Quadratic Equation

Quadratic Polynomial

$P(x) = ax^2 + bx + c$ where $a \neq 0$

Quadratic equation

$ax^2 + bx + c = 0$ where $a \neq 0$

Solution or root of the Quadratic equation

A real number α is called the root or solution of the quadratic equation if

$a\alpha^2 + b\alpha + c = 0$

Some other points to remember

- The root of the quadratic equation is the zeroes of the polynomial p(x).
- We know from chapter two that a polynomial of degree can have max two zeroes. So a quadratic equation can have maximum two roots
- A quadratic equation has no real roots if $b^2 - 4ac < 0$

How to Solve Quadratic equation

S.no	Method	Working
1	factorization	This method we factorize the equation by splitting the middle term b

		In $ax^2+bx+c=0$ Example $6x^2-x-2=0$ 1) First we need to multiple the coefficient a and c.In this case =6X-2=-12 2) Splitting the middle term so that multiplication is 12 and difference is the coefficient b $6x^2 +3x-4x-2=0$ 3x(2x+1) -2(2x+1)=0 (3x-2) (2x+1)=0 3) Roots of the equation can be find equating the factors to zero 3x-2=0 => x=3/2 2x+1=0 => x=-1/2
2	Square method	In this method we create square on LHS and RHS and then find the value. $ax^2 +bx+c=0$ 1) $x^2 +(b/a) x+(c/a)=0$ 2) $(x+b/2a)^2 -(b/2a)^2 +(c/a)=0$ 3) $(x+b/2a)^2=(b^2-4ac)/4a^2$ 4) $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ Example $x^2 +4x-5=0$

		1) $(x+2)^2$ -4-5=0 2) $(x+2)^2=9$ 3) Roots of the equation can be find using square root on both the sides x+2 =-3 => x=-5 x+2=3=> x=1
3	Quadratic method	For quadratic equation $ax^2 +bx+c=0$, roots are given by $x=\frac{-b+\sqrt{b^2-4ac}}{2a}$, $x=\frac{-b-\sqrt{b^2-4ac}}{2a}$ For $b^2 -4ac > 0$, Quadratic equation has two real roots of different value For $b^2-4ac =0$, quadratic equation has one real root For $b^2-4ac < 0$, no real roots for quadratic equation

Nature of roots of Quadratic equation

S.no	Condition	Nature of roots
1	$b^2 -4ac > 0$	Two distinct real roots
2	$b^2-4ac =0$	One real root
3	$b^2-4ac < 0$	No real roots