5. Solving Linear and Quadratic Equations

To solve linear equations, isolate the terms that contain the variable of interest on one side of the equation. All other terms should be on the other side of the equation. If needed, factor the variable of interest out of the terms containing it. Then divide to finish solving.

When solving a quadratic equation, set the equation equal to zero, then use the Quadratic Formula or factor and use the Zero Product Property. Note: If you need more practice with factoring, review Skill Builder 6.

Quadratic Formula: If \( ax^2 + bx + c = 0 \), then \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \).

Solution to problem 2-145:

a. \( 3(x - 2) + 4x = -4x + 3 \)
   \( 3x - 6 + 4x = -4x + 3 \)
   \( 7x = -4x + 9 \)
   \( 11x = 9 \)
   \( x = \frac{9}{11} \)

b. \( y = ax - bx + 3 \)
   \( y - 3 = ax - bx \)
   \( y - 3 = x(a - b) \)
   \( \frac{y - 3}{a - b} = x \)

c. \( x^2 - 7x + 7 = 5x + 8 \)
   \( x^2 - 12x - 1 = 0 \Rightarrow a = 1, b = -12, c = -1 \)
   \( x = \frac{12 \pm \sqrt{(-12)^2 - 4(1)(-1)}}{2(1)} \)
   \( x = \frac{12 \pm \sqrt{144}}{2} = \frac{12 \pm 12}{2} = 6 \pm 6 \)
   \( x = 6 \pm 3 \)

Solve each of the following equations for \( x \).

1. \( 7(10x + 7) + 9 = 6(-7x + 2) \)
2. \( a^2x + b^2x + 7 = 3c \)
3. \( 4x^2 - 12x = 0 \)
4. \( 8x + 2(y + 3x) = -9 \)
5. \( 9x^2 = 12x \)
6. \( 2x + 1 = 15x^2 \)
7. \( 2(x - 6)^2 + 5 = 23 \)
8. \( \frac{2}{3} x - 5 = 4x + \frac{1}{2} \)
9. \( (x - 5)^2 = 9 \)
10. \( 5x^2 = 15x \)
11. \( (x + 6)(x - 2) = -7 \)
12. \( kx + y^2 = x + t \)
13. \( (x + 3)^2 = 18 \)
14. \( \frac{2x + 1}{3} = 7 + 4x \)
15. \( 5x^2 - x = 3 \)
16. \( (x + 3)(x - 5) = 6 \)
17. \( 4(x^2 + x + 2) = 14 - x \)
18. \( \frac{x}{4} + 9 = \frac{2x + 3}{n} \)
Answers

1. \( x = -\frac{23}{36} \)
2. \( x = \frac{3c-7}{a^2+b^2} \)
3. \( x = 0, 3 \)

4. \( x = \frac{-2y-9}{14} = -\frac{2y+9}{14} \)
5. \( x = 0, \frac{4}{3} \)
6. \( x = -\frac{1}{5}, \frac{1}{3} \)

7. \( x = 3, 9 \)
8. \( x = -\frac{39}{25} = -1\frac{14}{25} \)
9. \( x = 2, 8 \)

10. \( x = 0, 3 \)
11. \( x = -5, 1 \)
12. \( x = \frac{t-y^2}{k-1} = \frac{y^2-t}{1-k} \)

13. \( x = -3 \pm 3\sqrt{2} \)
14. \( x = -2 \)
15. \( x = \frac{1\pm\sqrt{61}}{10} \)

16. \( x = 1 \pm \sqrt{22} \)
17. \( x = -2, \frac{3}{4} \)
18. \( x = \frac{12-36n}{n-8} = \frac{36n-12}{8-n} \)