

EXERCISE 1.2

Q.1 Solve the following equations using quadratic formula:

(i) $2 - x^2 = 7x$

Solution: $2 - x^2 = 7x$

$$1x^2 + 7x - 2 = 0$$

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

$\Rightarrow a = 1, b = 7, c = -2$

Using Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(7) \pm \sqrt{(7)^2 - 4(1)(-2)}}{2(1)}$$

$$x = \frac{-7 \pm \sqrt{49 + 8}}{2}$$

$\therefore x = \frac{-7 \pm \sqrt{57}}{2}$

Solution set is $\left\{ \frac{-7 \pm \sqrt{57}}{2} \right\}$

(ii) $5x^2 + 8x + 1 = 0$

Solution: $5x^2 + 8x + 1 = 0$

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

$\Rightarrow a = 5, b = 8, c = 1$

Using formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(5)(1)}}{2(5)}$$

$$x = \frac{-8 \pm \sqrt{64 - 20}}{10}$$

$$x = \frac{-8 \pm \sqrt{44}}{10}$$

$$x = \frac{-8 \pm \sqrt{4 \times 11}}{10}$$

$$x = \frac{-8 \pm 2\sqrt{11}}{10}$$

$$x = \frac{\cancel{2}(-4 \pm \sqrt{11})}{\cancel{10}5}$$

$$x = \frac{-4 \pm \sqrt{11}}{5}$$

Solution set is $\left\{ \frac{-4 \pm \sqrt{11}}{5} \right\}$

(iii) $\sqrt{3}x^2 + x = 4\sqrt{3}$

Solution: $\sqrt{3}x^2 + x = 4\sqrt{3}$

$$\sqrt{3}x^2 + 1x - 4\sqrt{3} = 0$$

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

$\Rightarrow a = \sqrt{3}, b = 1, c = -4\sqrt{3}$

Using formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$x = \frac{-1 \pm \sqrt{1 + 16(\sqrt{3})^2}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm \sqrt{1 + 16(3)}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm \sqrt{1 + 48}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm \sqrt{49}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm 7}{2\sqrt{3}}$$

$\Rightarrow x = \frac{-1 - 7}{2\sqrt{3}} \quad \text{or} \quad x = \frac{-1 + 7}{2\sqrt{3}}$

$$x = \frac{-\cancel{8}^4}{\cancel{2}\sqrt{3}} \quad \text{or} \quad x = \frac{\cancel{6}^3}{\cancel{2}\sqrt{3}}$$

$$x = \frac{-4}{\sqrt{3}} \quad \text{or} \quad x = \frac{3}{\sqrt{3}}$$

$$x = \frac{-4}{\sqrt{3}} \quad \text{or} \quad x = \sqrt{3} \quad \left(\because \frac{a}{\sqrt{a}} = \sqrt{a} \right)$$

