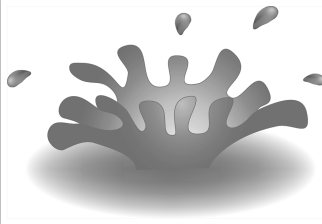


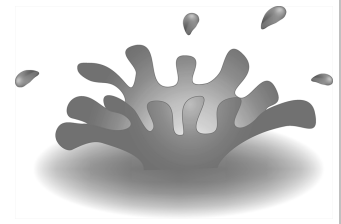
## Section 9.1

# Solving Quadratic Equations by the Square Root Property

### Making a Splash!!!!!!



In this section of the textbook, we will look at how a quadratic function can be used to model the distance an object will fall over a particular amount of time, such as a rock being dropped off a cliff into the water below.



#### First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 9.1 of your textbook which begins on page 620.
- Complete the *Concept and Vocabulary Check* on page 626 of the textbook.

#### Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

**Objective #1:** Solve quadratic equations using the square root property.

#### ✓ *Solved Problem #1*

**1a.** Solve by the square root property:  $x^2 = 36$

$$x^2 = 36$$

$$x = \sqrt{36} \text{ or } x = -\sqrt{36}$$

$$x = 6 \quad x = -6$$

The solution set is  $\{\pm 6\}$ .

**1b.** Solve by the square root property:  $5x^2 = 15$

$$5x^2 = 15$$

$$\frac{5x^2}{5} = \frac{15}{5}$$

$$x^2 = 3$$

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

The solution set is  $\{\pm\sqrt{3}\}$ .

#### ✎ *Pencil Problem #1* ✎

**1a.** Solve by the square root property:  $y^2 = 81$

**1b.** Solve by the square root property:  $4y^2 = 49$

**1c.** Solve by the square root property:  $2x^2 - 7 = 0$

$$2x^2 - 7 = 0$$

$$2x^2 = 7$$

$$x^2 = \frac{7}{2}$$

$$x = \sqrt{\frac{7}{2}} \text{ or } x = -\sqrt{\frac{7}{2}}$$

$$x = \pm \sqrt{\frac{7}{2}}$$

$$= \pm \frac{\sqrt{7}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \pm \frac{\sqrt{14}}{2}$$

The solution set is  $\left\{ \pm \frac{\sqrt{14}}{2} \right\}$ .

**1c.** Solve by the square root property:  $2x^2 + 1 = 51$

**1d.** Solve by the square root property:  $(x-3)^2 = 25$

$$(x-3)^2 = 25$$

$$x-3 = \sqrt{25} \text{ or } x-3 = -\sqrt{25}$$

$$x-3 = 5 \text{ or } x-3 = -5$$

$$x = 8 \qquad x = -2$$

The solution set is  $\{-2, 8\}$ .

**1d.** Solve by the square root property:  $(x+5)^2 = 121$

**1e.** Solve by the square root property:  $(x-2)^2 = 7$

$$(x-2)^2 = 7$$

$$x-2 = \sqrt{7} \text{ or } x-2 = -\sqrt{7}$$

$$x = 2 + \sqrt{7} \qquad x = 2 - \sqrt{7}$$

The solution set is  $\{2 \pm \sqrt{7}\}$ .

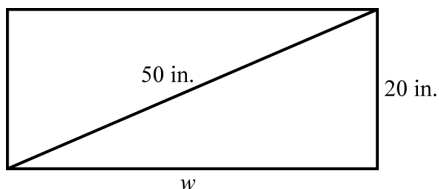
**1e.** Solve by the square root property:  $(x-5)^2 = 3$

**Objective #2:** Solve problems using the Pythagorean Theorem.

**✓ Solved Problem #2**

2. What is the width of a rectangle whose height is 20 inches and whose diagonal measures 50 inches? Express the answer in simplified radical form. Then find an approximation correct to the nearest tenth of an inch.

Draw a diagram:



$$w^2 + 20^2 = 50^2$$

$$w^2 + 400 = 2500$$

$$w^2 = 2100$$

$$w = \sqrt{2100} \quad \text{or} \quad w = -\sqrt{2100}$$

$$w = 10\sqrt{21} \quad w = -10\sqrt{21}$$

$$w \approx 45.8 \quad w \approx -45.8$$

The dimension must be positive. Reject  $-45.8$ .

The width of the rectangle is  $10\sqrt{21}$  inches or about 45.8 inches.

**✎ Pencil Problem #2 ✎**

2. A square flower bed is to be enlarged by adding 2 meters on each side. If the larger square has an area of 144 square meters, what is the length of the original square?

**Objective #3:** Find the distance between two points.**✓ Solved Problem #3**

3. Find the distance between  $(-4, 9)$  and  $(1, -3)$ .

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(1 - (-4))^2 + (-3 - 9)^2} \\ &= \sqrt{(5)^2 + (-12)^2} \\ &= \sqrt{25 + 144} \\ &= \sqrt{169} \\ &= 13 \end{aligned}$$

The distance between the two points is 13 units.

**✎ Pencil Problem #3**

3. Find the distance between  $(-4, 2)$  and  $(4, 17)$ .

**Answers for Pencil Problems (Textbook Exercise references in parentheses):**

1a.  $\{\pm 9\}$  (9.1 #3)

1b.  $\left\{\pm \frac{7}{2}\right\}$  (9.1 #11)

1c.  $\{\pm 5\}$  (9.1 #13)

1d.  $\{-16, 6\}$  (9.1 #21)

1e.  $\{5 \pm \sqrt{3}\}$  (9.1 #25)

2. 8 meters (9.1 #77)

3. 17 units (9.1 #51)

**Homework:**

- Review the Section 9.1 summary** on page 675 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.