

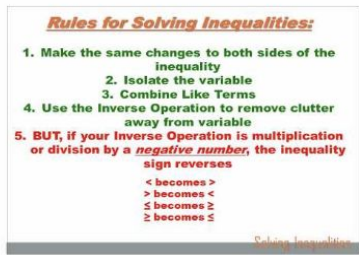
Equation and Inequality

Equation

An equation that can be written in the form $ax + b = 0$, where a and b are constants, is called a linear equation in one variable.

For example, $x - 4 = 10$ is a linear equation in x .

A value, such that, when you replace the variable with it, makes the equation true is called the solution of the equation.



Addition Axiom

If $a = b$, then $a + c = b + c$

For example:

Solve: $x - 10 = -2$

Solution:

$$x - 10 = -2$$

or, $x - 10 + 10 = -2 + 10$, addition axiom

$$\therefore x = 8$$

Subtraction Axiom

If $a = b$, then $a - c = b - c$

For example:

Solve for x : $x + 2 = 6$

Solution:

$$x + 2 = 6$$

or, $x = 6 - 2$

$$\therefore x = 4$$

Multiplication Axiom

If $a = b$, then $ac = bc$

For example:

Solve for x : $\frac{x}{2} = 5$

Solution:

$$\frac{x}{2} = 5$$

$$\text{or, } x = 5 \times 2$$

$$\therefore x = 10.$$

To solve word problems on linear equations apply the following steps:

1. Read the problem carefully to find out what is given and what is to be given.
2. Represent the unknown quantity by x or by some other letter.
3. Write the relation between known and unknown.
4. Solve the equation to obtain the value of unknown linear Inequality.

Inequality Symbols

$<$	– Less Than
$>$	– Greater Than
\leq	– Less Than or Equal to
\geq	– Greater Than or Equal to

Examples

1. Two numbers are in the ratio 3:4. If the sum of the numbers is 49, Find the numbers.

Solution:

Let the numbers be $3x$ and $4x$

$$\text{Then, } 3x + 4x = 49$$

$$\text{or, } 7x = 49$$

$$\text{or, } x = \frac{49}{7}$$

$$\therefore x = 7$$

$$\text{Now, } 3x = 3 \times 7 = 21 \text{ and } 4x = 4 \times 7 = 28$$

Hence, the required numbers are 21 and 28.

2. Two- third of the number is less than 10 than the original number. Find the number.

Solution:

Let the number be x .

$$\text{Then, } \frac{2}{3}x = x - 10$$

$$\text{or, } 2x = 3x - 30$$

$$\text{or, } 2x - 3x = -30$$

$$\text{or, } -x = -30$$

$$\therefore x = 30$$

Hence, the required number is 30.

Linear Inequality

An inequality is a relationship between two quantities that are not equal. In equations, one side is equal to the other side. In linear inequalities, one side is bigger than or smaller than or equal to the other side.

A linear equation in one variable has only one solution. An equality in one variable has a set of possible solutions.

The symbols used in inequality are:

$>$ means 'greater than'.

$<$ means 'less than'.

\geq means 'greater than or equal to'

\leq means 'less than or equal to'

Solving linear inequalities in one variable

Solving linear inequalities are the same as solving linear equations with one important exception.

When you multiply or divide an inequality by a negative value, it changes the direction of the inequality.

Look at this statement: $5 > 2$

Suppose we multiply both sides by -1 .

$(-1)(5) > (-1)(2)$

$-5 < -2$

-5 less than -2 because it is further to the left on the number line.

Thus, $-5 < -2$

Simultaneous Equation

The two equations having two unknowns are called Simultaneous equations. They are called simultaneous because they must be solved at the same time. For example, $x+y = 10$ and $x-y = 2$ are simultaneous equations. To solve a simultaneous equation we must use graph. For this, we have to draw the lines of the equations, The point where the lines cross is the solution.

Example:

Solve graphically: $x + y = 6$, $2x - y = 8$

Solution:

Given equations are $x + y = 6$ and $2x - y = 8$

$x + y = 6$

$y = 6 - x$ (i)

Table for $y = 6 - x$:

x	3	0	2
y	3	6	4

Again, $2x - y = 8$

$2x - 8 = y$

$y = 2x - 8$ (ii)

Table for $y = 2x - 8$

x	4	6	3
y	0	4	-2

Draw the lines of the equations on a graph. Since, both lines intersect at $P(6, 2)$, solution of the given equations is $x = 6$ and $y = 2$

Quadratic Equation

A general quadratic equation can be written in the form $ax^2 + bx + c = 0$, where x represents a variable or an unknown and a , b and c are constants with $a \neq 0$. (If $a = 0$, the equation is the linear equation.). For example: $2x^2 = 5x + 2 = 0$, is a quadratic equation where $a = 2$, $b = 5$ and $c = 2$

Solution of quadratic equations by factoring

To make the equation true, the solution of a quadratic equation consists of all numbers (roots). All quadratic equations have 2 solutions (i.e 2 roots).

Sometimes it is easy to find solutions or roots of a quadratic equation by factoring. Indeed, the basic principle to be used is: If a and b are real numbers such that $ab = 0$, then $a = 0$ or $b = 0$.

Examples

1. Solve: $x^2 = 49$

Solution:

$x^2 - 49 = 0$

$x^2 - 7^2 = 0$

$(x+7)(x-7) = 0$

$x + 7 = 0$ or $x - 7 = 0$

$\therefore x = -7$ or $x = 7$

2. Solve: $x^2 + 7x - 8 = 0$

$x^2 + (8 - 1)x + 8 = 0$

$x^2 + 8x - 1x + 8 = 0$

$x(x + 8) - 1(x + 8) = 0$

$(x + 8)(x - 1) = 0$

$x + 8 = 0$ or $x - 1 = 0$

$\therefore x = -8$ or $x = 1$