



Quadratic Equations



$$\begin{aligned} D &= b^2 - 4ac \\ &= 1^2 - 4(2)(-320) \\ &= 1 + 8(320) \\ &= 1 + 2560 \\ &= \boxed{2561 > 0} \checkmark \\ &\rightarrow x = 7 \end{aligned}$$

$$\text{Area} = 320$$

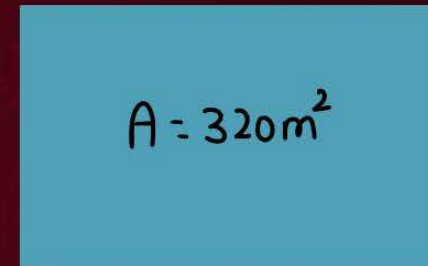
$$l \times b = 320$$

$$(2x+1)x = 320$$

$$2x^2 + x = 320$$

$$\boxed{2x^2 + x - 320 = 0} \rightarrow x = 7$$

Quadratic equation.



breadth = x

length = $2x+1$



Quadratic Equations



degree = 2

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

equal to

a = coefficient of x^2

b = " " x

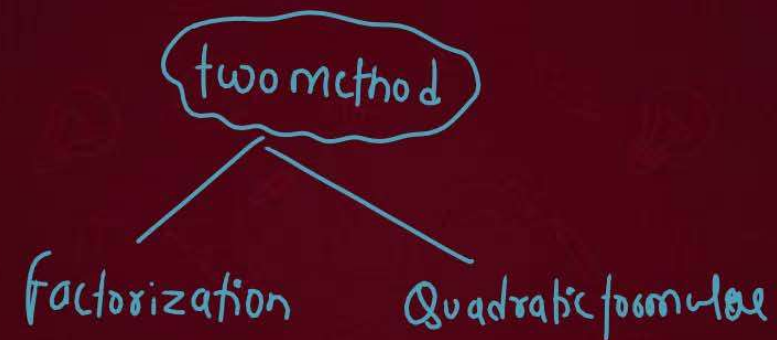
c = Constant

2 roots

$$4x^2 + 2x + 1 = 0$$
$$\left. \begin{array}{l} a = 4 \\ b = 2 \\ c = 1 \end{array} \right\}$$



Method to Find Out The Solution



QUESTION



Find the root of the given quadratic equation by factorisation

$$\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$$

$$\sqrt{2} \times 5\sqrt{2} = 2 \times 5 = 10$$

$$\begin{array}{c} 2 \\ \swarrow \searrow \\ \sqrt{2} \times \sqrt{2} \end{array}$$

$$\sqrt{2}x^2 + \underline{7x} + 5\sqrt{2} = 0$$

$$2 \times 5 = 10$$

$$2 + 5 = 7$$

$$(x + \sqrt{2})(\sqrt{2}x + 5) = 0$$

$$x + \sqrt{2} = 0 \quad | \quad \sqrt{2}x + 5 = 0$$

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

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

$$\sqrt{2}x^2 + \underline{2x} + \underline{5x} + 5\sqrt{2} = 0$$

$$\sqrt{2}x \left[\underline{x + \sqrt{2}} \right] + 5 \left[\underline{x + \sqrt{2}} \right] = 0$$

QUESTION



Find the roots of the quadratic equation $6x^2 - x - 2 = 0$. By quadratic formula

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

$$\left. \begin{array}{l} a=6 \\ b=-1 \\ c=-2 \end{array} \right\}$$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (-1)^2 - 4(6)(-2) \\ &= 1 + 48 \end{aligned}$$

$$\boxed{D=49}$$

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

$$x = \frac{-(-1) \pm \sqrt{49}}{12}$$

$$x = \frac{1 \pm 7}{12}$$

$$\begin{array}{l|l} x = \frac{1+7}{12} & x = \frac{1-7}{12} \\ x = \frac{8}{12} & x = -\frac{6}{12} = -\frac{1}{2} \end{array}$$

$$\boxed{x = \frac{2}{3}} \quad \boxed{x = -\frac{1}{2}}$$



Nature of roots

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

$$D = b^2 - 4ac > 0 \rightarrow \text{two distinct real roots} \rightarrow 2$$

$$D = b^2 - 4ac = 0 \rightarrow \text{two equal real roots} \rightarrow 1$$

$$D = b^2 - 4ac < 0 \rightarrow \text{no real roots} \rightarrow 0$$

Quadratic equation has
at most 2 real root.

QUESTION



Find the values of k for quadratic equations, So that they have two equal roots.

$$\underline{kx(x - 2) + 6 = 0}$$

$$k=0$$

$$(6=0) \text{ false}$$

$$kx(x-2) + 6 = 0$$

$$(kx^2 - 2kx + 6 = 0)$$

$$D=0$$

$$b^2 - 4ac = 0$$

$$(-2k)^2 - 4(k)(6) = 0$$

$$4k^2 - 24k = 0$$

$$(4k)[k-6] = 0$$

$$4k=0 \mid k-6=0$$

$$(k=0) \mid (k=6)$$

x

$$\boxed{k=6} \checkmark$$

QUESTION



A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h, less then it would have taken 3 hours more to cover the same distance. Find the uniform speed of the train.

40 km/h

Let uniform speed be x km/h

$$t = \frac{D}{S}$$

$$\frac{480}{x} + 3 = \frac{480}{x-8}$$

$$\frac{480}{x-8} - \frac{480}{x} = 3$$

$$480 \left[\frac{1}{x-8} - \frac{1}{x} \right] = 3$$

$$480 \left[\frac{x - x + 8}{x^2 - 8x} \right] = 3$$

$$\frac{4 \times 160 \times 8}{x^2 - 8x} = \frac{3}{1}$$

$$x^2 - 8x = 1280$$

$$x^2 - 8x - 1280 = 0$$

$$-40 \times 32 = -1280$$

$$-40 + 32 = -8$$

$$x^2 - 40x + 32x - 1280 = 0$$

$$x(x-40) + 32(x-40) = 0$$

$$(x-40)(x+32) = 0$$

$$x = 40, x = -32$$

Case 1

$$\text{Speed} = x$$

$$\text{Distance} = 480$$

$$\text{time} = t$$

$$t = \frac{480}{x} \quad \text{--- (i)}$$

Case 2

$$\text{Speed} = x - 8$$

$$\text{Distance} = 480$$

$$\text{time} = t + 3$$

$$t + 3 = \frac{480}{x-8} \quad \text{--- (ii)}$$