

5.6 Solving Equations by Factoring

Solutions

Solve each equation.

1. $(x - 1)(x - 7) = 0$

$$\begin{array}{l} x - 1 = 0 \text{ or } x - 7 = 0 \\ \underline{+1} \quad \underline{+1} \qquad \underline{+7} \quad \underline{+7} \\ x = 1 \text{ or } x = 7 \end{array}$$

{1, 7}

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

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

$$\begin{array}{l} x + 3 = 0 \text{ or } x - 3 = 0 \\ \underline{-3} \quad \underline{-3} \qquad \underline{+3} \quad \underline{+3} \\ x = -3 \text{ or } x = 3 \end{array}$$

{-3, 3}

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

5. $(2x + 5)(x - 4)(x - 6) = 0$

$$\begin{array}{l} 2x + 5 = 0 \text{ or } x - 4 = 0 \text{ or } x - 6 = 0 \\ \underline{-5} \quad \underline{-5} \qquad \underline{+4} \quad \underline{+4} \qquad \underline{+6} \quad \underline{+6} \\ 2x = -5 \text{ or } x = 4 \text{ or } x = 6 \\ \frac{2x}{2} = \frac{-5}{2} \\ x = -\frac{5}{2} \end{array}$$

$\{-\frac{5}{2}, 4, 6\}$

6. $(3x - 4)(2x + 1)(x + 6) = 0$

Answers: 1. {1, 7}; 3. {-3, 3}; 5. $\{-\frac{5}{2}, 4, 6\}$

Solve each equation.

7. $x^2 + 7x + 12 = 0$

$(x + 3)(x + 4) = 0$

$x + 3 = 0$ or $x + 4 = 0$
 $\underline{-3} \quad \underline{-3}$ $\underline{-4} \quad \underline{-4}$
 $x = -3$ or $x = -4$

$\{-3, -4\}$

Product 12	
1	12
2	6
3	4
Sum 7	

8. $x^2 - 8x + 15 = 0$

9. $2x^2 - 5x - 12 = 0$

Step 2:

$2x^2 + 3x - 8x - 12 = 0$

Step 4:

$(x - 4)(2x + 3) = 0$

$x - 4 = 0$ or $2x + 3 = 0$

$\underline{+4} \quad \underline{+4}$ $\underline{-3} \quad \underline{-3}$
 $x = 4$ or $2x = -3$

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

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

$\{4, -\frac{3}{2}\}$

Step 1:

Product -24	
-1	24
-2	12
-3	8
3	-8
Sum -5	

Step 3:

	$2x$	3
x	$2x^2$	$3x$
-4	$-8x$	-12

10. $6x^2 + x - 7 = 0$

Answers: 7. $\{-3, -4\}$; 9. $\{4, -\frac{3}{2}\}$

Solve each equation.

11. $3x^2 - 48 = 0$

$$\begin{aligned} 3(x^2 - 16) &= 0 \\ 3(x + 4)(x - 4) &= 0 \\ \frac{1}{3} \cdot 3(x + 4)(x - 4) &= 0 \cdot \frac{1}{3} \\ (x + 4)(x - 4) &= 0 \end{aligned}$$

$$\begin{aligned} x + 4 = 0 \quad \text{or} \quad x - 4 = 0 \\ \underline{-4} \quad \underline{-4} \quad \quad \quad \underline{+4} \quad \underline{+4} \\ x = -4 \quad \text{or} \quad x = 4 \end{aligned}$$

$$\boxed{\{-4, 4\}}$$

12. $5x^2 - 20 = 0$

13. $x^2 + 2x = 15$

$$\begin{aligned} x^2 + 2x &= 15 \\ x^2 + 2x - 15 &= 0 \\ (x - 3)(x + 5) &= 0 \end{aligned}$$

Product -15	
-1	15
-3	5
Sum 2	

$$\begin{aligned} x - 3 = 0 \quad \text{or} \quad x + 5 = 0 \\ \underline{+3} \quad \underline{+3} \quad \quad \quad \underline{-5} \quad \underline{-5} \\ x = +3 \quad \text{or} \quad x = -5 \end{aligned}$$

$$\boxed{\{3, -5\}}$$

14. $x^2 - x = 12$

Answers: 11. $\{-4, 4\}$; 13. $\{3, -5\}$

Solve each equation.

15. $6x^2 - x = 2$

$6x^2 - x = 2$

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

$6x^2 + 3x - 4x - 2 = 0$

$(3x - 2)(2x + 1) = 0$

$2x$	1
$3x$	$6x^2$
-2	$3x$
$-4x$	-2

$3x - 2 = 0$ or $2x + 1 = 0$

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

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

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

$\left\{ \frac{2}{3}, -\frac{1}{2} \right\}$

Product -12	
-1	12
-2	6
-3	4
3	-4
Sum -1	

16. $2x^2 - 9x = -9$

17. $x^2 - 3(3x - 4) = -8$

$x^2 - 9x + 12 = -8$

$x^2 - 9x + 20 = 0$

$(x - 4)(x - 5) = 0$

$x - 4 = 0$ or $x - 5 = 0$

$\frac{+4}{x} = \frac{+4}{4}$ or $\frac{+5}{x} = \frac{+5}{5}$

$x = 4$ or $x = 5$

$\{4, 5\}$

Product 20	
1	20
2	10
4	5
-4	-5
Sum -9	

18. $x^2 + 4(x - 2) = 4$

Answers: 15. $\left\{ \frac{2}{3}, -\frac{1}{2} \right\}$; 17. $\{4, 5\}$

Solve each equation.

19. $x^2 - 20 = 5$

$$\begin{aligned}x^2 - 20 &= 5 \\x^2 - 25 &= 0\end{aligned}$$

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

$$\begin{aligned}x - 5 = 0 &\text{ or } x + 5 = 0 \\+5 \quad +5 &\quad \quad -5 \quad -5 \\x = 5 &\text{ or } x = -5\end{aligned}$$

$$\{5, -5\}$$

20. $x^2 - 30 = 6$

21. $(x + 1)(x - 3) = 5$

$$\begin{aligned}x^2 - 3x + x - 3 &= 5 \\x^2 - 2x - 3 &= 5 \\x^2 - 2x - 8 &= 0\end{aligned}$$

Product -8	
-1	8
-2	4
2	-4
Sum -2	

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

$$\begin{aligned}x + 2 = 0 &\text{ or } x - 4 = 0 \\-2 \quad -2 &\quad \quad +4 \quad +4 \\x = -2 &\text{ or } x = 4\end{aligned}$$

$$\{-2, 4\}$$

22. $(x + 2)(x - 5) = 8$

Answers: 19. $\{5, -5\}$; 21. $\{-2, 4\}$