LESSON 9-6

Solving Quadratic Equations by Using Square Roots

Solve using square roots. Check your answer.

1. \( x^2 = 81 \)
   \[ x = \pm \sqrt{81} \]
   \[ x = \pm 9 \]
   The solutions are \( 9 \) and \( -9 \).

2. \( x^2 = 100 \)
   \[ x = \pm \sqrt{100} \]
   \[ x = \pm 10 \]
   The solutions are \( 10 \) and \( -10 \).

3. \( x^2 = 225 \)
   \[ x = \pm \sqrt{225} \]
   \[ x = \pm 15 \]

4. \( 441 = x^2 \)
   \[ \pm \sqrt{441} = x \]
   \[ x = \pm 21 \]

5. \( x^2 = -400 \)
   \[ x = \pm \sqrt{-400} \]
   \[ x = \pm 20i \]
   The solutions are \( 20i \) and \( -20i \).

6. \( 3x^2 = 108 \)
   \[ x = \pm \sqrt{108} \]
   \[ x = \pm 6 \]

7. \( 100 = 4x^2 \)
   \[ \pm \sqrt{100} = x \]
   \[ x = \pm 10 \]

8. \( x^2 + 7 = 71 \)
   \[ x^2 = 64 \]
   \[ x = \pm 8 \]

9. \( 49x^2 = 64 \)
   \[ \pm \sqrt{49}\times 64 = x \]
   \[ \pm 8\sqrt{7} = x \]

10. \( -2x^2 = -162 \)
    \[ \pm \sqrt{-2}\times -162 = x \]
    \[ \pm 18i = x \]

11. \( 9x^2 + 100 = 0 \)
    \[ \pm \sqrt{-9}\times 100 = x \]
    \[ \pm 10\sqrt{3}i = x \]

12. \( 0 = 81x^2 - 121 \)
    \[ \pm \sqrt{81}\times -121 = x \]
    \[ \pm 11 = x \]

13. \( 100x^2 = 25 \)
    \[ \pm \sqrt{100}\times 25 = x \]
    \[ \pm 5 = x \]

14. \( 100x^2 = 121 \)
    \[ \pm \sqrt{100}\times 121 = x \]
    \[ \pm 11 = x \]

Solve. Round to the nearest hundredth.

15. \( 8x^2 = 56 \)
    \[ \pm \sqrt{8}\times 56 = x \]
    \[ \pm 4 = x \]

16. \( 5 - x^2 = 20 \)
    \[ -x^2 = 15 \]
    \[ x^2 = -15 \]
    \[ x = \pm \sqrt{-15} \]

17. \( x^2 + 35 = 105 \)
    \[ x^2 = 70 \]
    \[ x = \pm \sqrt{70} \]

18. The height of a skydiver jumping out of an airplane is given by \( h = -16t^2 + 3200 \). How long will it take the skydiver to reach the ground? Round to the nearest tenth of a second.

19. The height of a triangle is twice the length of its base. The area of the triangle is 50 m\(^2\). Find the height and base to the nearest tenth of a meter.

20. The height of an acorn falling out of a tree is given by \( h = -16t^2 + b \). If an acorn takes 1 second to fall to the ground. What is the value of \( b \)?
### California Standards 2.0, 2.0

#### Practice

**Solving Quadratic Equations by Using Square Roots**

Solve using square roots. Check your answer.

1. \(x^2 = 81\)
   
   \(x = \pm \sqrt{81}\)
   
   \(x = \pm 9\)
   
   The solutions are \(9\) and \(-9\).

2. \(x^2 = 100\)
   
   \(x = \pm 10\)
   
   The solutions are \(10\) and \(-10\).

