear equation

To solve a linear equation means we have to find the value of unknown variable given in the equation. A linear equation has only one solution which is known as root of the equation.

Example:

Solve the following linear equation:

(i) 14y – 8 = 13 (ii) 17 + 6p = 9 (iii) $\frac{x}{3} + 1 = \frac{7}{15}$

Answer:

(i) Given, 14y – 8 = 13

=> 14y = 13 + 8

=> 14y = 21

=> y = $\frac{21}{14}$

=> y = $\frac{3}{2}$

(ii) Given, 17 + 6p = 9

=> 6p = 9 – 17

=> 6p = -8

=> $p = \frac{-8}{6}$

=> $p = \frac{-4}{3}$

(iii) Given, $\frac{x}{3} + 1 = \frac{7}{15}$

=> $\frac{x}{3} = \frac{7}{15} - 1$

=> $\frac{x}{3} = \frac{7 - 15}{15}$

=> $\frac{x}{3} = \frac{-8}{15}$

=> $x = 3 * \left(-\frac{8}{15}\right)$

=> $x = \frac{-3 * 8}{15}$

=> $x = \frac{-24}{15}$

=> $x = \frac{-8}{5}$

Example:

Solve: $\frac{x - 5}{3} = \frac{x - 3}{5}$

Answer:

Given, $\frac{x - 5}{3} = \frac{x - 3}{5}$

=> 5(x - 5) = 3(x - 3)

=> 5x – 25 = 3x – 9

=> 5x – 3x = -9 + 25

=> 2x = 16

=> x = 8

Example:

Solve: $\frac{3y + 4}{2 - 6y} = \frac{-2}{5}$

Answer:

Given, $\frac{3y + 4}{2 - 6y} = \frac{-2}{5}$

=> 5(3y + 4) = -2(2 – 6y)

=> 15y + 20 = -4 + 12y

=> 15y – 12y = -4 – 20

=> 3y = -24

=> y = $\frac{-24}{3}$

=> y = -8

To solve problems based on linear equations

In solving real-life problems using linear equation, we use the following steps:

Step 1: Read the problem and identify the unknown quantity.

Step 2: Choose a variable to represent this quantity.

Step 3: Formulate the equation for the variable to be determined.

Step 4: Solve the linear equation.

Example:

The ages of Hari and Harry are in the ratio 5 : 7. Four years from now the ratio of their ages will be 3 : 4. Find their present ages.

Answer:

Let the Ages of Hari and Harry be 5x years and 7x years.

According to question,

$\frac{5x + 4}{7x + 4} = \frac{3}{4}$

=> 4(5x + 4) = 3(7x + 4)

=> 20x + 16 = 21x + 12

=> 20x – 21x = 12 – 16

=> -x = -4

=> x = 4

Hence, the age of Hari = 5x = 5 * 4 = 20 years

and the age of Harry = 7x = 7 * 4 = 28 years.

Example:

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?

Answer:

Let another number be x.

Then positive number = 5x

According to the question,

5x + 21 = 2(x + 21)

=> 5x + 21 = 2x + 42

=> 5x – 2x + 21 = 42

=> 3x + 21 = 42

=> 3x = 42 – 21

=> 3x = 21

=> x = 7

Hence another number = 7 and positive number = 5 * 7 = 35

Note:

In case of integers, whole number and natural numbers

(i) Consecutive numbers are taken as: x, x + 1, x + 2, ….

(ii) Consecutive even numbers are taken as: x, x + 2, x + 4, …. ; where x is an even numbers.

(iii) Consecutive odd numbers are taken as: x, x + 2, x + 4, …. ; where x is an odd numbers.

(iii) Consecutive multiple of 3 are taken as: x, x + 3, x + 6, …. ; where x is a multiple of 3.

Example:

Two consecutive even numbers are such that half of the larger exceeds one-fourth of the smaller by 5. Find the numbers.

Answer:

Let the required even numbers be x and x + 2.

Now, $\frac{x+2}{2} - \frac{x}{4} = 5$

=> $\frac{2(x+2)-x}{4} = 5$

=> $\frac{2x+4-x}{4} = 5$

=> x + 4 = 5 * 4

=> x + 4 = 20

=> x = 20 - 4

=> x = 16

Required numbers = x and x + 2

= 16 and 16 + 2

= 16 and 18

Example:

Tejsi 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?

Answer:

Let the number be x.

According to question,

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

=> $8x-8*\frac{5}{2}=3x$

=> 8x – 4 * 5 = 3x

=> 8x – 20 = 3x

=> 8x = 3x + 20

=> 8x – 3x = 20

=> 5x = 20

=> x = 4

Hence, the required number is 4.

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