

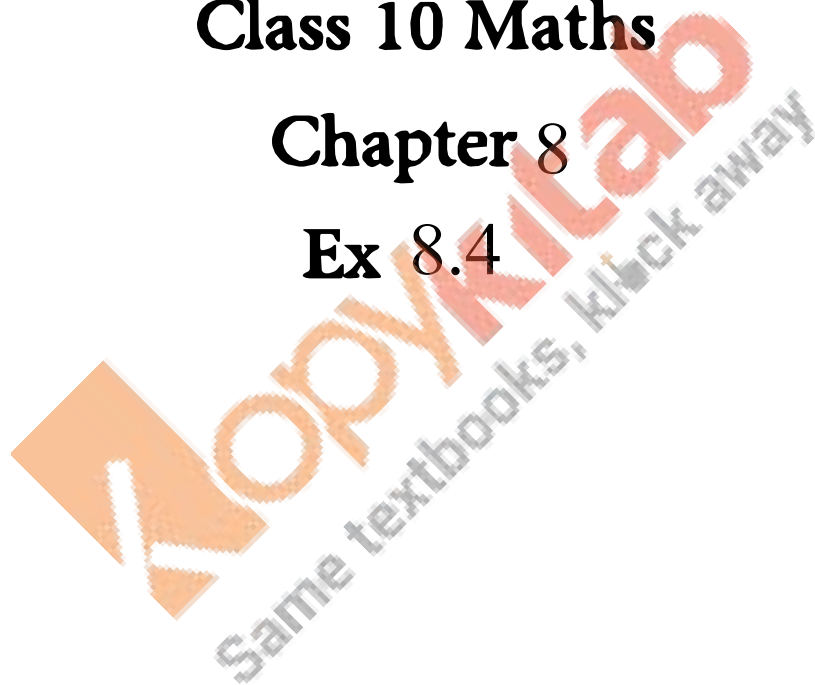
**RD SHARMA**

**Solutions**

**Class 10 Maths**

**Chapter 8**

**Ex 8.4**



By using the method of completing the square, find the roots of the following quadratic equations: (1)  $x^2 - 4\sqrt{2}x + 6 = 0$

Soln:

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

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

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

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

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

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

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

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

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

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

So, the roots for the given equation are :

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

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

Soln:

$$2x^2 - 7x + 3 = 0 \quad 2(x^2 - 7x + 3) = 0 \quad 2(x^2 - 7x + \frac{49}{4} - \frac{49}{4} + 3) = 0 \quad x^2 - 2 \times 7 \times x + 32 = 0$$

$$x^2 - 2 \times \frac{7}{2} \times x + \frac{32}{2} = 0 \quad x^2 - 2 \times 7 \times x + (7)^2 - (7)^2 + 32 = 0$$

$$x^2 - 2 \times \frac{7}{4} \times x + (\frac{7}{4})^2 - (\frac{7}{4})^2 + \frac{32}{4} = 0 \quad x^2 - 2 \times 7 \times x + (7)^2 - (49) + 32 = 0$$

$$x^2 - 2 \times \frac{7}{4} \times x + (\frac{7}{4})^2 - (\frac{49}{16}) + \frac{32}{4} = 0 \quad (x - 7)^2 - 49 + 32 = 0 \quad (x - \frac{7}{4})^2 - \frac{49}{16} + \frac{32}{4} = 0 \quad (x -$$

$$7)^2 = 49 - 32 \quad (x - \frac{7}{4})^2 = \frac{49}{16} - \frac{32}{4} \quad (x - 7)^2 = 49 - 26 \quad (x - \frac{7}{4})^2 = \frac{49 - 26}{16} \quad (x - 7)^2 = 23$$

$$(x - \frac{7}{4})^2 = \frac{23}{16} \quad (x - 7)^2 = (5)^2 \quad (x - \frac{7}{4})^2 = (\frac{5}{4})^2 \quad x - 7 = \pm 5 \quad x - \frac{7}{4} = \pm \frac{5}{4}$$

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

$$x = 74 + 54x = \frac{7}{4} + \frac{5}{4} \quad \text{or} \quad x = 74 - 54x = \frac{7}{4} - \frac{5}{4}$$

$$x = 124x = \frac{12}{4} \quad \text{or} \quad x = 24x = \frac{2}{4}$$

$$x = 3 \quad \text{or} \quad x = 1/2$$

$$(3) \quad 3x^2 + 11x + 10 = 0$$

$$\text{Soln: } 3x^2 + 11x + 10 = 0$$

$$x^2 + 11x + 10 = 0 \quad x^2 + \frac{11x}{3} + \frac{10}{3} = 0 \quad x^2 + 2 \times \frac{11x}{6} + \frac{10}{3} = 0$$

$$x^2 + 2 \times \frac{1}{2} \times \frac{11x}{3} + \frac{10}{3} = 0 \quad x^2 + 2 \times \frac{11x}{6} + \left(\frac{11}{6}\right)^2 - \left(\frac{11}{6}\right)^2 + \frac{10}{3} = 0$$

