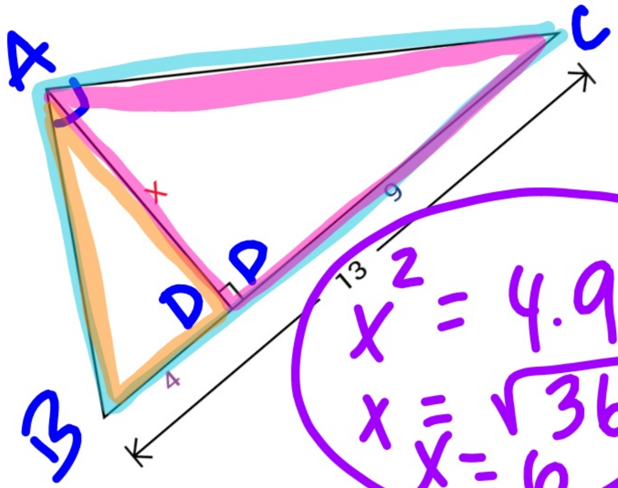
Developing Concepts

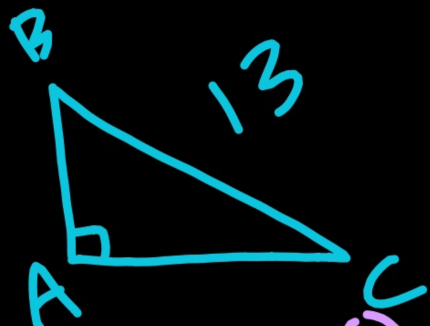
Investigating Triangles

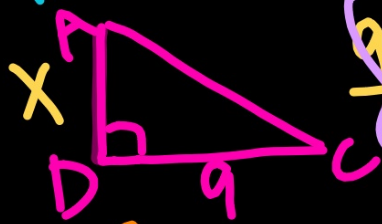
1. Cut an index card along one of its diagonals.
2. On one of the right triangles, draw an altitude from the right angle to the hypotenuse. Cut along the altitude to form two right triangles.
3. You should now have three right triangles. Compare the triangles. What special property do they share? Explain.

