

**Chapter
10****Fair Game Review****Evaluate the expression.**

1. $-2\sqrt{9} + 4$

2. $5 + 4\sqrt{36}$

3. $-\sqrt{\frac{81}{9}} + 11$

4. $2\sqrt{\frac{100}{4}} - 23$

5. $5(\sqrt{49} - 3)$

6. $-3(6 + 2\sqrt{25})$

7. $-4\left(\sqrt{\frac{36}{16}} - 5\right)$

8. $9\left(1 - 2\sqrt{\frac{16}{144}}\right)$

9. The number of visits to a website can be modeled by $y = \left(\frac{x}{4} + 3\right)^2$,

where y is hundreds of visits and x is the number of days since the website was launched. When did the website have 4900 visits?

**Chapter
10****Fair Game Review** (continued)**Factor the polynomial.**

10. $v^2 - 12v + 32$

11. $d^2 + 9d + 18$

12. $k^2 + 2k - 63$

13. $m^2 - 10m - 24$

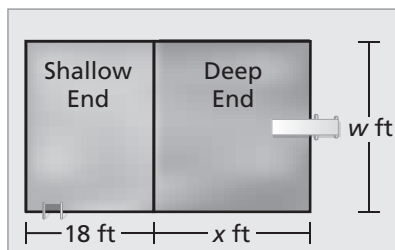
14. $t^2 - t - 90$

15. $f^2 + 6f - 27$

16. $a^2 + 16a + 55$

17. $q^2 - 21q + 68$

18. A swimming pool has a shallow end and a deep end. The total area (in square feet) of the swimming pool can be represented by $x^2 + 20x + 36$. Write a binomial that represents the width w of the swimming pool.



10.1**Graphing Square Root Functions**

For use with Activity 10.1

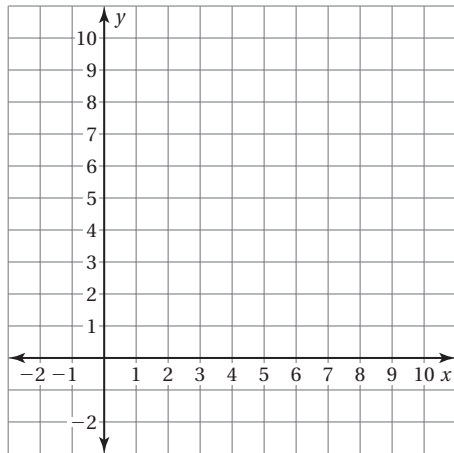
Essential Question How can you sketch the graph of a square root function?

1 ACTIVITY: Graphing Square Root Functions

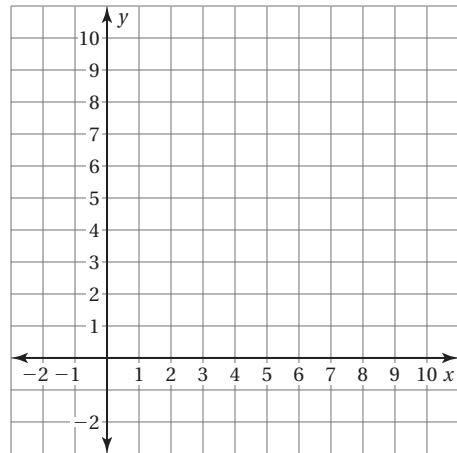
Work with a partner.

- Make a table of values for the function.
- Use the table to sketch the graph of the function.
- Describe the domain of the function.
- Describe the range of the function.

