

Exercise 5(C)

$$x^2 - 10x - 24 = 0$$

Solution:

Given equation, $x^2 - 10x - 24 = 0$

$$x^2 - 12x + 2x - 24 = 0$$

$$x(x - 12) + 2(x - 12) = 0$$

$$(x + 2)(x - 12) = 0$$

So, $x + 2 = 0$ or $x - 12 = 0$

Hence,

$$x = -2 \text{ or } x = 12$$

1. $x^2 - 16 = 0$

Solution:

Given equation, $x^2 - 16 = 0$

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

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

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

So, $(x - 4) = 0$ or $(x + 4) = 0$

Hence,

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

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

Solution:

Given equation, $2x^2 - \frac{1}{2}x = 0$

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

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

So, either $x = 0$ or $4x - 1 = 0$

Hence,

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

3. $x(x - 5) = 24$

Solution:

Given equation, $x(x - 5) = 24$

$$x^2 - 5x = 24$$

$$x^2 - 5x - 24 = 0$$

$$x^2 - 8x + 3x - 24 = 0$$

$$x(x - 8) + 3(x - 8) = 0$$

$$(x + 3)(x - 8) = 0$$

So, $x + 3 = 0$ or $x - 8 = 0$

Hence,

$$x = -3 \text{ or } x = 8$$

4. $\frac{9}{2}x = 5 + x^2$

Solution:

Given equation, $\frac{9}{2}x = 5 + x^2$

On multiplying by 2 both sides, we have

$$9x = 2(5 + x^2)$$

$$9x = 10 + 2x^2$$

$$2x^2 - 9x + 10 = 0$$

$$2x^2 - 4x - 5x + 10 = 0$$

$$2x(x - 2) - 5(x - 2) = 0$$

$$(2x - 5)(x - 2) = 0$$

So, $2x - 5 = 0$ or $x - 2 = 0$

Hence,

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

5. $\frac{6}{x} = 1 + x$

Solution:

Given equation, $\frac{6}{x} = 1 + x$

On multiplying by x both sides, we have

$$6 = x(1 + x)$$

$$6 = x + x^2$$

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

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

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

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

So, $x - 2 = 0$ or $x + 3 = 0$

Hence,

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

6. $x = \frac{3x + 1}{4x}$

Solution:

Given equation, $x = \frac{3x + 1}{4x}$

On multiplying by $4x$ both sides, we have

$$4x(x) = 3x + 1$$

$$4x^2 = 3x + 1$$

$$4x^2 - 3x - 1 = 0$$

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

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

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

So, $4x + 1 = 0$ or $x - 1 = 0$

Hence,

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

7. $x + 1/x = 2.5$

Solution:

Given equation, $x + 1/x = 2.5$

$$x + 1/x = 5/2$$

Taking LCM on L.H.S, we have

$$(x^2 + 1)/x = 5/2$$

$$2(x^2 + 1) = 5x$$

$$2x^2 + 2 = 5x$$

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

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

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

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

$$\text{So, } 2x - 1 = 0 \text{ or } x - 2 = 0$$

Hence,

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

8. $(2x - 3)^2 = 49$

Solution:

Given equation, $(2x - 3)^2 = 49$

Expanding the L.H.S, we have

$$4x^2 - 12x + 9 = 49$$

$$4x^2 - 12x - 40 = 0$$

Dividing by 4 on both side

$$x^2 - 3x - 10 = 0$$

$$x^2 - 5x + 2x - 10 = 0$$

$$x(x - 5) + 2(x - 5) = 0$$

$$(x + 2)(x - 5) = 0$$

$$\text{So, } x + 2 = 0 \text{ or } x - 5 = 0$$

Hence,

$$x = -2 \text{ or } 5$$

9. $2(x^2 - 6) = 3(x - 4)$

Solution:

Given equation, $2(x^2 - 6) = 3(x - 4)$

$$2x^2 - 12 = 3x - 12$$

$$2x^2 = 3x$$

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

$$\text{So, } x = 0 \text{ or } (2x - 3) = 0$$

Hence,

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

10. $(x + 1)(2x + 8) = (x + 7)(x + 3)$

Solution:

Given equation, $(x + 1)(2x + 8) = (x + 7)(x + 3)$

$$2x^2 + 2x + 8x + 8 = x^2 + 7x + 3x + 21$$

$$2x^2 + 10x + 8 = x^2 + 10x + 21$$

$$x^2 = 21 - 8$$

$$x^2 - 13 = 0$$

$$(x - \sqrt{13})(x + \sqrt{13}) = 0$$

So, $x - \sqrt{13} = 0$ or $x + \sqrt{13} = 0$

Hence,

$$x = -\sqrt{13} \text{ or } x = \sqrt{13}$$

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

Solution:

Given equation, $x^2 - (a + b)x + ab = 0$

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

$$x(x - a) - b(x - a) = 0$$

$$(x - b)(x - a) = 0$$

So, $x - b = 0$ or $x - a = 0$

Hence,

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

12. $(x + 3)^2 - 4(x + 3) - 5 = 0$

Solution:

Given equation, $(x + 3)^2 - 4(x + 3) - 5 = 0$

$$(x^2 + 9 + 6x) - 4x - 12 - 5 = 0$$

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

$$x^2 + 4x - 2x - 8 = 0$$

$$x(x + 4) - 2(x - 4) = 0$$

$$(x - 2)(x + 4) = 0$$

So, $x - 2 = 0$ or $x + 4 = 0$

Hence,

$$x = 2 \text{ or } x = -4$$

13. $4(2x - 3)^2 - (2x - 3) - 14 = 0$

Solution:

Given equation, $4(2x - 3)^2 - (2x - 3) - 14 = 0$

Let substitute $2x - 3 = y$

Then the equation becomes,

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

$$4y^2 - 8y + 7y - 14 = 0$$

$$4y(y - 2) + 7(y - 2) = 0$$

$$(4y + 7)(y - 2) = 0$$

So, $4y + 7 = 0$ or $y - 2 = 0$

Hence,

$y = -7/4$ or $y = 2$

But we have taken $y = 2x - 3$

Thus,

$$2x - 3 = -7/4 \quad \text{or} \quad 2x - 3 = 2$$

$$2x = 5/4 \quad \text{or} \quad 2x = 5$$

$$x = 5/8 \quad \text{or} \quad x = 5/2$$

14. $3x - 2/2x - 3 = 3x - 8/x + 4$

Solution:

Given equation, $3x - 2/2x - 3 = 3x - 8/x + 4$

On cross-multiplying we have,

$$(3x - 2)(x + 4) = (3x - 8)(2x - 3)$$

$$3x^2 - 2x + 12x - 8 = 6x^2 - 16x - 9x + 24$$

$$3x^2 + 10x - 8 = 6x^2 - 25x + 24$$

$$3x^2 - 35x + 32 = 0$$

$$3x^2 - 3x - 32x + 32 = 0$$

$$3x(x - 1) - 32(x - 1) = 0$$

$$(3x - 32)(x - 1) = 0$$

So, $3x - 32 = 0$ or $x - 1 = 0$

Hence,

$$x = 32/3 \quad \text{or} \quad x = 1$$

15. $2x^2 - 9x + 10 = 0$, when:

(i) $x \in \mathbb{N}$ (ii) $x \in \mathbb{Q}$

Solution:

Given equation, $2x^2 - 9x + 10 = 0$

$$2x^2 - 4x - 5x + 10 = 0$$

$$2x(x - 2) - 5(x - 2) = 0$$

$$(2x - 5)(x - 2) = 0$$

So, $2x - 5 = 0$ or $x - 2 = 0$

Hence,

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

(i) When $x \in \mathbb{N}$

$x = 2$ is the solution.

(ii) When $x \in \mathbb{Q}$

$x = 2, 5/2$ are the solutions

16. $\frac{x-3}{x+3} + \frac{x+3}{x-3} = 2\frac{1}{2}$

Solution:

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

$$\Rightarrow \frac{(x-3)^2 + (x+3)^2}{(x+3)(x-3)} = \frac{5}{2}$$

$$\Rightarrow \frac{x^2 - 6x + 9 + x^2 + 6x + 9}{x^2 - 9} = \frac{5}{2}$$

$$2(2x^2 + 18) = 5(x^2 - 9)$$

$$4x^2 + 36 = 5x^2 - 45$$

$$x^2 - 81 = 0$$

$$(x - 9)(x + 9) = 0$$

$$\text{So, } x - 9 = 0 \text{ or } x + 9 = 0$$

Hence,

$$x = 9 \text{ or } x = -9$$



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