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

$$(x + \frac{11}{6})^2 = \left(\frac{11}{6}\right)^2 - \frac{10}{3} \quad (x + \frac{11}{6})^2 = \frac{121}{36} - \frac{10}{3} \quad (x + \frac{11}{6})^2 = \frac{121 - 120}{36} = \frac{1}{36}$$

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

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

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

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

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

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

$$(4) \quad 2x^2 + x - 4 = 0$$

$$\text{Soln: } 2x^2 + x - 4 = 0$$

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

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

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

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

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

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

$$(x+14)^2(x + \frac{1}{4})^2 = 1+3216 \frac{1+32}{16}$$

$$(x+14)^2(x + \frac{1}{4})^2 = 3316 \frac{33}{16}$$

$$(x+14)(x + \frac{1}{4}) = \pm\sqrt{3316}\pm\sqrt{\frac{33}{16}}$$

$$(x+14)(x + \frac{1}{4}) = \sqrt{3316}\sqrt{\frac{33}{16}} \text{ or } (x+14)(x + \frac{1}{4}) = -\sqrt{3316}\sqrt{\frac{33}{16}}$$

$$x = \sqrt{334}-14x = \frac{\sqrt{33}}{4}-\frac{1}{4} \text{ or } x = -\sqrt{334}-14x = -\frac{\sqrt{33}}{4}-\frac{1}{4}$$

$$x = \sqrt{33}-14x = \frac{\sqrt{33-1}}{4} \text{ or } x = -\sqrt{33}-14x = \frac{-\sqrt{33-1}}{4}$$

$$\text{So, } x = \sqrt{33}-14x = \frac{\sqrt{33-1}}{4} \text{ or } x = -\sqrt{33}-14x = \frac{-\sqrt{33-1}}{4}$$

Are the two roots of the given equation.

**(5)  $2x^2+x+4=0$**   $2x^2 + x + 4 = 0$

**Soln:**  $2x^2+x+4=0$   $2x^2 + x + 4 = 0$

$$x^2+x+2=0 \quad x^2 + \frac{x}{2} + 2 = 0 \quad x^2+2 \times 12 \times 12 \times x+2=0 \quad x^2 + 2 \times \frac{1}{2} \times \frac{1}{2} \times x + 2 = 0 \quad x^2+2 \times 14 \times x+$$

$$(14)^2-(14)^2+2=0 \quad x^2 + 2 \times \frac{1}{4} \times x + (\frac{1}{4})^2 - (\frac{1}{4})^2 + 2 = 0 \quad x^2+2 \times 14 \times x+(14)^2=(14)^2-2$$

$$x^2 + 2 \times \frac{1}{4} \times x + (\frac{1}{4})^2 = (\frac{1}{4})^2 - 2 \quad (x+14)^2 = 116-2 \quad (x + \frac{1}{4})^2 = \frac{1}{16}-2$$

$$(x+14)^2(x + \frac{1}{4})^2 = 1-3216 \frac{1-32}{16}$$

$$(x+14)^2(x + \frac{1}{4})^2 = -3116 \frac{-31}{16}$$

$$(x+14)(x + \frac{1}{4}) = \pm\sqrt{-3116}\pm\sqrt{\frac{-31}{16}}$$

$$(x+14)(x + \frac{1}{4}) = \sqrt{-314} \frac{\sqrt{-31}}{4} \text{ or}$$

$$(x+14)(x + \frac{1}{4}) = -\sqrt{-314} \frac{-\sqrt{-31}}{4}$$

$$x = \sqrt{-31}-14x = \frac{\sqrt{-31-1}}{4} \text{ or } x = -\sqrt{-31}-14x = \frac{-\sqrt{-31-1}}{4}$$

Since,  $\sqrt{-31}\sqrt{-31}$  is not a real number,

Therefore, the equation doesn't have real roots.

