9.3 Similar Right Triangles

Learning Target Use proportional relationships in right triangles.

Success Criteria

- I can explain the Right Triangle Similarity Theorem.
- I can find the geometric mean of two numbers.
- I can find missing dimensions in right triangles.

Vocab:

Geometric Mean A number between two numbers such that $x = \sqrt{a \cdot b}$

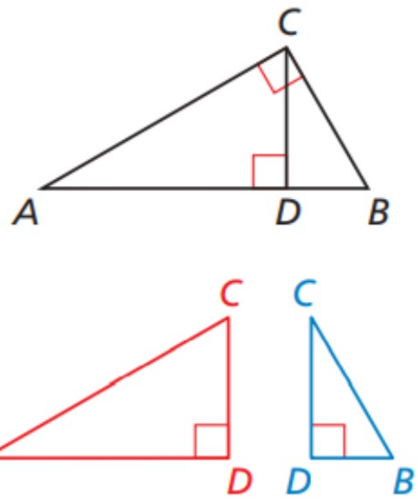
ex: 8 & 5

geometric mean: $x = \sqrt{8 \cdot 5} = \sqrt{40} = 6.35$

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 $\triangle CBD \sim \triangle ACD$.

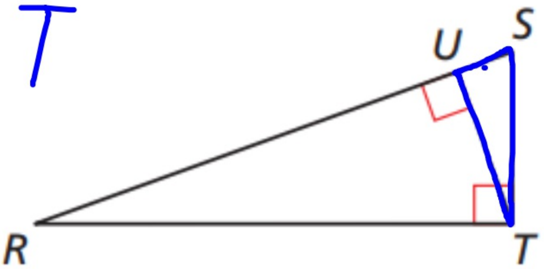
Prove this Theorem Exercise 41, page 468

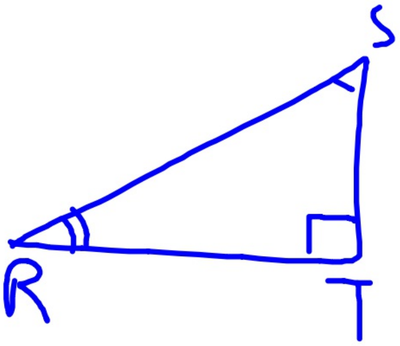
EXAMPLE 1 Identifying Similar Triangles

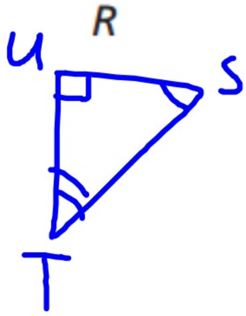
WATCH

Identify the similar triangles.

$\triangle STR \sim \triangle SUT$



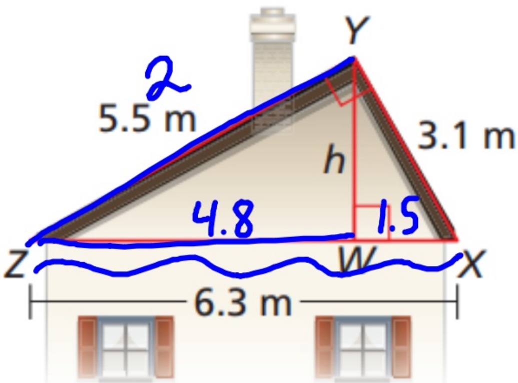




EXAMPLE 2 Modeling Real Life

WATCH

A roof has a cross section that is a right triangle. The diagram shows the approximate dimensions of this cross section. Find the height *h* of the roof.



$\triangle XYZ \sim \triangle XWY$

$\overline{WX} = 6.3 - 4.8 = 1.5$

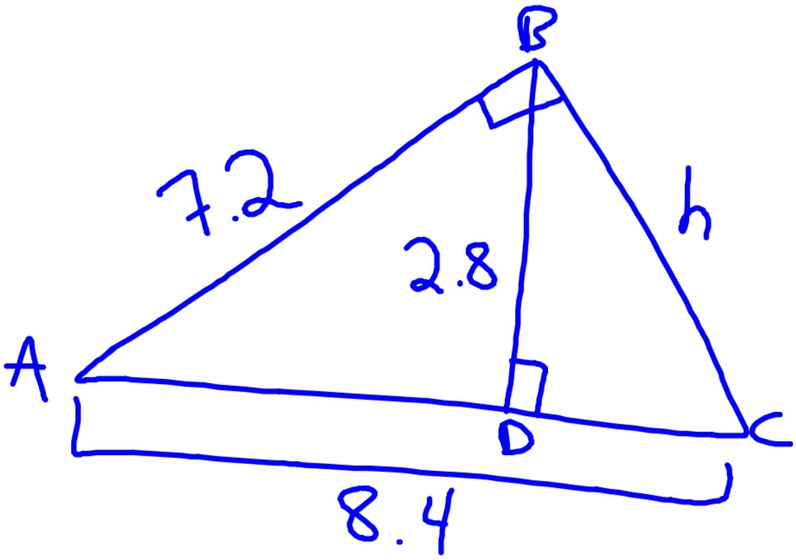
$$\frac{5.5^2}{6.3} = \frac{\cancel{6.3}\,\overline{ZW}}{\cancel{6.3}}$$