$$\text{Solution set is } \left\{ \sqrt{3}, -\frac{4}{\sqrt{3}} \right\}$$

$$(iv) \quad 4x^2 - 14 = 3$$

$$\text{Solution: } 4x^2 - 14 = 3x$$

$$4x^2 - 3x - 14 = 0$$

$$\text{As } ax^2 + bx + c = 0$$

$$\Rightarrow a = 4, b = -3, c = -14$$

Using formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-14)}}{2(4)}$$

$$x = \frac{3 \pm \sqrt{9 + 224}}{8}$$

$$\text{Solution set is } \left\{ \frac{3 \pm \sqrt{233}}{8} \right\}$$

$$(v) \quad 6x^2 - 3 - 7x = 0$$

$$\text{Solution: } 6x^2 - 3 - 7x = 0$$

$$6x^2 - 7x - 3 = 0$$

$$\text{As } ax^2 + bx + c = 0$$

$$\Rightarrow a = 6, b = -7, c = -3$$

Using Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(6)(-3)}}{2(6)}$$

$$x = \frac{7 \pm \sqrt{49 + 72}}{12}$$

$$x = \frac{7 \pm \sqrt{121}}{12}$$

$$x = \frac{7 \pm 11}{12}$$

$$\Rightarrow x = \frac{7-11}{12} \quad \text{or} \quad x = \frac{7+11}{12}$$

$$x = \frac{-4}{12} \quad \text{or} \quad x = \frac{18}{12}$$

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

$$\text{Solution set is } \left\{ \frac{-1}{3}, \frac{3}{2} \right\}$$

$$(vi) \quad 3x^2 + 8x + 2 = 0$$

$$\text{Solution: } 3x^2 + 8x + 2 = 0$$

$$\text{As } ax^2 + bx + c = 0$$

$$\Rightarrow a = 3, b = 8, c = 2$$

Using formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(3)(2)}}{2(3)}$$

$$x = \frac{-8 \pm \sqrt{64 - 24}}{6}$$

$$x = \frac{-8 \pm \sqrt{40}}{6}$$

$$x = \frac{-8 \pm \sqrt{4 \times 10}}{6}$$

$$x = \frac{-8 \pm 2\sqrt{10}}{6}$$

$$x = \frac{\cancel{2}(-4 \pm \sqrt{10})}{\cancel{6}^3}$$

$$x = \frac{-4 \pm \sqrt{10}}{3}$$

$$\text{Solution set is } \left\{ \frac{-4 \pm \sqrt{10}}{3} \right\}$$

$$(vii) \quad \frac{3}{x-6} - \frac{4}{x-5} = 1$$

$$\text{Solution: } \frac{3}{x-6} - \frac{4}{x-5} = 1$$

$$\frac{3(x-5) - 4(x-6)}{(x-6)(x-5)} = 1$$

$$3(x-5) - 4(x-6) = (x-6)(x-5)$$

$$3x - 15 - 4x + 24 = x^2 - 5x - 6x + 30$$

$$-1x + 9 = x^2 - 11x + 30$$

$$x^2 - 11x + 1x + 30 - 9 = 0$$

$$1x^2 - 10x + 21 = 0$$

$$\text{As } ax^2 + bx + c = 0$$

$$\Rightarrow a = 1, \quad b = -10, \quad c = 21$$

Using formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(21)}}{2(1)}$$

$$x = \frac{10 \pm \sqrt{100 - 84}}{2}$$

$$x = \frac{10 \pm \sqrt{16}}{2}$$

$$x = \frac{10 \pm 4}{2}$$

$$x = \cancel{2} \frac{(5 \pm 2)}{\cancel{2}}$$

$$\Rightarrow x = 5 + 2 \quad \text{or} \quad x = 5 - 2$$

$$x = 7 \quad \text{or} \quad x = 3$$

Solution set is $\{3, 7\}$

$$(viii) \quad \frac{x+2}{x-1} - \frac{4-x}{2x} = 2\frac{1}{3}$$

$$\text{Solution: } \frac{x+2}{x-1} - \frac{4-x}{2x} = 2\frac{1}{3}$$

$$\frac{(x+2)2x - (4-x)(x-1)}{(x-1)(2x)} = \frac{7}{3}$$

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

$$\frac{2x^2 + 4x - 5x + 4 + x^2}{2x^2 - 2x} = \frac{7}{3}$$

$$\frac{3x^2 - x + 4}{2x^2 - 2x} = \frac{7}{3}$$

$$3(3x^2 - x + 4) = 7(2x^2 - 2x)$$

$$9x^2 - 3x + 12 = 14x^2 - 14x$$

$$\Rightarrow 14x^2 - 9x^2 - 14x + 3x - 12 = 0$$

$$5x^2 - 11x - 12 = 0$$

$$\text{As } ax^2 + bx + c = 0$$

$$\Rightarrow a = 5, \quad b = -11, \quad c = -12$$

Using formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(5)(-12)}}{2(5)}$$

$$x = \frac{11 \pm \sqrt{121 + 240}}{10}$$

$$x = \frac{11 \pm \sqrt{361}}{10}$$

$$x = \frac{11 \pm 19}{10}$$

$$\Rightarrow x = \frac{11-19}{10} \quad \text{or} \quad x = \frac{11+19}{10}$$

$$x = \frac{-8}{10} \quad \text{or} \quad x = \frac{30}{10}$$

$$x = -\frac{4}{5} \quad \text{or} \quad x = 3$$

Solution set is $\left\{3, -\frac{4}{5}\right\}$

$$(ix) \quad \frac{a}{x-b} + \frac{b}{x-a} = 2$$

$$\text{Solution: } \frac{a}{x-b} + \frac{b}{x-a} = 2$$

$$\frac{a(x-a) + b(x-b)}{(x-b)(x-a)} = 2$$

$$\frac{ax - a^2 + bx - b^2}{x^2 - ax - bx + ab} = 2$$

$$ax - a^2 + bx - b^2 = 2(x^2 - ax - bx + ab)$$

$$ax - a^2 + bx - b^2 = 2x^2 - 2ax - 2bx + 2ab$$

$$2x^2 - 2ax - 2bx + 2ab - ax + a^2 - bx + b^2 = 0$$

$$2x^2 - 2ax - ax - 2bx - bx + 2ab + a^2 + b^2 = 0$$

$$2x^2 - 3ax - 3bx + 2ab + a^2 + b^2 = 0$$

$$2x^2 - (3a + 3b)x + (a^2 + b^2 + 2ab) = 0$$

$$2x^2 - (3a + 3b)x + (a + b)^2 = 0$$

$$\text{As } Ax^2 + Bx + C = 0$$

$$\Rightarrow A = 2, B = -(3a + 3b), C = (a + b)^2$$

Using Formula

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-[-(3a+3b)] \pm \sqrt{[-(3a+3b)]^2 - 4(2)(a+b)^2}}{2(2)}$$