$$(6) 4x^2 + 4\sqrt{3}x + 3 = 0 \quad 4x^2 + 4\sqrt{3}x + 3 = 0$$

$$\text{Soln: } 4x^2 + 4\sqrt{3}x + 3 = 0 \quad 4x^2 + 4\sqrt{3}x + 3 = 0$$

$$x^2 + 4\sqrt{3}x + 3 = 0 \quad x^2 + \frac{4\sqrt{3}x}{4} + \frac{3}{4} = 0 \quad x^2 + 2 \times 12 \times \sqrt{3} \times x + 34 = 0$$

$$x^2 + 2 \times \frac{1}{2} \times \sqrt{3} \times x + \frac{3}{4} = 0 \quad x^2 + 2 \times \sqrt{32} \times x + (\sqrt{32})^2 - (\sqrt{32})^2 + 34 = 0$$

$$x^2 + 2 \times \frac{\sqrt{3}}{2} \times x + \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2 + \frac{3}{4} = 0 \quad (x + \sqrt{32})^2 - 34 + 34 = 0 \quad (x + \frac{\sqrt{3}}{2})^2 - \frac{3}{4} + \frac{3}{4} = 0$$

$$(x + \sqrt{32})^2 (x + \frac{\sqrt{3}}{2})^2 = 0$$

$$(x + \sqrt{32})(x + \frac{\sqrt{3}}{2}) = 0 \quad \text{and} \quad (x + \sqrt{32})(x + \frac{\sqrt{3}}{2}) = 0$$

$$x = -\sqrt{32} \quad \text{and} \quad x = -\frac{\sqrt{3}}{2}$$

$$\text{Therefore, } x = -\sqrt{32} \quad \text{and} \quad x = -\frac{\sqrt{3}}{2}$$

Are the real roots of the given equation.

$$(7) \sqrt{2}x^2 - 3x - 2\sqrt{2} = 0 \quad \sqrt{2}x^2 - 3x - 2\sqrt{2} = 0$$

$$\text{Soln: } \sqrt{2}x^2 - 3x - 2\sqrt{2} = 0 \quad \sqrt{2}x^2 - 3x - 2\sqrt{2} = 0$$

$$x^2 - 3x\sqrt{2} - 2\sqrt{2}\sqrt{2} = 0 \quad x^2 - \frac{3x}{\sqrt{2}} - \frac{2\sqrt{2}}{\sqrt{2}} = 0 \quad x^2 - 3x\sqrt{2} - 2 = 0 \quad x^2 - \frac{3x}{\sqrt{2}} - 2 = 0 \quad x^2 - 2 \times 12 \times 3x\sqrt{2} - 2 = 0$$

$$x^2 - 2 \times \frac{1}{2} \times \frac{3x}{\sqrt{2}} - 2 = 0 \quad x^2 - 2 \times 3x2\sqrt{2} + (32\sqrt{2})^2 - (32\sqrt{2})^2 - 2 = 0$$

$$x^2 - 2 \times \frac{3x}{2\sqrt{2}} + \left(\frac{3}{2\sqrt{2}}\right)^2 - \left(\frac{3}{2\sqrt{2}}\right)^2 - 2 = 0 \quad (x - 32\sqrt{2})^2 = 98 + 2(x - \frac{3}{2\sqrt{2}})^2 = \frac{9}{8} + 2 \quad (x - 32\sqrt{2})^2 = 9 + 168$$

$$(x - \frac{3}{2\sqrt{2}})^2 = \frac{9+16}{8} \quad (x - 32\sqrt{2})^2 = 258 \quad (x - \frac{3}{2\sqrt{2}})^2 = \frac{25}{8}$$

$$(8) \sqrt{3}x^2 + 10x + 7\sqrt{3} = 0 \quad \sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$$

$$\text{Soln: } \sqrt{3}x^2 + 10x + 7\sqrt{3} = 0 \quad \sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$$

$$x^2 + 10x\sqrt{3} + 7\sqrt{3}\sqrt{3} = 0 \quad x^2 + \frac{10x}{\sqrt{3}} + \frac{7\sqrt{3}}{\sqrt{3}} = 0 \quad x^2 + 2 \times 12 \times 10x\sqrt{3} + 7 = 0$$

$$x^2 + 2 \times \frac{1}{2} \times \frac{10x}{\sqrt{3}} + 7 = 0 \quad (x + 5\sqrt{3})^2 = 253 - 7(x + \frac{5}{\sqrt{3}})^2 = \frac{25}{3} - 7 \quad (x + 5\sqrt{3})^2 = 25 - 213$$

$$(x + \frac{5}{\sqrt{3}})^2 = \frac{25-21}{3} \quad (x + 5\sqrt{3})^2 = 43 \quad (x + \frac{5}{\sqrt{3}})^2 = \frac{4}{3} \quad x + 5\sqrt{3} = \pm\sqrt{43}$$

