Exercise 5(C)

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Solve equations, number 1 to 20, given below, using factorization method:

1. $x^2 – 10x – 24 = 0$

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,
$x = -2$ or $x = 12$

2. $x^2 – 16 = 0$

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,
$x = 4$ or $x = -4$

3. $2x^2 – ½ x = 0$

Solution:

Given equation, $2x^2 – ½ x = 0$
$4x^2 – x = 0$
$x(4x - 1) = 0$
So, either $x = 0$ or $4x – 1 = 0$
Hence,
$x = 0$ or $x = ¼$

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

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 or x = 8

5. 9/2 x = 5 + x^2
Solution:

Given equation, 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 = 5/2 or x = 2

6. 6/x = 1 + x
Solution:

Given equation, 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 or x = -3

7. x = (3x + 1)/ 4x
Solution:

Given equation, x = (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 = -1/4 or x = 1

8. $x + 1/x = 2.5$
Solution:

Given equation, $x + 1/x = 2.5$
$x + 1/x = 5/2$
Taking LCM on L.H.S, we have
$(x^2 + 1)/ x = 5/2$
$2(x^2 + 1) = 5x$
$2x^2 + 2 = 5x$
$2x^2 - 5x + 2 = 0$
$2x^2 - 4x - x + 2 = 0$
$2x(x - 2) -1(x - 2) = 0$
$(2x - 1)(x - 2) = 0$
So, $2x - 1 = 0$ or $x – 2 = 0$
Hence,
$x = ½$ or $x = 2$

9. $(2x - 3)^2 = 49$
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
$x^2 – 3x – 10 = 0$
$x^2 – 5x + 2x – 10 = 0$
$x(x - 5) + 2(x - 5) = 0$
$(x + 2) (x - 5) = 0$
So, $x + 2 = 0$ or $x – 5 = 0$
Hence,
$x = -2$ or 5

10. $2(x^2 – 6) = 3(x - 4)$
Solution:

Given equation, $2(x^2 - 6) = 3(x - 4)$
$2x^2 – 12 = 3x – 12$
$2x^2 = 3x$
$x(2x - 3) = 0$
So, $x = 0$ or $(2x - 3) = 0$
Hence,
$x = 0$ or $x = 3/2$

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

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

12. $x^2 – (a + b)x + ab = 0$
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,
$x = b$ or $x = a$

13. $(x + 3)^2 – 4(x + 3) – 5 = 0$
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,
$x = 2$ or $x = -4$

14. $4(2x - 3)^2 – (2x - 3) – 14 = 0$
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 or 2x – 3 = 2
2x = 5/ 4 or 2x = 5
x = 5/8 or x = 5/2

15. 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 or x = 1

16. $2x^2 – 9x + 10 = 0$, when:
(i) x ∈ N (ii) x ∈ 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 or x = 2
(i) When x ∈ N
x = 2 is the solution.
(ii) When x ∈ Q
x = 2, 5/2 are the solutions

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

Solution:

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

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

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

$2(2x^2 + 18) = 5(x^2 – 9)$

$4x^2 + 36 = 5x^2 – 45$

$x^2 – 81 = 0$

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

So, $x – 9 = 0$ or $x + 9 = 0$

Hence,

$x = 9$ or $x = -9$