7.3 Use Similar Right Triangles

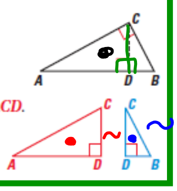
Before You identified the altitudes of a triangle.
Now You will use properties of the altitude of a right triangle.
Why? So you can determine the height of a wall, as in Example 6.

THEOREM *For Your Notebook*

THEOREM 7.5

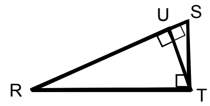
If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.

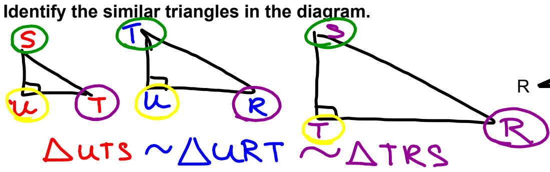
$\triangle CBD \sim \triangle ABC$, $\triangle ACD \sim \triangle ABC$, and $\triangle CBD \sim \triangle ACD$.



Example 1:

Identify the similar triangles in the diagram.





$\triangle UTS \sim \triangle URT \sim \triangle TRS$

Geometric Mean:

The Geometric Mean of TWO numbers a and b is the positive number x such that:

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

$\sqrt{x^2} = \sqrt{ab}$

$x = \sqrt{ab}$

Example 2: Find the Geometric Mean of the numbers:

1. 25 and 4

$GM = \sqrt{25 \cdot 4}$

$GM = \sqrt{100}$

$GM = 10$

2. 72 and 2

$GM = \sqrt{72 \cdot 2} = \sqrt{144} = 12$

3. 8 and 9

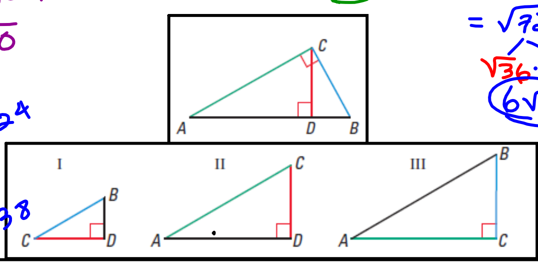
$GM = \sqrt{8 \cdot 9}$

$= \sqrt{72}$

$\sqrt{36} \cdot \sqrt{2}$

$6\sqrt{2}$

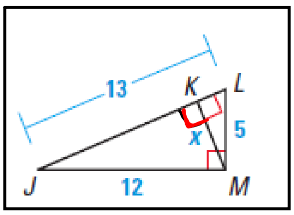
7.2 B odd, 24
1-25 odd
7.1 B
1-37, odd
34, 36, 38

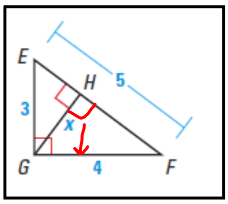


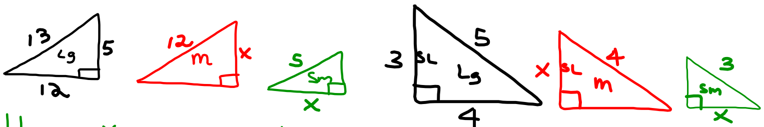
Proportions Involving Geometric Means in Right $\triangle ABC$

length of shorter leg of I / length of shorter leg of II	→ $\frac{BD}{CD} = \frac{CD}{AD}$ ←		length of longer leg of I / length of longer leg of II
length of hypotenuse of III / length of hypotenuse of I	→ $\frac{AB}{CB} = \frac{CB}{DB}$ ←		length of shorter leg of III / length of shorter leg of I
length of hypotenuse of III / length of hypotenuse of II	→ $\frac{AB}{AC} = \frac{AC}{AD}$ ←		length of longer leg of III / length of longer leg of II

Example 3: Find the altitude of the Large Triangle.







$\frac{LL_{sm\triangle}}{LL_{Lg\triangle}}$ $\frac{x}{12} = \frac{5}{13}$ $\frac{H_{sm\triangle}}{H_{Lg\triangle}}$

$\frac{13x}{13} = \frac{60}{13}$

$x = \frac{60}{13}$

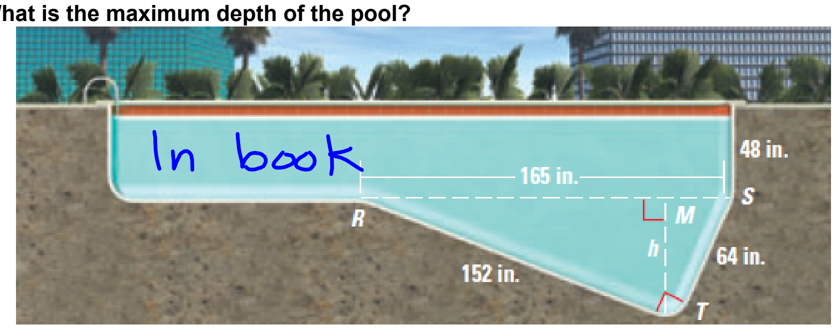
$\frac{SL_{m\triangle}}{SL_{Lg\triangle}}$ $\frac{x}{3} = \frac{4}{5}$ $\frac{H_{m\triangle}}{H_{Lg\triangle}}$

$\frac{5x}{5} = \frac{12}{5}$

$x = 2.4$

Example 4:

Swimming Pool The diagram shows a cross-section of a swimming pool. What is the maximum depth of the pool?

