

Chapter 4 - Quadratic Equations

Example 3 : Find the roots of the equation $2x^2 - 5x + 3 = 0$, by factorisation.

$$2x^2 - 5x + 3 = 0$$

$$2x^2 - 2x - 3x + 3 = 0$$

$$2x(x - 1) - 3(x - 1) = 0$$

$$(2x - 3)(x - 1) = 0$$

either $2x - 3 = 0$

$$x = \frac{3}{2}$$

or $x - 1 = 0$

$$x = 1.$$

$$x = 1, \frac{3}{2}$$

Example 4 : Find the roots of the quadratic equation $6x^2 - x - 2 = 0$.

$$6x^2 - x - 2 = 0$$

$$6x^2 - 4x + 3x - 2 = 0$$

$$2x(3x - 2) + 1(3x - 2) = 0$$

$$\text{Either } (2x + 1) = 0$$

$$x = \frac{-1}{2}$$

$$\text{or } 3x - 2 = 0$$

$$x = \frac{2}{3}$$

$$\begin{array}{r} 2 \overline{) 12} \\ \underline{2} \\ 3 \\ \underline{3} \\ 0 \end{array}$$

$$\begin{array}{r} -4 \\ +3 \\ \hline \end{array}$$

Example 5 : Find the roots of the quadratic equation $3x^2 - 2\sqrt{6}x + 2 = 0$.

$$3x^2 - 2\sqrt{6}x + 2 = 0$$

$$3x^2 - \sqrt{6}x - \sqrt{6}x + 2 = 0$$

$$3x^2 - \sqrt{3} \cdot \sqrt{2}x - \sqrt{3} \sqrt{2}x + 2 = 0$$

$$\sqrt{3}x(\sqrt{3}x - \sqrt{2}) - \sqrt{2}(\sqrt{3}x - \sqrt{2}) = 0$$

$$(\sqrt{3}x - \sqrt{2})(\sqrt{3}x - \sqrt{2}) = 0$$

$$\sqrt{3}x - \sqrt{2} = 0$$

$$x = \frac{\sqrt{2}}{\sqrt{3}} = \sqrt{\frac{2}{3}}$$

$$\sqrt{3}x - \sqrt{2} = 0$$

$$x = \sqrt{\frac{2}{3}}$$

6

$\sqrt{6} \times \sqrt{6}$

$(\sqrt{6})^2$

$-\sqrt{6} - \sqrt{6}$

$-2\sqrt{6}$

$$\sqrt{6} = \sqrt{3 \times 2}$$

$$= \sqrt{3} \cdot \sqrt{2}$$

$$x = \sqrt{\frac{2}{3}}, \sqrt{\frac{2}{3}}$$

EXERCISE 4.2

1. Find the roots of the following quadratic equations by factorisation:

(i) $x^2 - 3x - 10 = 0$

(ii) $2x^2 + x - 6 = 0$

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

(iv) $2x^2 - x + \frac{1}{8} = 0$

(v) $100x^2 - 20x + 1 = 0$

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

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

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

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

either

$$x + \sqrt{2} = 0$$
$$x = -\sqrt{2}$$

or

$$\sqrt{2}x + 5 = 0$$
$$x = -\frac{5}{\sqrt{2}}$$

$$\begin{array}{r|l} 2 & 10 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

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

$$2x^2 - x + \frac{1}{8} = 0$$

$$\frac{16x^2 - 8x + 1}{8} = 0$$

$$16x^2 - 8x + 1 = 0$$

$$16x^2 - 4x - 4x + 1 = 0$$

$$4x(4x - 1) - 1(4x - 1) = 0$$

either

$$4x - 1 = 0$$

$$x = 1/4$$

$$\text{or } 4x - 1 = 0$$

$$x = 1/4$$

$$\begin{array}{r|l} 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$$2x \quad 2x \quad 2x \quad 2$$

$$-4 \quad -4$$

$$x = \frac{1}{4}, \frac{1}{4}$$

3. Find two numbers whose sum is 27 and product is 182.

$$\text{let I}^{\text{st}} \text{ No} = x$$

$$\text{II}^{\text{nd}} \text{ No} = 27 - x$$

$$(x)(27 - x) = 182$$

$$27x - x^2 = 182$$

$$x^2 - 27x + 182 = 0$$

$$x^2 - 14x - 13x + 182 = 0$$

$$x(x - 14) - 13(x - 14) = 0 \Rightarrow x - 13 = 0 \quad x - 14 = 0$$

$$x = 13, 14.$$

$$\begin{array}{r|l} 2 & 182 \\ \hline 7 & 91 \\ \hline 13 & 13 \\ \hline & 1 \end{array}$$