a. $y = \sqrt{x}$

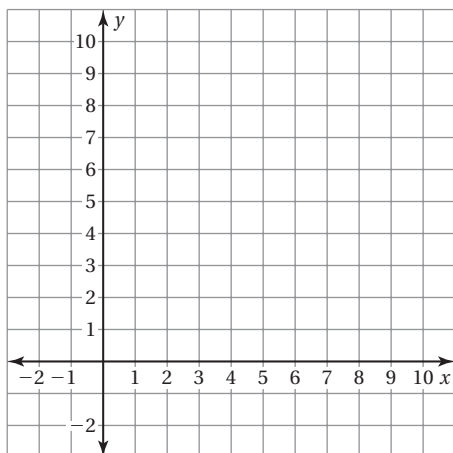


b. $y = \sqrt{x} + 2$

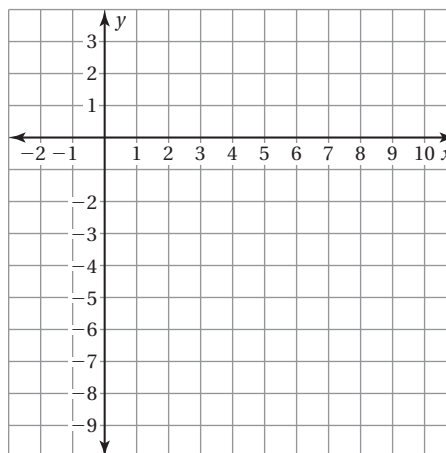


10.1 Graphing Square Root Functions (continued)

c. $y = \sqrt{x+1}$



d. $y = -\sqrt{x}$

**2** **ACTIVITY:** Writing Square Root Functions

Work with a partner. Write a square root function, $y = f(x)$, that has the given values. Then use the function to complete the table.

a.

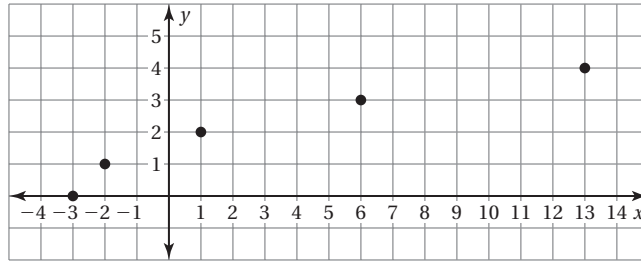
x	$f(x)$
-4	0
-3	1
-2	
-1	
0	2
1	

b.

x	$f(x)$
-4	1
-3	2
-2	
-1	
0	3
1	

10.1 Graphing Square Root Functions (continued)**3 ACTIVITY:** Writing a Square Root Function

Work with a partner. Write a square root function, $y = f(x)$, that has the given points on its graph. Explain how you found your function.

**What Is Your Answer?**

4. **IN YOUR OWN WORDS** How can you sketch the graph of a square root function? Summarize a procedure for sketching the graph. Then use your procedure to sketch the graph of each function.

a. $y = 2\sqrt{x}$

b. $y = \sqrt{x} - 1$

c. $y = \sqrt{x - 1}$

d. $y = -2\sqrt{x}$

10.1**Practice**

For use after Lesson 10.1

Find the domain of the function.

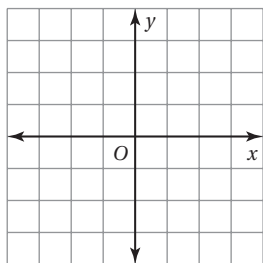
1. $y = 3\sqrt{x}$

2. $y = \sqrt{x-5}$

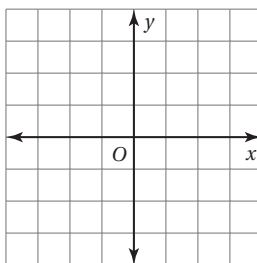
3. $y = 2\sqrt{-x+1}$

Graph the function. Describe the domain and range. Compare the graph to the graph of $y = \sqrt{x}$.

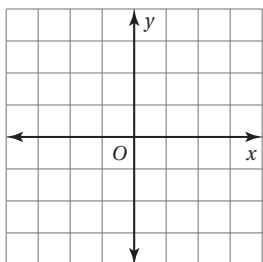
4. $y = \sqrt{x} - 3$



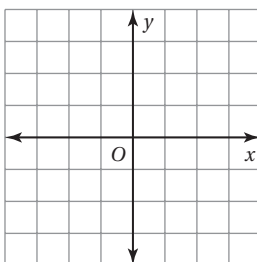
5. $y = \sqrt{x+2}$



6. $y = \sqrt{x-4} + 1$



7. $y = -\sqrt{x+3} + 4$



8. The radius of a sphere is given by $r = \frac{1}{2}\sqrt{\frac{S}{\pi}}$, where S is the surface area of the sphere.

- Find the domain of the function. Use a graphing calculator to graph the function.
- Use the *trace* feature to approximate the surface area of a sphere with a radius of 2 centimeters.