***Key Vocabulary: Diagonal, altitude, hypotenuse, right triangle, similar, congruent**



$$x^2 = 4 \cdot 9$$
$$x = \sqrt{36}$$
$$x = 6$$



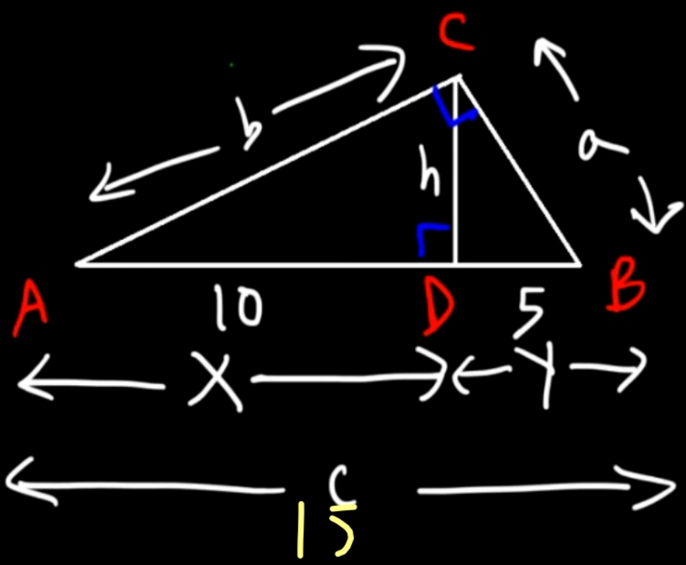


$$\frac{9}{x} = \frac{x}{4}$$

$$\frac{4}{x} = \frac{x}{9}$$

$$x^2 = 36$$
$$x = \sqrt{36}$$
$$x = 6$$

1. Calculate the length of segments CD, AC, and BC in the figure below.



$h^2 = 10 \cdot 5$

$h = \sqrt{50}$

$h = \sqrt{25}\sqrt{2} = 5\sqrt{2}$

$b^2 = 10 \cdot 15$

$b = \sqrt{150}$

$b = \sqrt{25} \cdot \sqrt{6}$

$b = 5\sqrt{6}$

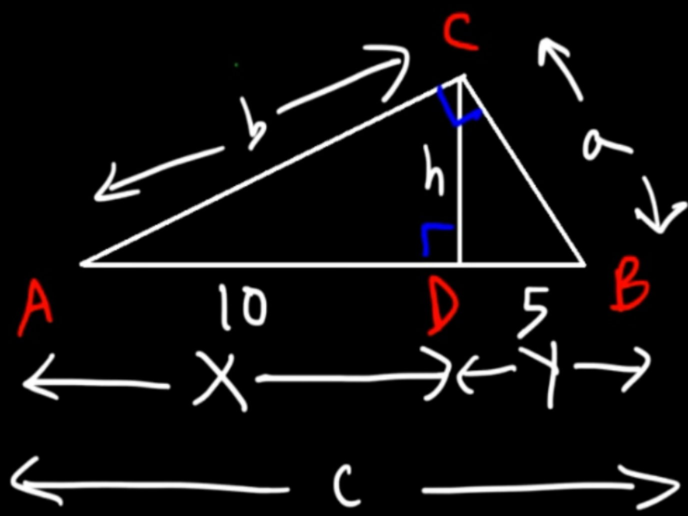
$a^2 = 5 \cdot 15$

$a = \sqrt{75}$

$\sqrt{25} \cdot \sqrt{3}$

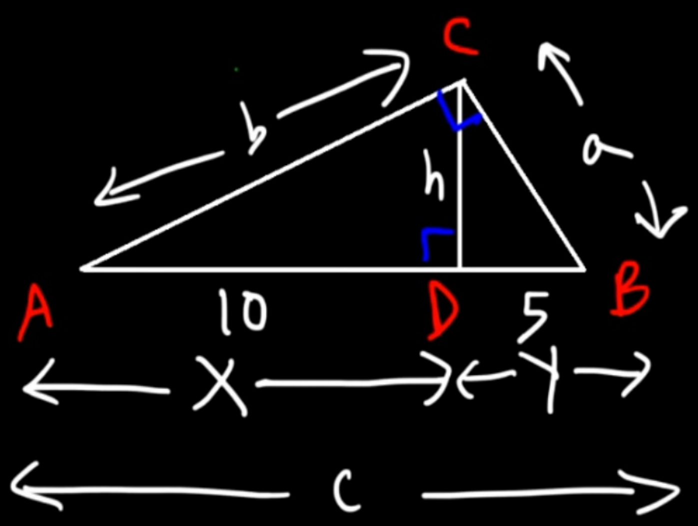
$5\sqrt{3}$

1. Calculate the length of segments CD, AC, and BC in the figure below.



See more details from link to youtube video on Teams on General tab!

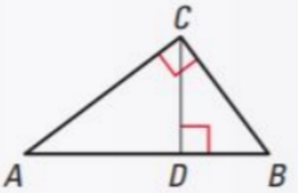
1. Calculate the length of segments CD, AC, and BC in the figure below.



$\boxed{h = 5\sqrt{2}}$ $\boxed{b = 5\sqrt{6}}$ $\boxed{a = 5\sqrt{3}}$

THEOREM 9.1

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.



