Name _____ Date _____

9.3 Similar Right Triangles

For use with Exploration 9.3

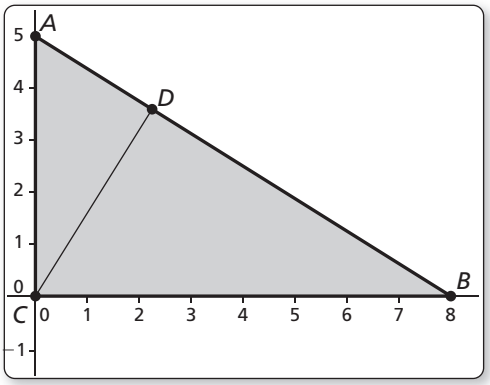
Essential Question How are altitudes and geometric means of right triangles related?

1 EXPLORATION: Writing a Conjecture

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner.

a. Use dynamic geometry software to construct right $\triangle ABC$, as shown. Draw $\overline{CD}$ so that it is an altitude from the right angle to the hypotenuse of $\triangle ABC$.



Points
$A(0, 5)$
$B(8, 0)$
$C(0, 0)$
$D(2.25, 3.6)$

Segments
$AB = 9.43$
$BC = 8$
$AC = 5$

b. The **geometric mean** of two positive numbers a and b is the positive number x that satisfies

$$\frac{a}{x} = \frac{x}{b}.$$

x is the geometric mean of a and b.

Write a proportion involving the side lengths of $\triangle CBD$ and $\triangle ACD$ so that CD is the geometric mean of two of the other side lengths. Use similar triangles to justify your steps.

Name_____ Date _____

9.3 Similar Right Triangles (continued)

1 EXPLORATION: Writing a Conjecture (continued)

c. Use the proportion you wrote in part (b) to find *CD*.

d. Generalize the proportion you wrote in part (b). Then write a conjecture about how the geometric mean is related to the altitude from the right angle to the hypotenuse of a right triangle.

2 EXPLORATION: Comparing Geometric and Arithmetic Means

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use a spreadsheet to find the arithmetic mean and the geometric mean of several pairs of positive numbers. Compare the two means. What do you notice?

	A	B	C	D
1	a	b	Arithmetic Mean	Geometric Mean
2	3	4	3.5	3.464
3	4	5		
4	6	7		
5	0.5	0.5		
6	0.4	0.8		
7	2	5		
8	1	4		
9	9	16		
10	10	100		
11				

Communicate Your Answer

3. How are altitudes and geometric means of right triangles related?

Name _____ Date _____

9.3 Notetaking with Vocabulary

For use after Lesson 9.3

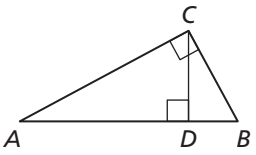
In your own words, write the meaning of each vocabulary term.

geometric mean

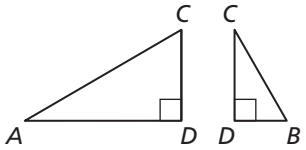
Theorems

Theorem 9.6 Right Triangle Similarity Theorem

If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.



$\triangle CBD \sim \triangle ABC$, $\triangle ACD \sim \triangle ABC$, and $\triangle CBD \sim \triangle ACD$.



Notes:

Core Concepts

Geometric Mean

The **geometric mean** of two positive numbers a and b is the positive number $\boldsymbol{x}$ that satisfies $\frac{a}{\boldsymbol{x}} = \frac{\boldsymbol{x}}{b}$. So, $\boldsymbol{x}^2 = ab$ and $\boldsymbol{x} = \sqrt{ab}$.

Notes:

Name_____ Date _____

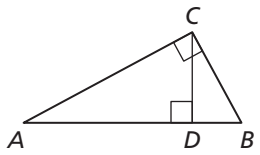
9.3 Notetaking with Vocabulary (continued)

Theorems

Theorem 9.7 Geometric Mean (Altitude) Theorem

In a right triangle, the altitude from the right angle to the hypotenuse divides the hypotenuse into two segments.

The length of the altitude is the geometric mean of the lengths of the two segments of the hypotenuse.



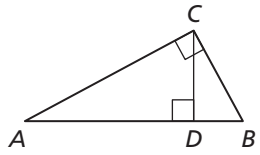
$CD^2 = AD \bullet BD$

Notes:

Theorem 9.8 Geometric Mean (Leg) Theorem

In a right triangle, the altitude from the right angle to the hypotenuse divides the hypotenuse into two segments.

The length of each leg of the right triangle is the geometric mean of the lengths of the hypotenuse and the segment of the hypotenuse that is adjacent to the leg.



$CB^2 = DB \bullet AB$

$AC^2 = AD \bullet AB$

Notes:

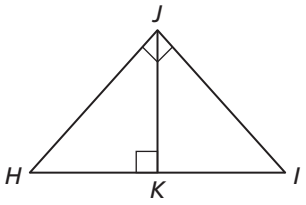
Name _____ Date _____

9.3 Notetaking with Vocabulary (continued)

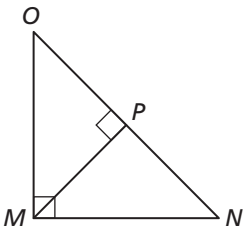
Extra Practice

In Exercises 1 and 2, identify the similar triangles.

1.



2.



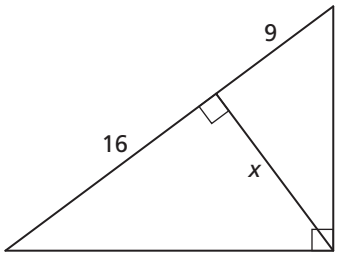
In Exercises 3 and 4, find the geometric mean of the two numbers.

3. 2 and 6

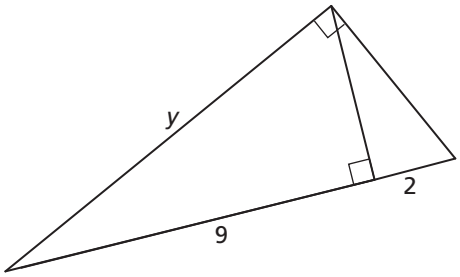
4. 5 and 45

In Exercises 5–8, find the value of the variable.

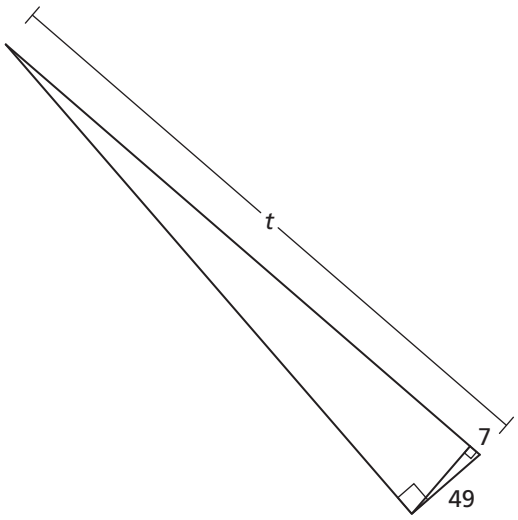
5.



6.



7.



8.