Extension
10.1**Practice**

For use after Extension 10.1

Simplify the expression.

1. $\sqrt{\frac{1}{26}}$

2. $\frac{\sqrt{5}}{\sqrt{3}}$

3. $\sqrt{\frac{35}{6}}$

4. $\sqrt{\frac{8}{11}}$

5. $\sqrt{\frac{32}{24}}$

6. $\frac{2}{\sqrt{7}} + \frac{12}{\sqrt{7}}$

7. $\frac{3}{\sqrt{18}} + \sqrt{2}$

8. $6 - \sqrt{\frac{27}{10}}$

Extension
10.1**Practice (continued)**

Simplify the expression.

9. $\frac{4}{2 - \sqrt{2}}$

10. $\frac{1}{\sqrt{6} + 4}$

11. $\frac{8}{1 - \sqrt{5}}$

12. $\frac{5}{\sqrt{3} + 2}$

13. $\frac{9}{\sqrt{5} + \sqrt{8}}$

14. $\frac{-2}{\sqrt{12} - \sqrt{6}}$

15. The distance d (in kilometers) that you can see to the horizon with your eye level h meters above the water is given by $d = \sqrt{13h}$. How far can you see when your eye level is $\frac{2}{3}$ meter above the water?



10.2

Solving Square Root Equations

For use with Activity 10.2

Essential Question How can you solve an equation that contains square roots?

1 ACTIVITY: Analyzing a Free-Falling Object

Work with a partner. The table shows the time t (in seconds) that it takes a free-falling object (with no air resistance) to fall d feet.

- Sketch the graph of t as a function of d .
- Use your graph to estimate the time it takes for a free-falling object to fall 240 feet.
- The relationship between d and t is given by the function

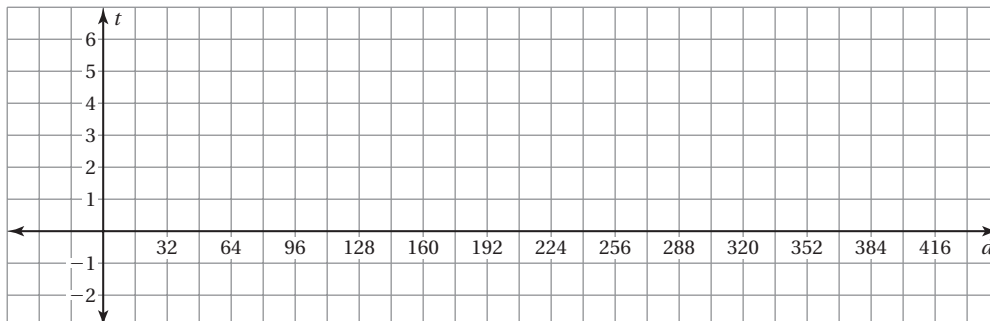
$$t = \sqrt{\frac{d}{16}}$$

Use this function to check the estimate you obtained from the graph.

d feet	t seconds
0	0.00
32	1.41
64	2.00
96	2.45
128	2.83
160	3.16
192	3.46
224	3.74
256	4.00
288	4.24
320	4.47



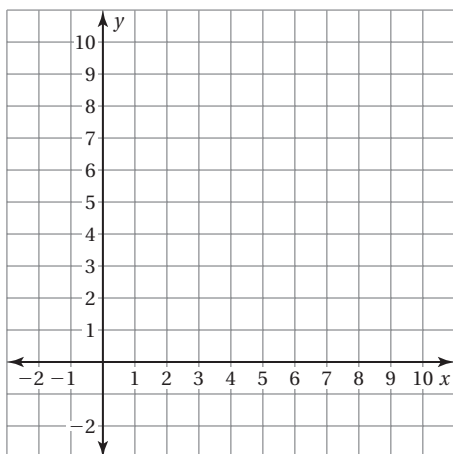
- Consider a free-falling object that takes 5 seconds to hit the ground. How far did it fall? Explain your reasoning.



