

Exercise 8.4

Find the roots of the following quadratic equations (if they exist) by the method of completing the square.

1. $x^2 - 4\sqrt{2}x + 6 = 0$

Solution:

Given equation,

$$x^2 - 4\sqrt{2}x + 6 = 0$$

$$x^2 - 2 \times x \times 2\sqrt{2} + (2\sqrt{2})^2 - (2\sqrt{2})^2 + 6 = 0$$

$$(x - 2\sqrt{2})^2 = (2\sqrt{2})^2 - 6$$

$$(x - 2\sqrt{2})^2 = (4 \times 2) - 6 = 8 - 6$$

$$(x - 2\sqrt{2})^2 = 2$$

$$(x - 2\sqrt{2}) = \pm \sqrt{2}$$

$$(x - 2\sqrt{2}) = \sqrt{2} \text{ or } (x - 2\sqrt{2}) = -\sqrt{2}$$

$$x = \sqrt{2} + 2\sqrt{2} \text{ or } x = -\sqrt{2} + 2\sqrt{2}$$

$$\Rightarrow x = 3\sqrt{2} \text{ or } x = \sqrt{2}$$

Thus, the roots of the given quadratic equation are $x = 3\sqrt{2}$ and $x = \sqrt{2}$.

2. $2x^2 - 7x + 3 = 0$

Solution:

Given equation,

$$2x^2 - 7x + 3 = 0$$

$$2\left(x^2 - \frac{7x}{2} + \frac{3}{2}\right) = 0$$

$$x^2 - 2 \times \frac{7}{2} \times \frac{1}{2} \times x + \frac{3}{2} = 0$$

$$x^2 - 2 \times \frac{7}{4} \times x + \left(\frac{7}{4}\right)^2 - \left(\frac{7}{4}\right)^2 + \frac{3}{2} = 0$$

$$x^2 - 2 \times \frac{7}{4} \times x + \left(\frac{7}{4}\right)^2 - \left(\frac{49}{16}\right) + \frac{3}{2} = 0$$

R D Sharma Solutions For Class 10 Maths Chapter 8 - Quadratic Equations

$$\left(x - \frac{7}{4}\right)^2 - \frac{49}{16} + \frac{3}{2} = 0$$

$$\left(x - \frac{7}{4}\right)^2 = \frac{49}{16} - \frac{3}{2}$$

$$\left(x - \frac{7}{4}\right)^2 = \frac{49 - 26}{16}$$

$$\left(x - \frac{7}{4}\right)^2 = \frac{25}{16}$$

$$\left(x - \frac{7}{4}\right)^2 = \left(\frac{5}{4}\right)^2$$

$$x - \frac{7}{4} = \pm \frac{5}{4}$$

$$x - \frac{7}{4} = \frac{5}{4} \text{ or } x - \frac{7}{4} = -\frac{5}{4}$$

$$x = \frac{7}{4} + \frac{5}{4} \text{ or } x = \frac{7}{4} - \frac{5}{4}$$

$$\Rightarrow x = \frac{12}{4} = 3 \text{ or } x = \frac{2}{4} = \frac{1}{2}$$

Thus, the roots of the given quadratic equation are $x = 3$ and $x = 1/2$.

3. $3x^2 + 11x + 10 = 0$

Solution:

Given equation,

$$x^2 + \frac{11x}{3} + \frac{10}{3} = 0$$

$$x^2 + 2 \times \frac{1}{2} \times \frac{11x}{3} + \frac{10}{3} = 0$$

$$x^2 + 2 \times \frac{11x}{6} + \left(\frac{11}{6}\right)^2 - \left(\frac{11}{6}\right)^2 + \frac{10}{3} = 0$$