$$x = \frac{+3(a+b) \pm \sqrt{[-3(a+b)]^2 - 8(a+b)^2}}{4}$$

$$x = \frac{3(a+b) \pm \sqrt{[(-3)^2(a+b)]^2 - 8(a+b)^2}}{4}$$

$$x = \frac{3(a+b) \pm \sqrt{9(a+b)^2 - 8(a+b)^2}}{4}$$

$$x = \frac{3(a+b) \pm \sqrt{(a+b)^2}}{4}$$

$$x = \frac{3(a+b) \pm (a+b)}{4}$$

$$x = \frac{3(a+b) - (a+b)}{4} \text{ or } x = \frac{3(a+b) + (a+b)}{4}$$

$$x = \frac{2(a+b)}{4} \text{ or } x = \frac{4(a+b)}{4}$$

$$x = \frac{a+b}{2}$$

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

$$x = \frac{1}{2}(a+b)$$

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

$$\text{Solution set is } \left\{ (a+b), \frac{1}{2}(a+b) \right\}$$

$$(x) \quad -(\ell + m) - \ell x^2 + (2\ell + m)x = 0, \ell \neq 0$$

$$\text{Solution: } -(\ell + m) - \ell x^2 + (2\ell + m)x = 0, \ell \neq 0$$

$$\Rightarrow (\ell + m) + \ell x^2 - (2\ell + m)x = 0 \quad 01(032)$$

$$\Rightarrow \ell x^2 - (2\ell + m)x + (\ell + m) = 0$$

$$\text{As } ax^2 + bx + c = 0$$

$$\Rightarrow a = \ell, b = -(2\ell + m), c = \ell + m$$

Using Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-[-(2\ell + m)] \pm \sqrt{[-(2\ell + m)]^2 - 4(\ell)(\ell + m)}}{2(\ell)}$$

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

$$x = \frac{(2\ell + m) \pm \sqrt{(2\ell)^2 + (m)^2 + 2(2\ell)(m) - 4\ell^2 - 4\ell m}}{2\ell}$$

$$x = \frac{(2\ell + m) \pm \sqrt{4\cancel{\ell^2} + m^2 + 4\cancel{\ell m} - 4\cancel{\ell^2} - 4\cancel{\ell m}}}{2\ell}$$

$$x = \frac{(2\ell + m) \pm \sqrt{m^2}}{2\ell}$$

$$x = \frac{(2\ell + m) \pm m}{2\ell}$$

$$x = \frac{2\ell + \cancel{m} - \cancel{m}}{2\ell} \text{ or } x = \frac{2\ell + m + m}{2\ell}$$

$$x = \frac{\cancel{2\ell}}{\cancel{2\ell}} \text{ or } x = \frac{2\ell + 2m}{2\ell}$$

$$x = 1 \text{ or } x = \frac{\cancel{2}(\ell + m)}{\cancel{2}\ell}$$

$$x = \frac{\ell + m}{\ell}$$

$$\text{Solution set is } \left\{ 1, \frac{\ell + m}{\ell} \right\}$$

Equations reducible to quadratic form

Type (i):

The equations of the type $ax^4 + bx^2 + c = 0$

Example 1:

Solve the equation $x^4 - 13x^2 + 36 = 0$

Solution: $x^4 - 13x^2 + 36 = 0$ (i)

Let $x^2 = y$ (ii)

Then $x^4 = y^2$

Equation (i) becomes

$$y^2 - 13y + 36 = 0$$

$$y^2 - 9y - 4y + 36 = 0$$

$$y(y - 9) - 4(y - 9) = 0$$

$$(y - 9)(y - 4) = 0$$

Either $y - 9 = 0$ or $y - 4 = 0$,

$$y = 9 \quad \text{or} \quad y = 4$$

From equation (ii) Put $y = x^2$

$$x^2 = 9 \quad \text{or} \quad x^2 = 4$$

$$\sqrt{x^2} = \pm\sqrt{9} \quad \text{or} \quad \sqrt{x^2} = \pm\sqrt{4}$$

$$\Rightarrow x = \pm 3 \quad \text{or} \quad x = \pm 2$$

$\therefore$ The solution set is $\{\pm 2, \pm 3\}$

Type (ii):