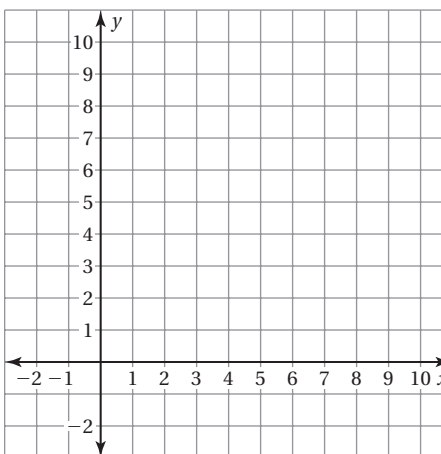
10.2 Solving Square Root Equations (continued)**2 ACTIVITY:** Solving a Square Root Equation

Work with a partner. Sketch the graph of each function. Then find the value of x such that $f(x) = 2$. Explain your reasoning.

a. $f(x) = \sqrt{x - 2}$



b. $f(x) = \sqrt{x} - 1$

**3 ACTIVITY:** Solving a Square Root Function

Work with a partner. The speed s (in feet per second) of the free-falling object in Activity 1 is given by the function

$$s = \sqrt{64d}.$$

Find the distance traveled for each speed.

a. $s = 8$ ft/sec

b. $s = 16$ ft/sec

c. $s = 24$ ft/sec

10.2 Solving Square Root Equations (continued)**What Is Your Answer?**

- 4. IN YOUR OWN WORDS** How can you solve an equation that contains square roots? Summarize a procedure for solving a square root equation. Then use your procedure to solve each equation.

a. $\sqrt{x} + 2 = 3$

b. $4 - \sqrt{x} = 1$

c. $5 = \sqrt{x + 20}$

d. $-3 = -2\sqrt{x}$

10.2**Practice**

For use after Lesson 10.2

Solve the equation. Check your solution.

1. $\sqrt{x} + 4 = 9$

2. $-2 = 6 - \sqrt{x}$

3. $7 = 1 + 2\sqrt{x + 4}$

4. $\sqrt{5x - 11} - 3 = 5$

5. $\sqrt{4x - 3} = \sqrt{x + 6}$

6. $\sqrt{8x + 1} = \sqrt{7x + 7}$

7. $x = \sqrt{12x - 32}$

8. $\sqrt{4x + 13} = x - 2$

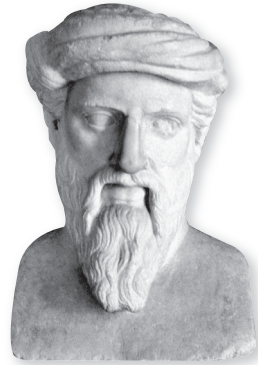
9. The formula $\frac{S}{8} = \sqrt{df}$ relates the speed S (in feet per second), drag factor f , and distance d (in feet) it takes for a car to come to a stop after the driver applies the brakes. A car travels at 80 feet per second and the drag factor is $\frac{2}{3}$. What distance does it take for the car to stop once the driver applies the brakes?

10.3**The Pythagorean Theorem**

For use with Activity 10.3

Essential Question How are the lengths of the sides of a right triangle related?

Pythagoras was a Greek mathematician and philosopher who discovered one of the most famous rules in mathematics. In mathematics, a rule is called a **theorem**. So, the rule that Pythagoras discovered is called the Pythagorean Theorem.

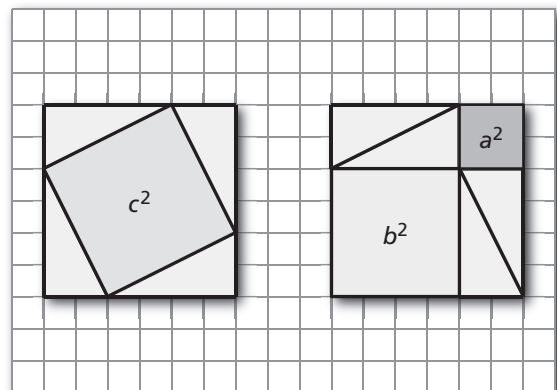
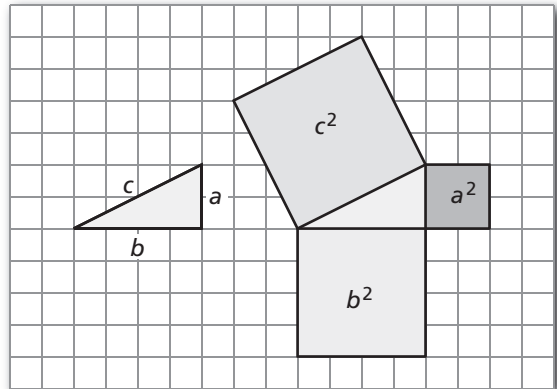