$$\left(x + \frac{11}{6}\right)^2 = \left(\frac{11}{6}\right)^2 - \frac{10}{3}$$

R D Sharma Solutions For Class 10 Maths Chapter 8 -
Quadratic Equations

$$\left(x + \frac{11}{6}\right)^2 = \frac{121}{36} - \frac{10}{3}$$

$$\left(x + \frac{11}{6}\right)^2 = \frac{121 - 120}{36}$$

$$\left(x + \frac{11}{6}\right)^2 = \frac{1}{36}$$

$$\left(x + \frac{11}{6}\right)^2 = \left(\frac{1}{6}\right)^2$$

$$x + \frac{11}{6} = \pm \frac{1}{6}$$

$$x + \frac{11}{6} = \frac{1}{6} \text{ or } x + \frac{11}{6} = \frac{-1}{6}$$

$$x = \frac{1}{6} - \frac{11}{6} \text{ or } x = \frac{-1}{6} - \frac{11}{6}$$

$$x = \frac{-10}{6} \text{ or } x = \frac{-12}{6} = -2$$

$\Rightarrow x = -5/3 \text{ or } x = -2$

Thus, the roots of the given quadratic equation are $x = -5/3$ and $x = -2$.

4. $2x^2 + x - 4 = 0$

Solution:

Given equation,

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

$$2\left(x^2 + \frac{x}{2} - \frac{4}{2}\right) = 0$$

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

$$x^2 + 2 \times \frac{1}{4} \times x + \left(\frac{1}{4}\right)^2 - \left(\frac{1}{4}\right)^2 - 2 = 0$$

$$\left(x + \frac{1}{4}\right)^2 = \left(\frac{1}{4}\right)^2 + 2$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{1}{16} + 2$$

R D Sharma Solutions For Class 10 Maths Chapter 8 - Quadratic Equations

$$\left(x + \frac{1}{4}\right)^2 = \frac{1 + 2 \times 16}{16}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{1 + 32}{16}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{33}{16}$$

$$\left(x + \frac{1}{4}\right) = \pm \sqrt{\frac{33}{16}}$$

$$\left(x + \frac{1}{4}\right) = \sqrt{\frac{33}{16}}$$

$$\text{or } \left(x + \frac{1}{4}\right) = -\sqrt{\frac{33}{16}}$$

$$x = \frac{\sqrt{33}}{4} - \frac{1}{4} \text{ or } x = -\frac{\sqrt{33}}{4} - \frac{1}{4}$$

$$x = \frac{\sqrt{33} - 1}{4} \text{ or } x = -\frac{\sqrt{33} - 1}{4}$$

Thus, the roots of the given quadratic equation are $x = \frac{\sqrt{33} - 1}{4}$ or $x = -\frac{\sqrt{33} - 1}{4}$

5. $2x^2 + x + 4 = 0$

Solution:

Given equation,

$$2x^2 + x + 4 = 0$$

$$x^2 + x/2 + 2 = 0$$

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

$$x^2 + 2 \times \frac{1}{4} \times x + \left(\frac{1}{4}\right)^2 - \left(\frac{1}{4}\right)^2 + 2 = 0$$

$$x^2 + 2 \times \frac{1}{4} \times x + \left(\frac{1}{4}\right)^2 = \left(\frac{1}{4}\right)^2 - 2$$

R D Sharma Solutions For Class 10 Maths Chapter 8 - Quadratic Equations

$$\left(x + \frac{1}{4}\right)^2 = \frac{1-32}{16}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{-31}{16}$$

$$\left(x + \frac{1}{4}\right) = \pm \sqrt{-\frac{31}{16}}$$

$$\left(x + \frac{1}{4}\right) = \frac{\sqrt{-31}}{4} \text{ or } \left(x + \frac{1}{4}\right) = \frac{-\sqrt{-31}}{4}$$

$$x = \frac{\sqrt{-31}-1}{4} \text{ or } x = \frac{-\sqrt{-31}-1}{4}$$

Thus, the above are the two roots of the given quadratic equation.



Myclass24
Your Class. Your Pace.