The equations of the type $ap(x) + \frac{b}{p(x)} = c$

Example 2:

Solve the equation $2(2x - 1) + \frac{3}{2x - 1} = 5$

Solution:

$$2(2x - 1) + \frac{3}{2x - 1} = 5 \quad \text{.....(i)}$$

$$\text{Let } 2x - 1 = y \quad \text{.....(ii)}$$

Then the equation (i) becomes

$$2y + \frac{3}{y} = 5$$

$$\text{or } 2y^2 + 3 = 5y$$

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

Using quadratic formula

$$ay^2 + by + c = 0$$

$$\Rightarrow a = 2, b = -5, c = 3$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 2 \times 3}}{2 \times 2}$$

$$y = \frac{5 \pm \sqrt{25 - 24}}{4} = \frac{5 \pm \sqrt{1}}{5} = \frac{5 \pm 1}{4}$$

We have

$$y = \frac{5+1}{4} \quad \text{or} \quad y = \frac{5-1}{4}$$

$$y = \frac{6}{4} = \frac{3}{2} \quad \text{or} \quad y = \frac{4}{4} = 1$$

From equation (ii) putting $(y = 2x - 1)$

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

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

$$2x = \frac{5}{2} \quad \text{or} \quad x = \frac{2}{2}$$

$$x = \frac{5}{4} \quad \text{or} \quad x = 1$$

Thus, the solution set is $\left\{1, \frac{5}{4}\right\}$

Type (iii): Reciprocal equations of the type:

$$a\left(x^2 + \frac{1}{x^2}\right) + b\left(x + \frac{1}{x}\right) + c = 0$$

$$\text{or } ax^4 + bx^3 + cx^2 + bx + a = 0$$

Reciprocal Equation

An equation is said to be a reciprocal equation, if it remains unchanged, when x is replaced by $\frac{1}{x}$.

Replacing x by $\frac{1}{x}$ in

$$ax^4 - bx^3 + cx^2 - bx + a = 0, \text{ we have}$$

$$a\left(\frac{1}{x}\right)^4 - b\left(\frac{1}{x}\right)^3 + c\left(\frac{1}{x}\right)^2 - b\left(\frac{1}{x}\right) + a = 0$$

$$\left(\frac{a}{x^4}\right) - \left(\frac{b}{x^3}\right) + \left(\frac{c}{x^2}\right) - \left(\frac{b}{x}\right) + a = 0$$

Multiplying both side by x^4 , we get

$$a - bx + cx^2 - bx^3 + ax^4 = 0.$$

By arranging these terms we get the same equation .

Thus $ax^4 - bx^3 + cx^2 - bx + a = 0$ is a reciprocal equation.

Example 3:

Solve the equation

$$2x^4 - 5x^3 - 14x^2 - 5x + 2 = 0$$

Solution:

$$2x^4 - 5x^3 - 14x^2 - 5x + 2 = 0$$

Dividing each term by x^2 .

$$\frac{2x^4}{x^2} - \frac{5x^3}{x^2} - \frac{14x^2}{x^2} - \frac{5x}{x^2} + \frac{2}{x^2} = 0$$

$$2x^2 - 5x - 14 - \frac{5}{x} + \frac{2}{x^2} = 0$$

$$2\left(x^2 + \frac{1}{x^2}\right) - 5\left(x + \frac{1}{x}\right) - 14 = 0 \quad \dots\dots (i)$$

$$\text{Let } x + \frac{1}{x} = y, \quad \dots\dots (ii)$$

Taking square both side

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

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

So equation (i) becomes

$$2(y^2 - 2) - 5y - 14 = 0$$

$$2y^2 - 4 - 5y - 14 = 0$$

$$2y^2 - 5y - 18 = 0$$

$$2y^2 - 9y + 4y - 18 = 0$$

$$y(2y - 9) + 2(2y - 9) = 0$$

$$\Rightarrow (2y - 9)(y + 2) = 0$$

$$\text{Either } 2y - 9 = 0 \quad \text{or} \quad y + 2 = 0$$

From equation (ii) Putting $y = x + \frac{1}{x}$, we have

$$2\left(x + \frac{1}{x}\right) - 9 = 0 \quad \text{or} \quad x + \frac{1}{x} + 2 = 0$$