Pythagoras
(c. 570 B.C.–c. 490 B.C.)

1 ACTIVITY: Discovering the Pythagorean Theorem

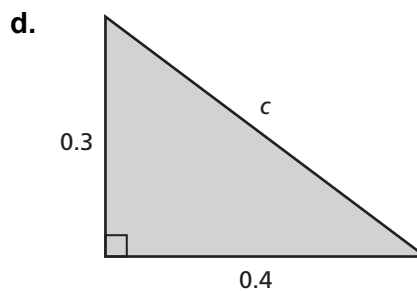
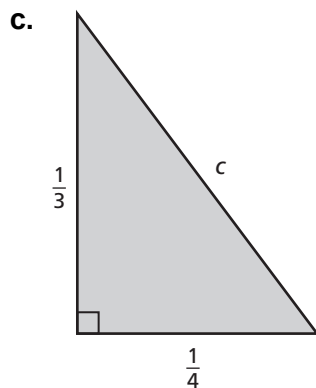
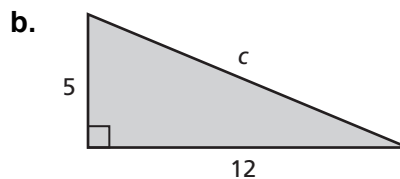
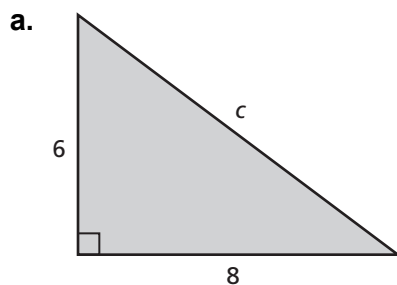
Work with a partner.

- On grid paper, draw any right triangle. Label the lengths of the two shorter sides (the **legs**) a and b .
- Label the length of the longest side (the **hypotenuse**) c .
- Draw squares along each of the three sides. Label the areas of the three squares a^2 , b^2 , and c^2 .
- Cut out the three squares. Make eight copies of the right triangle and cut them out. Arrange the figures to form two identical larger squares.
- What does this tell you about the relationship among a^2 , b^2 , and c^2 ?



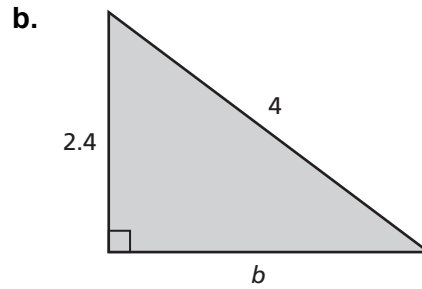
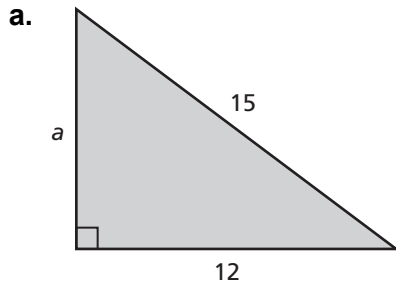
10.3 The Pythagorean Theorem (continued)**2 ACTIVITY:** Finding the Length of the Hypotenuse

Work with a partner. Use the result of Activity 1 to find the length of the hypotenuse of each right triangle.



10.3 The Pythagorean Theorem (continued)**3** **ACTIVITY:** Finding the Length of a Leg

Work with a partner. Use the result of Activity 1 to find the length of the leg of each right triangle.

