Lesson 9.3 Similar Right Triangles

Sunday, February 20, 2022 12:06 PM

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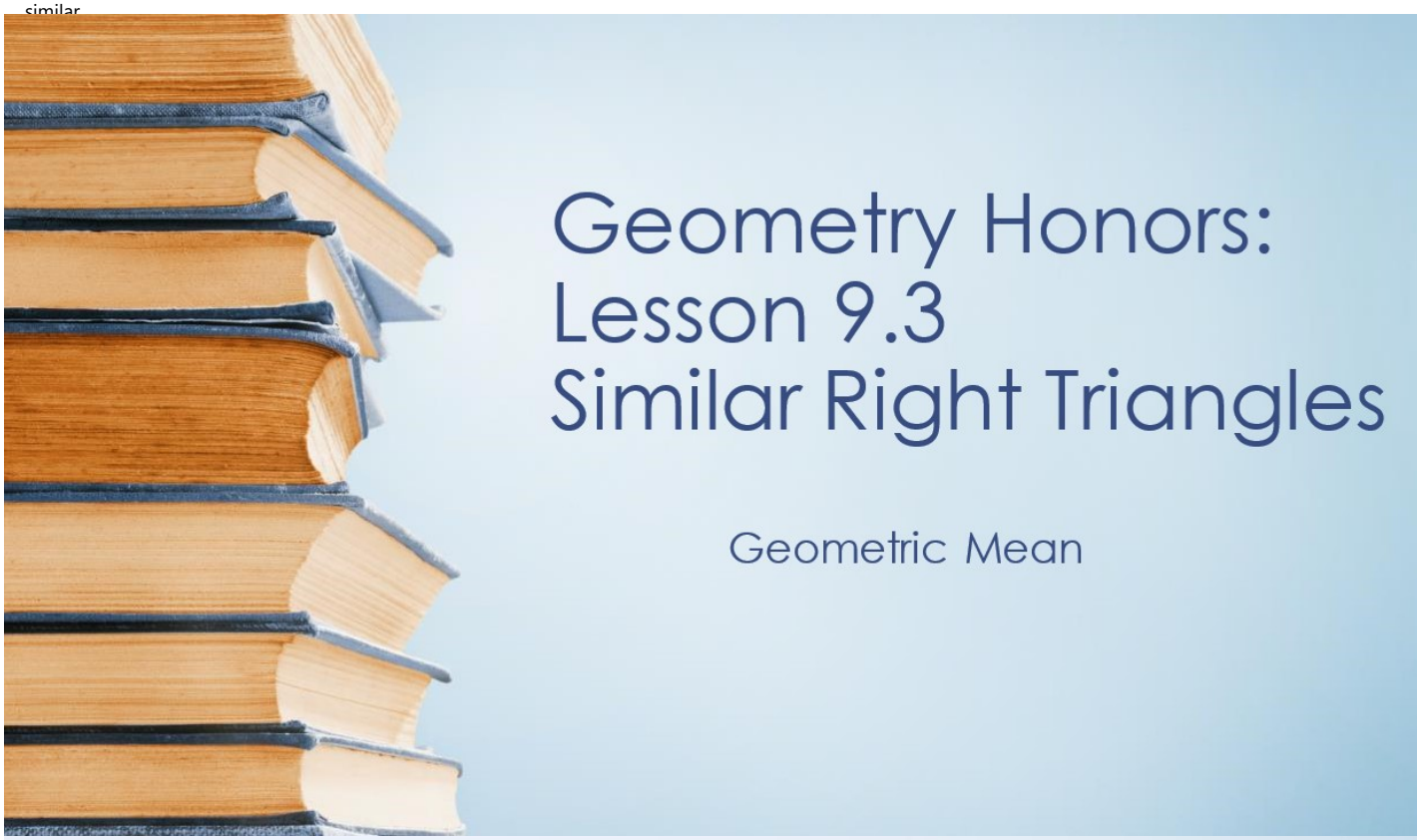
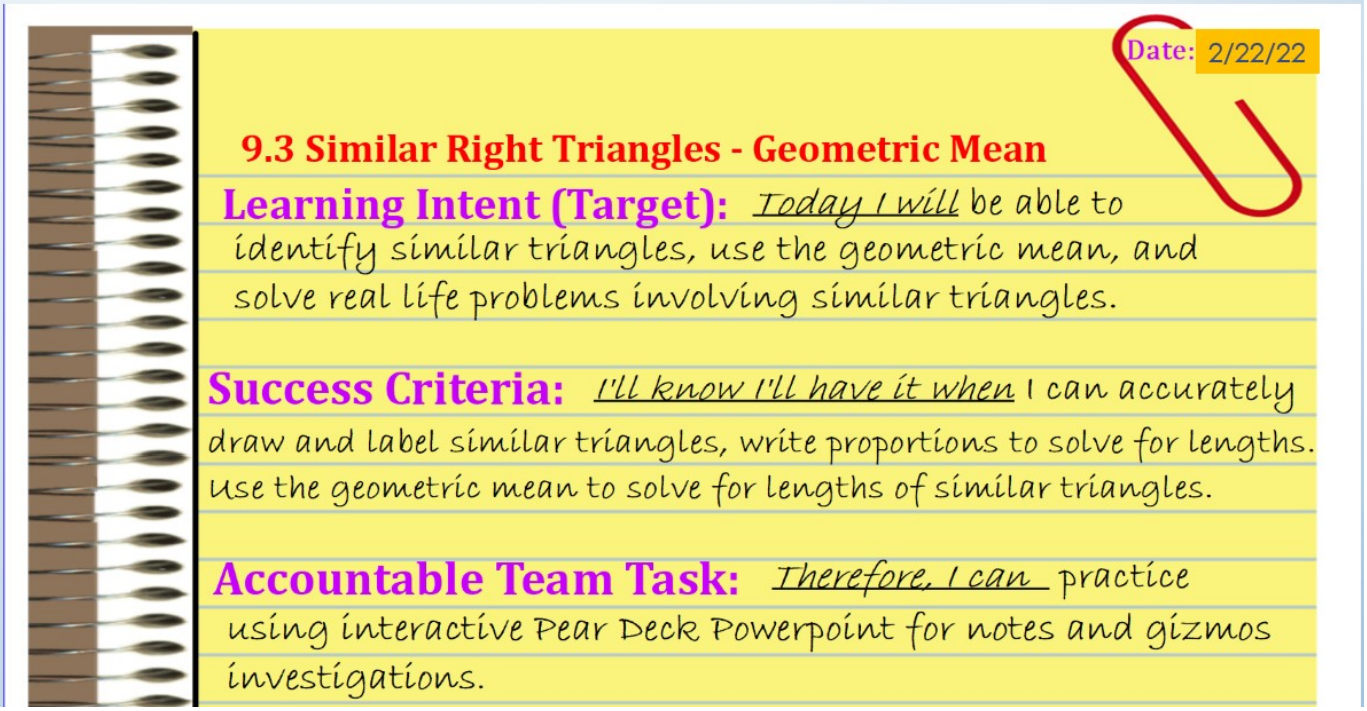
Gem 9.3 similar