$2 \times 7 \times 13$
 $-14 \quad -13$

$$\underline{x = 13}$$

$$\underline{x = 14.}$$

$$x = 13$$

Ist No. 13

IInd No. 14

$$x = 14$$

Ist No. 14

IInd No. 13

4. Find two consecutive positive integers, sum of whose squares is 365.

$$x-13=0 \quad x+14=0$$

$$x=13, -14.$$

$$x=13.$$

$$\text{I}^{\text{st}} \text{ No.} \rightarrow 13$$

$$\text{II}^{\text{nd}} \text{ No.} \rightarrow 13+1$$

$$=14.$$

$$\text{I}^{\text{st}} \text{ No.} \rightarrow x$$

$$\text{II}^{\text{nd}} \text{ No.} \rightarrow x+1$$

$$x^2 + (x+1)^2 = 365$$

$$x^2 + x^2 + 1 + 2x = 365$$

$$2x^2 + 2x + 1 - 365 = 0$$

$$2x^2 + 2x - 364 = 0$$

$$x^2 + x - 182 = 0$$

$$x^2 + 14x - 13x - 182 = 0$$

$$x(x+14) - 13(x+14) = 0$$

$$(a+b)^2 = a^2 + b^2 + 2ab.$$

2	182
7	91
13	13
	1

$$-13 + 14$$

5. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.

let Base = x cm

Altitude = $(x-7)$ cm.

H = 13 cm.

$$H^2 = B^2 + P^2$$

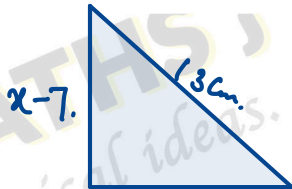
$$(13)^2 = x^2 + (x-7)^2$$

$$x^2 + x^2 + 49 - 14x = 169$$

$$2x^2 - 14x + 49 - 169 = 0$$

$$2x^2 - 14x - 120 = 0$$

$$x^2 - 7x - 60 = 0$$



$$x^2 - 7x - 60 = 0$$

$$x^2 - 12x + 5x - 60 = 0$$

$$x(x-12) + 5(x-12) = 0$$

$$x+5=0 \quad x-12=0$$

$$x = -5 \quad x = 12$$

$$x = -5, 12.$$

2	60
2	30
5	15
3	3
	1

$$-12 + 5$$

Base = 12
Altitude = $12-7$
= 5

6. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was ₹ 90, find the number of articles produced and the cost of each article.

Let No. of articles = x .

Cost of Production = $2x + 3$

$$x(2x + 3) = 90$$

$$2x^2 + 3x - 90 = 0$$

$$2x^2 + 15x - 12x - 90 = 0$$

$$x(2x + 15) - 6(2x + 15) = 0$$

$$(x - 6)(2x + 15) = 0$$

$$\begin{array}{r|l} 2 & 180 \\ \hline & 90 \\ \hline 5 & 45 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \\ & +15 \quad -12 \end{array} = 3.$$

Either $x - 6 = 0$ or $2x + 15 = 0$

$$x = 6$$

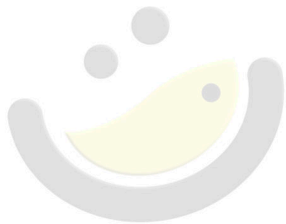
$$x = -15/2$$

No. of articles = 6

Cost of each article = $2x + 3$

$$= 2 \times 6 + 3 = 12 + 3$$

$$= 15.$$



OMG { MATHS }

The poetry of logical ideas.