$4.8 = \overline{ZW}$

$$\frac{h}{2.8} = \frac{8.4}{7.2}$$

$$h = \frac{8.4 \times 2.8}{7.2}$$

$$= 3.27$$



EXAMPLE 3 **Finding a Geometric Mean**

Find the geometric mean of 24 and 48.

$\sqrt{1152} \doteq 33.94$

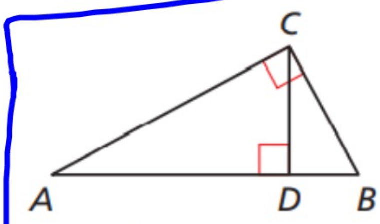
THEOREMS

9.7 Geometric Mean (Altitude) Theorem

In a right triangle, the altitude 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.

Prove this Theorem Exercise 39, page 468



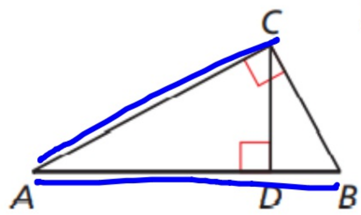
$CD^2 = AD \cdot BD$

9.8 Geometric Mean (Leg) Theorem

In a right triangle, the altitude 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 that leg.

Prove this Theorem Exercise 40, page 468



$CB^2 = DB \cdot AB$

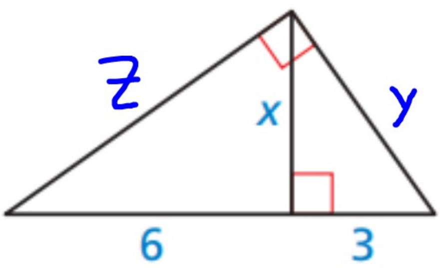
$AC^2 = AD \cdot AB$

EXAMPLE 4 Using a Geometric Mean

WATCH

Find the value of each variable.

a.

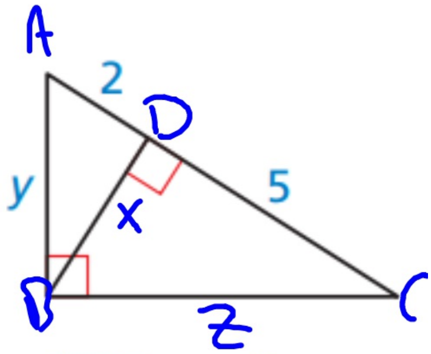


$x = \sqrt{6 \cdot 3} = \sqrt{18}$

$y = \sqrt{3 \cdot 9} = \sqrt{27}$

$z = \sqrt{6 \cdot 9} = \sqrt{54}$

b.



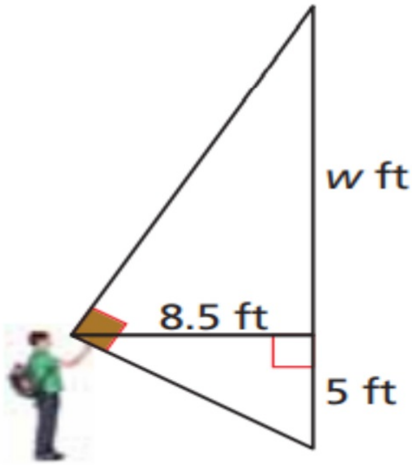
$x = \sqrt{2 \cdot 5} = \sqrt{10}$

$y = \sqrt{2 \cdot 7} = \sqrt{14}$

$z = \sqrt{5 \cdot 7} = \sqrt{35}$

EXAMPLE 5 **Using Indirect Measurement**

To find the cost of installing a rock wall in your school gymnasium, you need to find the height of the gym wall. You use a cardboard square to line up the top and bottom of the gym wall with your eye. Your friend measures the vertical distance from the ground to your eye and the horizontal distance from you to the gym wall. Find the height of the gym wall.



$$\frac{8.5^2}{5} = \frac{5w}{5}$$

$$14.45 = w$$

HW:

p 466

#1-31 odd