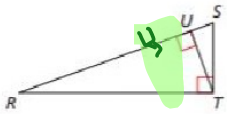
Theorem

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.

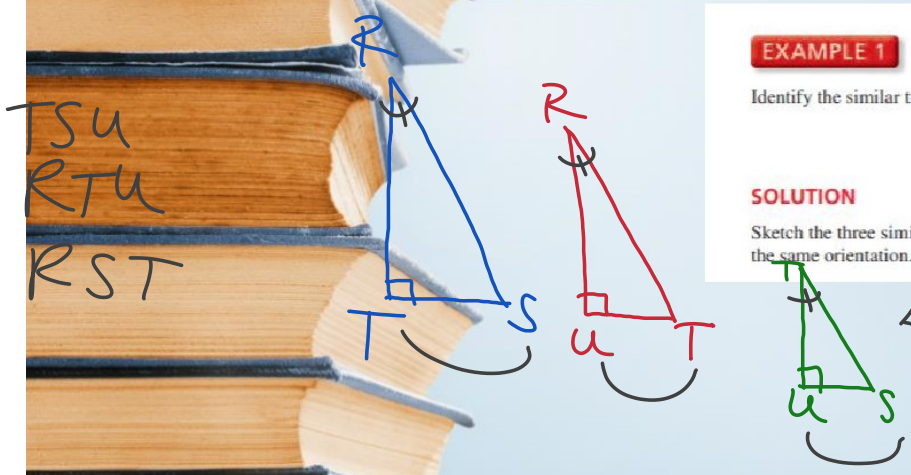
EXAMPLE 1 Identifying Similar Triangles

Identify the similar triangles in the diagram.



SOLUTION

Sketch the three similar right triangles so that the corresponding angles and sides h the same orientation.



△STRS ~ △SURT ~ △UTS

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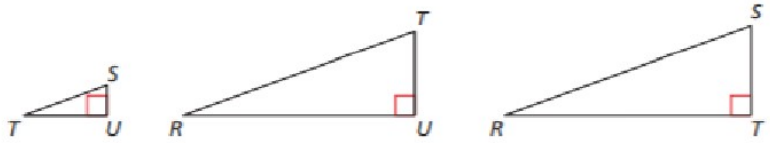
Sketch the three similar right triangles so that the corresponding angles and sides have the same orientation.



▶ $\triangle TSU \sim \triangle RTU \sim \triangle RST$

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Theorems

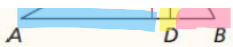
Theorem 9.7 Geometric Mean (Altitude) Theorem

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.

Proof Ex. 41, p. 484



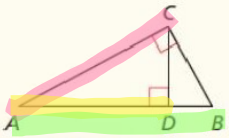
$CD^2 = AD \cdot BD$

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.

