

## Solution of Quadratic Equation.

(1) **Factorization method:** Let  $ax^2 + bx + c = a(x - \alpha)(x - \beta) = 0$ . Then  $x = \alpha$  and  $x = \beta$  will satisfy the given equation.

Hence, factorize the equation and equating each factor to zero gives roots of the equation.

Example:  $3x^2 - 2x + 1 = 0 \Rightarrow (x - 1)(3x + 1) = 0$

$$x = 1, -1/3$$

(2) **Hindu method (Sri Dharacharya method):** By completing the perfect square as

$$ax^2 + bx + c = 0 \Rightarrow x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

Adding and subtracting  $\left(\frac{b}{2a}\right)^2$ ,  $\left[\left(x + \frac{b}{2a}\right)^2 - \frac{b^2 - 4ac}{4a^2}\right] = 0$  which gives,  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Hence the quadratic equation  $ax^2 + bx + c = 0$  ( $a \neq 0$ ) has two roots, given by

$$\alpha = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, \beta = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Note: Every quadratic equation has two and only two roots.