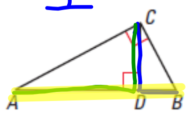


THEOREMS *For Your Notebook* "⊥" Picture

THEOREM 7.6 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.



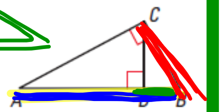
$$\frac{BD}{CD} = \frac{CD}{AD}$$

$$\frac{\text{seg hyp}}{\text{alt}} = \frac{\text{alt}}{\text{seg hyp}}$$

THEOREM 7.7 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.



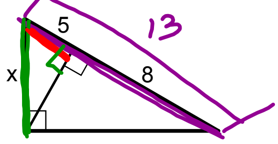
$$\frac{AB}{CB} = \frac{CB}{DB} \text{ and } \frac{AB}{AC} = \frac{AC}{AD}$$

$$\frac{\text{hyp}}{\text{leg}} = \frac{\text{leg}}{\text{seg hyp}}$$

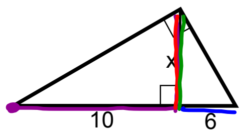
"closest"

Example 5: Find x.

7.7



7.6 "⊥"



$$\frac{13}{x} = \frac{x}{5}$$

$$\sqrt{x^2} = \sqrt{65}$$

$$x = \sqrt{65}$$

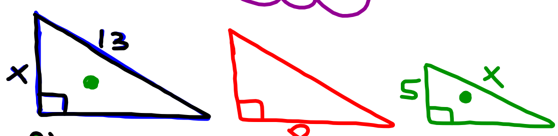
$$\frac{10}{x} = \frac{x}{6}$$

$$\sqrt{60} = \sqrt{x^2}$$

$$x = \sqrt{60}$$

$$\sqrt{4}\ \sqrt{15}$$

$$2\sqrt{15}$$



$$\text{SL}_{\text{Lg}\Delta} \quad \text{SL}_{\text{sm}\Delta} \qquad \frac{x}{5} = \frac{13}{x} \ \ \text{H}_{\text{Lg}\Delta}$$

$$65 = x^2$$

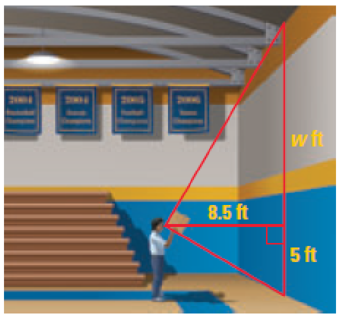
$$x = \sqrt{65}$$

xample 6:

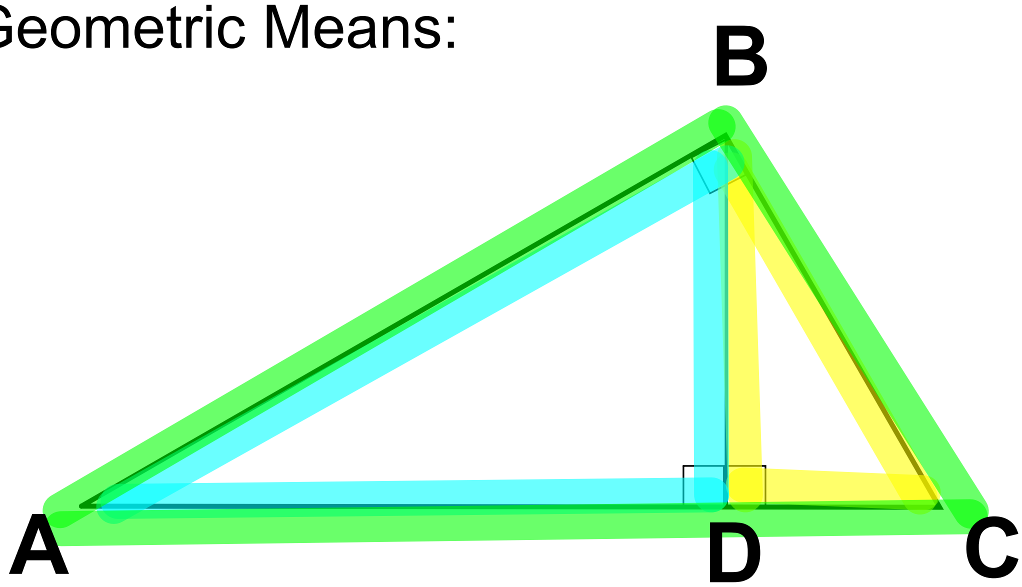
To find the cost of installing a rock wall in your school gymnasium, you need to find the height of the gym wall.

You use a cardboard square to line up the top and the bottom of the gym wall. Your friend measures the vertical distance from the ground to your eye and the distance from you to the gym wall.

Approximate the height of the gym wall.



Geometric Means:



Geometric Means: