

Quadratic Equations

Equation of degree two in one variable

General Form

$$ax^2 + bx + c = 0$$

a, b, c are real numbers
 $a \neq 0$

Quadratic Formula

Roots of $ax^2 + bx + c = 0$ are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Nature of Roots

For quadratic equation
 $ax^2 + bx + c = 0$,
Discriminant (D) = $b^2 - 4ac$

1. $D > 0$, Two distinct real roots

2. $D = 0$, Two equal real roots

3. $D < 0$, No real roots (imaginary)

4. $D > 0$, and D is a perfect square
Roots are real rational

5. $D > 0$, and D is not a perfect square
Roots are real irrational

Solution of a Quadratic Equation

By Factorization

Find roots of $x^2 - 3x - 10 = 0$, by factorization method.

$$\text{Sol : } x^2 - 3x - 10 = 0$$

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

$$\Rightarrow x(x-5) + 2(x-5) = 0$$

$$\Rightarrow (x-5)(x+2) = 0$$

$$\text{The roots of } x^2 - 3x - 10 = 0$$

$$x-5 = 0 \text{ or } x+2 = 0$$

$$x = 5 \text{ or } x = -2$$

$$\text{Roots are } 5, -2$$