**What Is Your Answer?**

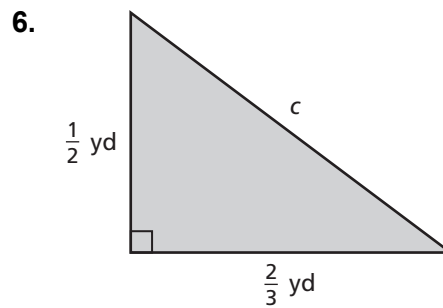
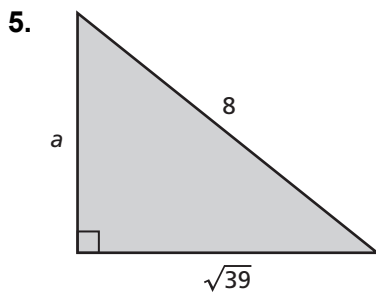
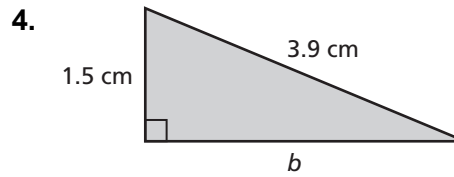
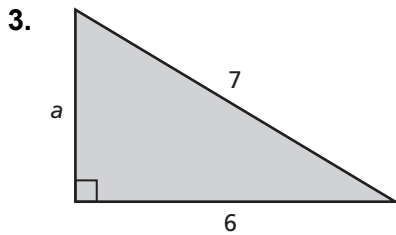
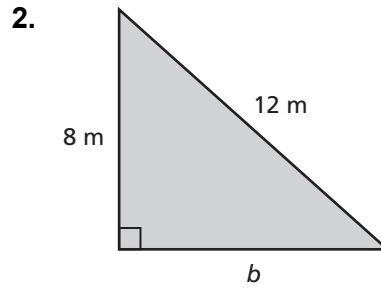
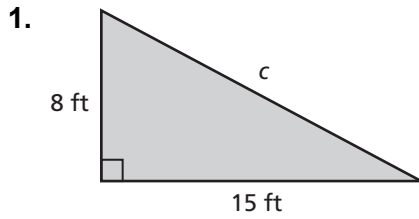
4. **IN YOUR OWN WORDS** How are the lengths of the sides of a right triangle related? Give an example using whole numbers.

10.3

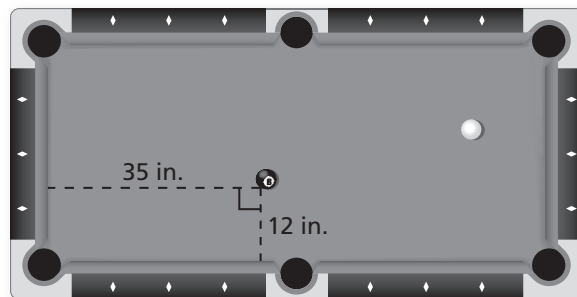
Practice

For use after Lesson 10.3

Find the missing length of the triangle.



7. The figure shows the location of the eight ball and cue ball in a game of pool. How many inches from the bottom left corner pocket is the eight ball?



10.4**Using the Pythagorean Theorem**

For use with Activity 10.4

Essential Question In what other ways can you use the Pythagorean Theorem?

The *converse* of a statement switches the hypothesis and the conclusion.

Statement:If p , then q .**Converse of the statement:**If q , then p .**1 ACTIVITY: Analyzing Converses of Statements**

Work with a partner. Write the converse of the true statement. Determine whether the converse is true or false. If it is false, give a counterexample.

- a. If $a = b$, then $a^2 = b^2$.

Converse: _____

- b. If two nonvertical lines have the same slope, then the lines are parallel.

Converse: _____

- c. If a sequence has a common difference, then it is an arithmetic sequence.

Converse: _____

- d. If a and b are rational numbers, then $a + b$ is a rational number.

Converse: _____

Is the converse of a true statement always true? always false? Explain.

10.4 Using the Pythagorean Theorem (continued)**2 ACTIVITY:** The Converse of the Pythagorean Theorem

Work with a partner. The converse of the Pythagorean Theorem states: “If the equation $a^2 + b^2 = c^2$ is true of the side lengths of a triangle, then the triangle is a right triangle.”