$$x + \frac{5}{\sqrt{3}} = \pm\sqrt{\frac{4}{3}} \quad x + 5\sqrt{3} = +2\sqrt{3} \text{ or } x + 5\sqrt{3} = -2\sqrt{3} \quad x + \frac{5}{\sqrt{3}} = +\frac{2}{\sqrt{3}} \text{ or } x + \frac{5}{\sqrt{3}} = -\frac{2}{\sqrt{3}} \quad x = -3\sqrt{3} \text{ or } x = -7\sqrt{3}$$

$$x = \frac{-3}{\sqrt{3}} \text{ or } x = \frac{-7}{\sqrt{3}} \quad x = -\sqrt{3} \text{ and } x = -7\sqrt{3} \quad x = -\sqrt{3} \text{ and } x = \frac{-7}{\sqrt{3}}$$

$$(9) \quad x^2 - (\sqrt{2}+1)x + \sqrt{2} = 0 \quad x^2 - (\sqrt{2} + 1)x + \sqrt{2} = 0$$

$$\text{Soln: } x^2 - (\sqrt{2}+1)x + \sqrt{2} = 0 \quad x^2 - (\sqrt{2} + 1)x + \sqrt{2} = 0$$

$$x^2 - 2 \times 12 (\sqrt{2}+1)x + \sqrt{2} = 0 \quad x^2 - 2 \times \frac{1}{2} (\sqrt{2} + 1)x + \sqrt{2} = 0 \quad x^2 - 2 \times \sqrt{2} + 12x + (\sqrt{2}+12)^2 -$$

$$(\sqrt{2}+12)^2 + \sqrt{2} = 0 \quad x^2 - 2 \times \frac{\sqrt{2}+1}{2}x + (\frac{\sqrt{2}+1}{2})^2 - (\frac{\sqrt{2}+1}{2})^2 + \sqrt{2} = 0 \quad (x - \sqrt{2}+12)^2 = (\sqrt{2}+12)^2 - \sqrt{2}$$

$$(x - \frac{\sqrt{2}+1}{2})^2 = (\frac{\sqrt{2}+1}{2})^2 - \sqrt{2}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (2+2\sqrt{2}+1)4 - \sqrt{2} \frac{(2+2\sqrt{2}+1)}{4} - \sqrt{2}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (3+2\sqrt{2}-4\sqrt{2})4 \frac{(3+2\sqrt{2}-4\sqrt{2})}{4}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (3-2\sqrt{2})4 \frac{(3-2\sqrt{2})}{4}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (2+1-2\sqrt{2})4 \frac{(2+1-2\sqrt{2})}{4}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (\sqrt{2})^2 + 1 - 2\sqrt{2} (2)^2 \frac{(\sqrt{2})^2 + 1 - 2\sqrt{2}}{(2)^2}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (\sqrt{2}-1)^2 (2)^2 \frac{(\sqrt{2}-1)^2}{(2)^2}$$

$$(x - \sqrt{2}+12)^2 (x - \frac{\sqrt{2}+1}{2})^2 = (\sqrt{2}-12)^2 (\frac{\sqrt{2}-1}{2})^2$$

$$x - \sqrt{2} + 12 \quad x - \frac{\sqrt{2}+1}{2} = \pm (\sqrt{2}-12) (\frac{\sqrt{2}-1}{2})$$

$$x - \sqrt{2} + 12 \quad x - \frac{\sqrt{2}+1}{2} = (\sqrt{2}-12) (\frac{\sqrt{2}-1}{2})$$

$$\text{Or } x - \sqrt{2} + 12 \quad x - \frac{\sqrt{2}+1}{2} = (-\sqrt{2}-12) (\frac{-\sqrt{2}-1}{2})$$

$$x = \sqrt{2} + 12 \quad x = \frac{\sqrt{2}+1}{2} + (\sqrt{2}-12) (\frac{\sqrt{2}-1}{2})$$

$$\text{Or } x = \sqrt{2} + 12x = \frac{\sqrt{2}+1}{2} + (-\sqrt{2}-12)\left(\frac{-\sqrt{2}-1}{2}\right)$$

$$x = 2\sqrt{2} \text{ or } x = 22x = \frac{2\sqrt{2}}{2} \text{ or } x = \frac{2}{2}$$

$$x = \sqrt{2}x = \sqrt{2} \text{ or } x = 1.$$

$$(10) \quad x^2 - 4ax + 4a^2 - b^2 = 0$$

$$\text{Soln: } x^2 - 4ax + 4a^2 - b^2 = 0$$

$$x^2 - 2(2a).x + (2a)^2 - b^2 = 0$$

$$(x - 2a)^2 = b^2$$

$$x - 2a = \pm b$$

$$x - 2a = b \text{ or } x - 2a = -b$$

$$x = 2a + b \text{ or } x = 2a - b$$

Therefore,  $x = 2a + b$  or  $x = 2a - b$  are the two roots of the given equation.