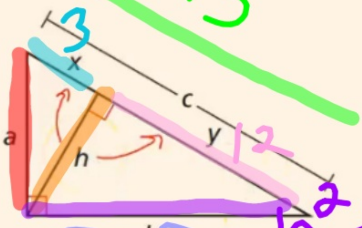
$\triangle CBD \sim \triangle ABC$, $\triangle ACD \sim \triangle ABC$, and $\triangle CBD \sim \triangle ACD$

$h^2 = 3 \cdot 12 = h^2 = 36$

$h = \sqrt{36}$

$h = 6$

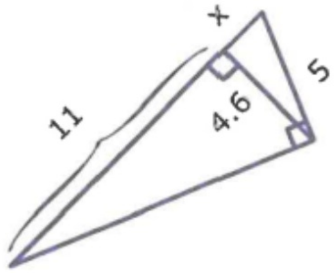
Corollaries **Geometric Means**

COROLLARY		EXAMPLE	DIAGRAM
8-1-2	The length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the two segments of the hypotenuse.	$\frac{x}{h} = \frac{h}{y}$ $h^2 = xy$ $a^2 = 3 \cdot 15$	
8-1-3	The length of a leg of a right triangle is the geometric mean of the lengths of the hypotenuse and the segment of the hypotenuse adjacent to that leg.	$a^2 = 45$ $a = \sqrt{45}$ $a^2 = xc$ $b^2 = yc$ $b = 6\sqrt{5}$	$a = \sqrt{9} \cdot \sqrt{5}$ $a = 3\sqrt{5}$

$b^2 = 12 \cdot$

$b^2 = \sqrt{18}$

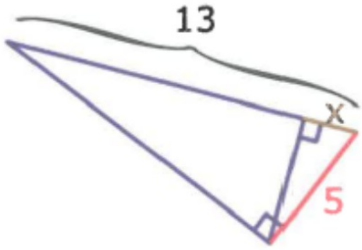
$\sqrt{36} \cdot$



$4.6^2 = 11 \cdot x$

$\frac{21.16}{11} = \frac{11x}{11}$

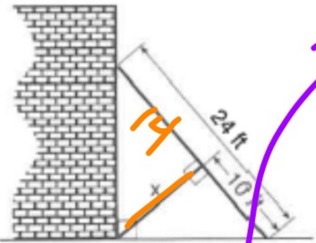
$1.92 = x$



$5^2 = 13x$ $\quad \frac{25}{13} = \frac{13x}{13}$

$1.92 = x$

The accompanying diagram shows a 24-foot ladder leaning against a building. A steel brace extends from the ladder to the point where the building meets the ground. The brace forms a right angle with the ladder.



$x^2 = 14 \cdot 10$

$x = \sqrt{140}$

$\sqrt{4}\ \sqrt{35}$

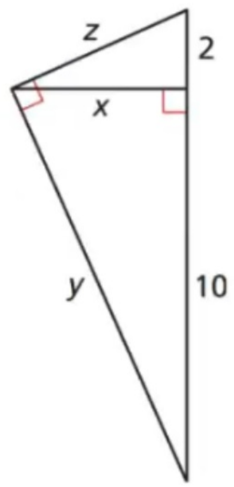
$2\sqrt{35}$

If the steel brace is connected to the ladder at a point that is 10 feet from the foot of the ladder, which equation can be used to find the length, x, of the steel brace?

(1) $\frac{10}{x} = \frac{x}{14}$ (2) $\frac{10}{x} = \frac{x}{24}$ (3) $10^2 + x^2 = 14^2$ (4) $10^2 + x^2 = 24^2$

$x^2 = 10 \cdot 14$

Find x, y, and z.