- a. Do you think the converse of the Pythagorean Theorem is true or false? How could you use deductive reasoning to support your answer?

- b. Consider $\triangle DEF$ with side lengths a , b , and c , such that $a^2 + b^2 = c^2$. Also consider $\triangle JKL$ with leg lengths a and b , where $\angle K = 90^\circ$.

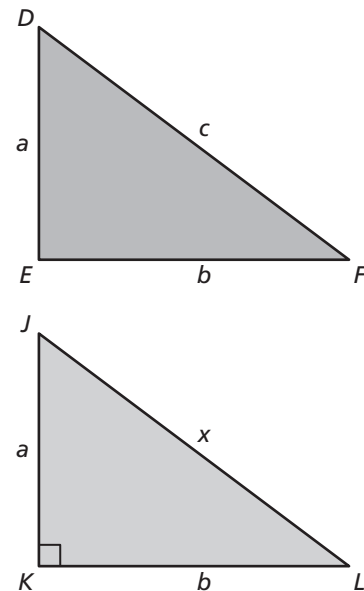
- What does the Pythagorean Theorem tell you about $\triangle JKL$?

- What does this tell you about c and x ?

- What does this tell you about $\triangle DEF$ and $\triangle JKL$?

- What does this tell you about $\angle E$?

- What can you conclude?



10.4 Using the Pythagorean Theorem (continued)**3 ACTIVITY:** Developing the Distance Formula

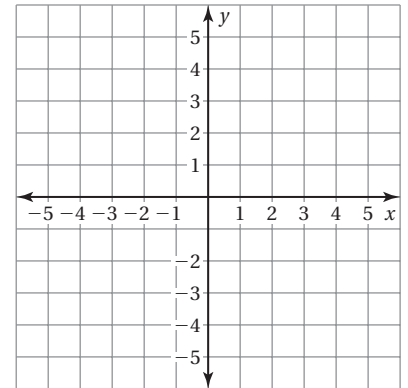
Work with a partner. Follow the steps below to write a formula that you can use to find the distance between and two points in a coordinate plane.

Step 1: Choose two points in the coordinate plane that do not lie on the same horizontal or vertical line. Label the points (x_1, y_1) and (x_2, y_2) .

Step 2: Draw a line segment connecting the points. This will be the hypotenuse of a right triangle.

Step 3: Draw horizontal and vertical line segments from the points to form the legs of the right triangle.

Step 4: Use the x -coordinates to write an expression for the length of the horizontal leg.



Step 5: Use the y -coordinates to write an expression for the length of the vertical leg.

Step 6: Substitute the expressions for the lengths of the legs into the Pythagorean Theorem.

Step 7: Solve the equation in Step 6 for the hypotenuse c .

What does the length of the hypotenuse tell you about the two points?

What Is Your Answer?

- 4. IN YOUR OWN WORDS** In what other ways can you use the Pythagorean Theorem?
- 5.** What kind of real-life problems do you think the converse of the Pythagorean Theorem can help you solve?

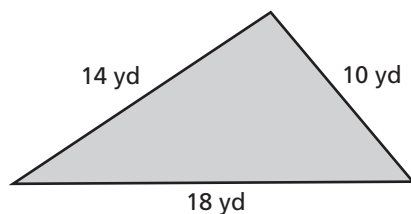
10.4

Practice

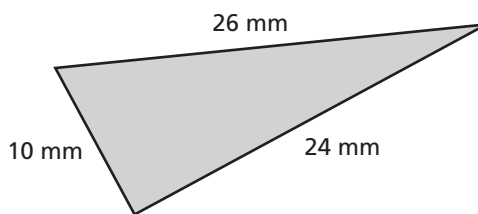
For use after Lesson 10.4

Tell whether the triangle with the given side lengths is a right triangle.

1.



2.



3. 4 m, 4.2 m, 5.8 m

4. 31 in., 35 in., 16 in.

Find the distance between the two points.

5. $(2, 1)$, $(-3, 6)$

6. $(-6, -4)$, $(2, 2)$

7. $(1, -7)$, $(4, -5)$

8. $(-9, 3)$, $(-5, -8)$

9. The cross-section of a wheelchair ramp is shown. Does the ramp form a right triangle?