Proof Ex. 42, p. 484



$CB^2 = DB \cdot AB$

$AC^2 = AD \cdot AB$

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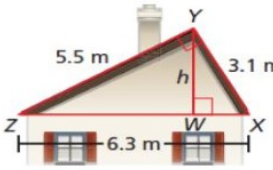
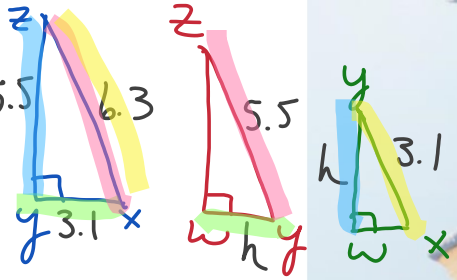
A roof has a cross section that is a right triangle. The diagram shows the approximate dimensions of this cross section. Find the height h of the roof.



$\frac{h}{3.1} = \frac{5.5}{6.3}$

$\frac{17.05}{6.3} = \frac{6.3h}{6.3}$

$2.7 = h$



1. **Understand the Problem** You are given the side lengths of a right triangle. You need to find the height of the roof, which is the altitude drawn to the hypotenuse.
2. **Make a Plan** Identify any similar triangles. Then use the similar triangles to write a proportion involving the height and solve for h.
3. **Solve the Problem** Identify the similar triangles and sketch them.

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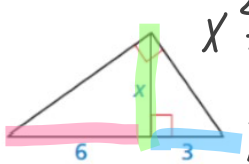
Find the value of each variable.

a.



$x^2 = 6(3)$

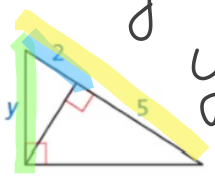
$x^2 = 18$

$x = \sqrt{18}$

$\sqrt{9} \cdot \sqrt{2}$

$x = 3\sqrt{2}$

b.



$y^2 = 2(7)$

$y^2 = 14$

$y = \sqrt{14}$

SOLUTION

a. Apply the Geometric Mean (Altitude) Theorem.

b. Apply the Geometric Mean (Leg) Theorem.

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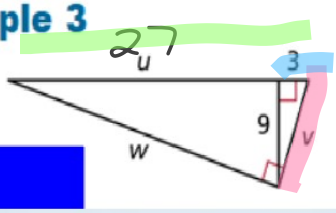
Check It Out! Example 3

Find *u*, *v*, and *w*.



4
9
16
25
36

$v^2 = 3(30)$
$v^2 = 90$
$v = \sqrt{90}$
$\sqrt{9}\sqrt{10}$
$v = 3\sqrt{10}$

$9^2 = 3u$
$\frac{81}{3} = \frac{3u}{3}$
$27 = u$

$w^2 = 27(30)$
$w^2 = 810$
$w = \sqrt{810}$
$\sqrt{81}\sqrt{10}$
$w = 9\sqrt{10}$

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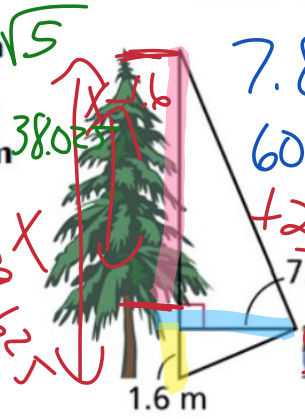
To estimate the height of a Douglas fir, Jan positions herself so that her lines of sight to the top and bottom of the tree form a 90° angle. Her eyes are about 1.6 m above the ground, and she is standing 7.8 m from the tree. What is the height of the tree to the nearest meter?



$\sqrt{5}$
$x - 1.6$
38.025
x
62°

$7.8^2 = 1.6(x - 1.6)$
$60.84 = 1.6x - 2.56$
$+2.56 \quad +2.56$
$\frac{63.4}{1.6} = \frac{1.6x}{1.6}$
$39.625 = x$

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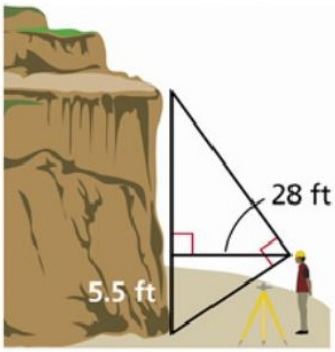
A surveyor positions himself so that his line of sight to the top of a cliff and his line of sight to the bottom form a right angle as shown. What is the height of the cliff to the nearest foot?



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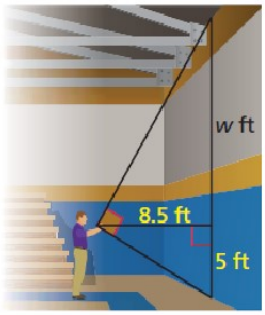
To find the cost of installing a rock wall in your school gymnasium, you need to find the height of the gym wall. You use a cardboard square to line up the top and bottom of the gym wall. Your friend measures the vertical distance from the ground to your eye and the horizontal distance from you to the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



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