$x^2 = 2 \cdot 10$

$x^2 = 20$

$x = \sqrt{20}$

$x = \sqrt{4} \cdot \sqrt{5}$

$x = 2\sqrt{5}$

$y^2 = 10 \cdot 12$

$y^2 = 120$

$y = \sqrt{120}$

$y = \sqrt{4}\sqrt{30}$

$y = 2\sqrt{30}$

$z^2 = 2 \cdot 12$

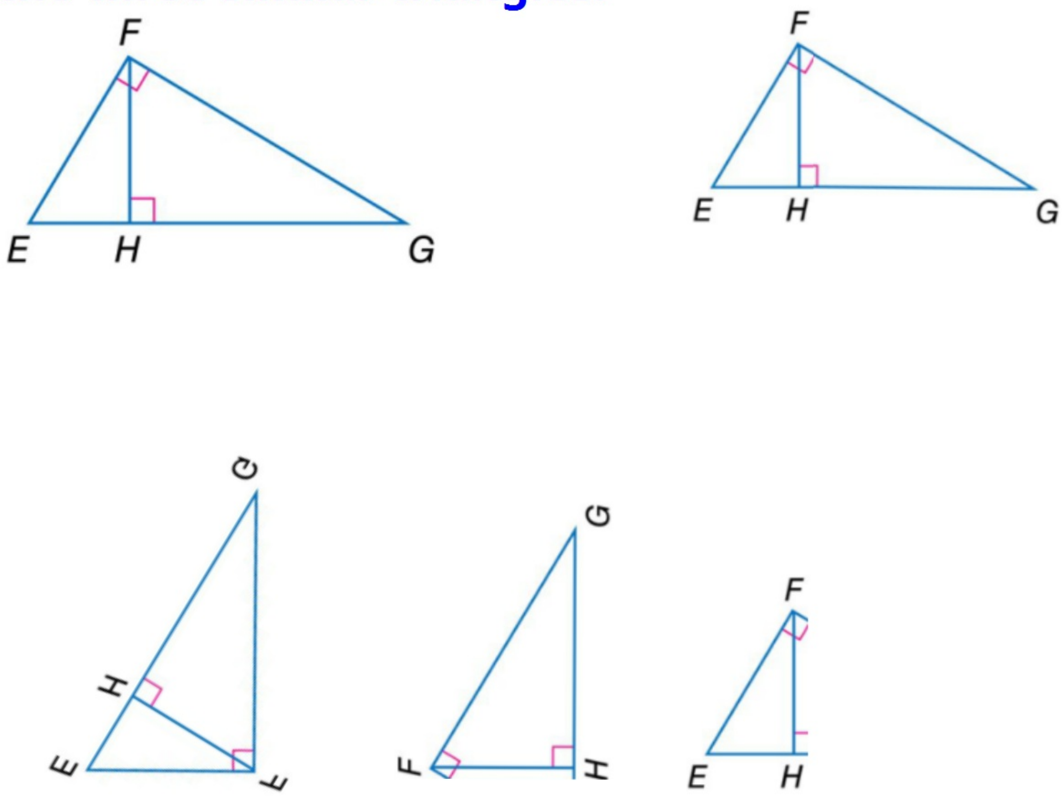
$z^2 = 24$

$z = \sqrt{24}$

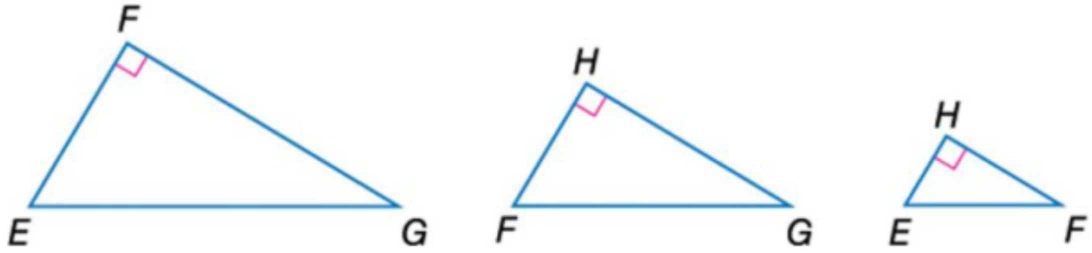
$z = \sqrt{4} \cdot \sqrt{6}$

$z = 2\sqrt{6}$

***Draw out the three similar triangles.**



***Write a triangle similarity statements.**



$\Delta EGF \sim \Delta FGH \sim \Delta EFH.$