3. \(x^2 = 225\)
   
   \(x = \pm \sqrt{225}\)
   
   \(x = \pm 15\)
   
   \(\pm 21 - x\)
   
   \(\pm 5\)
   
   \(\pm 9\)
   
   \(\pm 11\)
   
   \(\pm 10\)

4. \(x^2 = 100\)
   
   \(x = \pm \sqrt{100}\)
   
   \(x = \pm 10\)
   
   \(\pm 12 - x\)
   
   \(\pm 10\)

**Round to the nearest hundredth.**

5. \(x^2 = 35\)
   
   \(x = \pm \sqrt{35}\)
   
   \(x = \pm 5.92\)
   
   \(\pm 5\)
   
   \(\pm 9\)
   
   \(\pm 11\)
   
   \(\pm 10\)

**Solve using the quadratic formula.**

1. \(x^2 - 8x + 13 = 0\)
   
   \(x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\)
   
   \(x = \frac{-8 \pm \sqrt{64 - 52}}{2}\)
   
   \(x = \frac{-8 \pm 6}{2}\)
   
   \(x = 1, 5\)

2. \(x^2 + 6x + 34 = 0\)
   
   \(x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\)
   
   \(x = \frac{-6 \pm \sqrt{36 - 136}}{2}\)
   
   \(x = \frac{-6 \pm 2i\sqrt{100}}{2}\)
   
   \(x = -3 \pm i\sqrt{10}\)

3. \(x^2 - 2x - 15 = 0\)
   
   \(x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\)
   
   \(x = \frac{2 \pm \sqrt{4 + 60}}{2}\)
   
   \(x = \frac{2 \pm 8}{2}\)
   
   \(x = 5, -3\)

**Solve each equation by completing the square.**

1. \(x^2 - 8x + 13 = 0\)
   
   \(x^2 - 8x + 16 = -3\)
   
   \((x - 4)^2 = -3\)
   
   \(x = 4 \pm i\sqrt{3}\)

2. \(x^2 + 6x + 34 = 0\)
   
   \(x^2 + 6x + 9 = -25\)
   
   \((x + 3)^2 = -25\)
   
   \(x = -3 \pm 5i\)

3. \(x^2 - 2x - 15 = 0\)
   
   \(x^2 - 2x + 1 = -16\)
   
   \((x - 1)^2 = -16\)
   
   \(x = 1 \pm 4i\)

### California Standards 2.0, 2.0

#### Practice

**Completing the Square**

Complete the square to form a perfect square trinomial.

1. \(x^2 + 4x + 4 = (x + 2)^2\)
2. \(x^2 - 2x + 1 = (x - 1)^2\)
3. \(x^2 + 5x + \frac{25}{4} = (x + \frac{5}{2})^2\)

**Solve each equation by completing the square.**

1. \(x^2 - 8x + 13 = 0\)
   
   \(x^2 - 8x + 16 = -3\)
   
   \((x - 4)^2 = -3\)
   
   \(x = 4 \pm i\sqrt{3}\)

2. \(x^2 + 6x + 34 = 0\)
   
   \(x^2 + 6x + 9 = -25\)
   
   \((x + 3)^2 = -25\)
   
   \(x = -3 \pm 5i\)

3. \(x^2 - 2x - 15 = 0\)
   
   \(x^2 - 2x + 1 = -16\)
   
   \((x - 1)^2 = -16\)
   
   \(x = 1 \pm 4i\)

### California Standards 2.0, 2.0

#### Practice

**The Discriminant**

Find the number of real solutions of each equation by using the discriminant.

1. \(x^2 = 25\)
   
   \(b^2 - 4ac = 0\)
   
   None

2. \(x^2 - 11x + 28 = 0\)
   
   \(b^2 - 4ac = 1\)
   
   One

3. \(x^2 = 8x + 16 = 0\)
   
   \(b^2 - 4ac = 4\)
   
   Two

4. \(x^2 + 6x - 4 = 0\)
   
   \(b^2 - 4ac = 10\)
   
   None

5. \(x^2 - 24x = 144\)
   
   \(b^2 - 4ac = 0\)
   
   One

6. \(3x^2 + 6x - 5 = 0\)
   
   \(b^2 - 4ac = 36\)
   
   None

**Find the number of x-intercepts of each function by using the discriminant.**

1. \(y = 2x^2 + 3x + 1\)
   
   \(b^2 - 4ac = 1\)
   
   One

2. \(y = 4x^2 + 4x + 1\)
   
   \(b^2 - 4ac = 0\)
   
   One