Chapter: 02: Quadratic Equation

EQUATIONS:

An equation is a statement of equality between two expressions called members.

$ax + b = 0$ $\quad\quad$ $5x = 5$

L.H.S = R.H.S

CONDITIONAL EQUATION OR (SIMPLY AN EQUATION):

An equation which is true for only certain values of the variables (or unknowns) involved is called a conditional equation or simply an equation

$ax + b = 0 \rightarrow 1$

$5y = 6 \rightarrow 2$

$ax + z = 0 \rightarrow 1$

$5x = 6 \rightarrow 1$

$\boxed{x = 6/5}$

$\cancel{5}(6/\cancel{5}) = 6$

$6 = 6$

L.H.S = R.H.S

LINEAR EQUATION:

A linear equation in the variable x can be written as $\boxed{ax + b = 0}$; a, b are $a \neq 0$

$5x = 0 \Rightarrow a = 5 ; b = 0$

$2x - 3 = 0 \Rightarrow a = 2 ; b = -3$

$ay + b = 0$; $\boxed{a \neq 0}$ → Linear Eqs.

if $a = 0$

$0(x) + b = 0$

$\boxed{b = 0}$

QUADRATIC EQUATION

A quadratic equation in the variable x has the form $\boxed{ax^2 + bx + c = 0}$ where a, b, and c are constants and a≠0. It is also called $\boxed{\text{2nd degree polynomial}}$

$a = 0$

$0(x^2) + bx + c = 0$

$0 + bx + c = 0$

$\boxed{bx + c = 0}$ → linear

Examples

i. $x^2 - 7x + 10 = 0$; $a = 1$; $b = -7$; $c = 10$

ii. $6x^2 + x - 15 = 0$; $a = 6$; $b = 1$; $c = -15$

iii. $4x^2 + 5x + 3 = 0$; $a = 4$; $b = 5$; $c = 3$

iv. $3x^2 - x = 0$; $a = 3$; $b = -1$; $c = 0$
v. $\boxed{x^2 = 4}$; $a = 1$; $b = 0$; $c = -4$

AN INCOMPLETE QUADRATIC EQUATION:

If b= 0 and c =0 in quadratic equation is called incomplete quadratic equation.

$ax^2 + bx + c = 0$
$ax^2 + 0(x) + 0 = 0$
$ax^2 = 0$

$\boxed{x^2 = 0}$

$ax^2 + bx + c = 0$

Example:

i. $3x^2 = 0$; $a = 3$; $\boxed{b = 0}$; $\boxed{c = 0}$
ii. $x^2 = 4$; $a = 1$; $\boxed{b = 0}$; $c = -4$
iii. $7x^2 - 2x = 0$; $a = 7$; $b = -2$; $\boxed{c = 0}$
iv.

$x^2 = 4$
$x^2 - 4 = 4 - 4$
$\boxed{x^2 - 4 = 0}$

solution

ZEROS OR ROOTS OF THE EQUATION:

To solve $ax^2 + bx + c = 0$, is to find the value of x which satisfy the equation, these value of x is called *zero or root of the equation*. Or the solution of an equation is called root

$x^2 + 9 = 0$
$\boxed{x_1 = 3}$
$x_2 = -3$

For $x = 3$
$3^2 + 9 = 0$
$9 + 9 = 0$
$18 \neq 0$ $0 = 0$
$x_1 = 3$ is not root

Example:

1. $x^2 + 9 = 0$; $x_1 = ?$ $x_2 = ?$

$\boxed{0 = 0}$

METHODS OF SOLVING QUADRATIC EQUATIONS

There are three basic technique to solving a quadratic equation

1) By factorization
2) By completing square $(a^2 + b^2 + 2ab)$ or $(a^2 + b^2 - 2ab)$; $(a+b)^2$; $(a-b)^2$
3) By quadratic formula

$x_1 = ?$
$x_2 = ?$

SOLUTION BY FACTORIZATION:

It involves factoring the polynomial $\boxed{ax^2 + bx + c = 0}$ it makes use of the fact that if $\boxed{ab=0}$ then $\boxed{a=0}$ or $\boxed{b=0}$

$\underbrace{(x-2)}_{a}\underbrace{(x-4)}_{b} = 0$

$x-2=0$; $x-4=0$

$\boxed{x=2}$ $\boxed{x=4}$

$\boxed{x_1=2}$ $\boxed{x_2=4}$

Multiply

$10x^2$

$5x \times 2x =$

$10x^2$

Add|sub

$-7x$

$\boxed{-5x}\ \boxed{-2x} =$

$-7x$

Expl :- $x^2 - 7x + 10 = 0$

$x^2 = x.x$

Sol :-

$x^2 - 5x - 2x + 10 = 0$

$x(x-5) - 2(x-5) = 0$

$-2(x-5)$

$-2x+10$

$(x-5)(x-2) = 0$

$x-5=0$; $x-2=0$

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

$x(x-5) - 2(x+3)$

$(x-5)$ $(x-5)$

$(x+3)$ $(x+3)$

$x^2 - 7x + 10 = 0$

$x = 5$

$(5)^2 - 7(5) + 10 = 0$

$25 - 35 + 10 = 0$

$35 - 35 = 0$

$0 = 0$

L.H.S = R.H.S

L.H.S $\neq$ R.H.S

$x = 2$

$(2)^2 - 7(2) + 10 = 0$

$4 - 14 + 10 = 0$

$-10 + 10 = 0$

$0 = 0$

Root

$\boxed{x_1 = 5}$, $\boxed{x_2 = 2}$

S.S $= \{5, 2\}$

Solution set

$+25 - 35$

-10