$$2x + \frac{2}{x} - 9 = 0 \quad \text{or} \quad x^2 + 1 + 2x = 0$$

$$\boxed{2x^2 - 9x + 2 = 0} \quad \text{or} \quad \boxed{x^2 + 2x + 1 = 0}$$

First we solve $2x^2 - 9x + 2 = 0$ by quadratic formula, we get

$$a = 2, b = -9, c = 2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4 \times 2 \times 2}}{2 \times 2}$$

$$x = \frac{9 \pm \sqrt{81 - 16}}{4}$$

$$x = \frac{9 \pm \sqrt{65}}{4}$$

Now we solve $x^2 + 2x + 1 = 0$ by quadratic formula

$$a = 1, b = 2, c = 1$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4 \times 1 \times 1}}{2 \times 1}$$

$$x = \frac{-2 \pm \sqrt{4 - 4}}{2} \quad \text{or} \quad x = \frac{-2 \pm 0}{2}$$

$$x = -1, -1$$

$$\text{Thus, the solution set is } \left\{ -1, \frac{9 \pm \sqrt{65}}{4} \right\}$$

Type (iv): Exponential equations:

In exponential equations, variable occurs in exponent. For example $2^x = 8$

Example 4:

Solve the equation $5^{1+x} + 5^{1-x} = 26$

Solution: $5^{1+x} + 5^{1-x} = 26$

$$5^1 \cdot 5^x + 5^1 \cdot 5^{-x} = 26$$

$$\text{or } 5 \cdot 5^x + \frac{5}{5^x} - 26 = 0 \quad \dots\dots\dots(i)$$

$$\text{Let } 5^x = y. \quad \dots\dots\dots(ii)$$

Then equation (i) becomes

$$5y + \frac{5}{y} - 26 = 0$$

$$5y^2 + 5 - 26y = 0$$

$$5y^2 - 26y + 5 = 0$$

$$5y^2 - 25y - y + 5 = 0$$

$$5y(y-5) - 1(y-5) = 0$$

$$(y-5)(5y-1) = 0$$

$$\text{Either } y-5 = 0 \quad \text{or} \quad 5y-1 = 0,$$

$$y = 5 \quad \text{or} \quad 5y = 1$$

$$\text{or} \quad y = \frac{1}{5} = 5^{-1}$$

From equation (ii) Put $y = 5^x$

$$5^x = 5^1 \quad \text{or} \quad 5^x = 5^{-1}$$

$$\Rightarrow x = 1 \quad \text{or} \quad \Rightarrow x = -1$$

$\therefore$ The solution set is $\{\pm 1\}$.

Type (v): The equations of the type:

$$(x+a)(x+b)(x+c)(x+d) = k,$$

where $a+b=c+d$

Example 5:

Solve the equation

$$(x-1)(x+2)(x+8)(x+5) = 19$$

Solution:

$$(x-1)(x+2)(x+8)(x+5) = 19$$

$$\text{Or } [(x-1)(x+8)][(x+2)(x+5)] - 19 = 0$$

$$(\because -1+8=2+5)$$

$$(x^2+7x-8)(x^2+7x+10) - 19 = 0 \quad \dots\dots (i)$$

$$\text{Let } x^2+7x = y \quad \dots\dots (ii)$$

Then equation (i) becomes

$$(y-8)(y+10) - 19 = 0$$

$$y^2 + 2y - 80 - 19 = 0$$

$$y^2 + 2y - 99 = 0$$

$$y^2 + 11y - 9y - 99 = 0$$

$$y(y+11) - 9(y+11) = 0$$

$$(y+11)(y-9) = 0$$

$$\text{Either } y+11 = 0 \quad \text{or} \quad y-9 = 0$$

From equation (ii) Put $y = x^2 + 7x$

$$\boxed{x^2 + 7x + 11 = 0} \quad \text{or} \quad \boxed{x^2 + 7x - 9 = 0}$$

First we solve $x^2 + 7x + 11 = 0$ by quadratic formula

$$a = 1, \quad b = 7, \quad c = 11$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(1)(11)}}{2(1)}$$

$$\text{Or } = \frac{-7 \pm \sqrt{49 - 44}}{2} = \frac{-7 \pm \sqrt{5}}{2}$$

Now we solve $x^2 + 7x - 9 = 0$

$$a = 1, \quad b = 7, \quad c = -9$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(1)(-9)}}{2(1)}$$

$$\text{or } x = \frac{-7 \pm \sqrt{49 + 36}}{2} = \frac{-7 \pm \sqrt{85}}{2}$$

$$\therefore \text{ The solution set is } \left\{ \frac{-7 \pm \sqrt{5}}{2}, \frac{-7 \pm \sqrt{85}}{2} \right\}$$