

12.4 Similarity in Right Triangles

How does the altitude to the hypotenuse of a right triangle help you use similar right triangles to solve problems?

Geometric Mean

The geometric mean of two positive numbers is the positive square root of their product.

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

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

$$x = \sqrt{ab}$$

Reminder: to reduce radical, find largest perfect square factor

Example 1 Find the geometric mean x of the numbers.

(A) 4 and 25

$$\frac{4}{x} \rightarrow \frac{x}{25}$$

$$\sqrt{x^2} = \sqrt{100}$$

$$x = 10$$

(B) 9 and 20

$$\frac{9}{x} \rightarrow \frac{x}{20}$$

$$\sqrt{x^2} = \sqrt{180} = \sqrt{36 \cdot 5}$$
~~$$\sqrt{x^2} = \sqrt{180}$$~~
~~$$x = 45$$~~
~~$$x = 20$$~~

$$36 \cdot 5$$

$$x = 6\sqrt{5}$$

Your Turn

Find the geometric mean of the numbers. If necessary, give the answer in simplest radical form.

6. 6 and 24

$$\frac{6}{x} \rightarrow \frac{x}{24}$$

$$\sqrt{x^2} = \sqrt{144}$$

$$x = 12$$

7. 5 and 12

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

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

$$4 \cdot 15$$

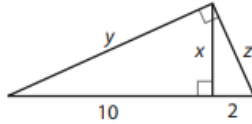
$$x = \sqrt{4} \cdot \sqrt{15}$$

$$x = 2\sqrt{15}$$

You can use the Geometric Means Theorems to find unknown segment lengths in a right triangle!

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Example 3 Find the indicated value.



Find x and y

$$\frac{10}{x} = \frac{x}{2}$$

$$\sqrt{x^2} = \sqrt{20}$$

$$4.5$$

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

$$\frac{10}{y} = \frac{y}{12}$$

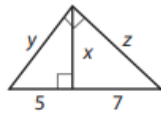
$$\sqrt{y^2} = \sqrt{120}$$

$$4.30$$

$$y = 2\sqrt{30}$$

Your Turn

10. Find x .



$$\frac{5}{x} = \frac{x}{7}$$

$$\sqrt{x^2} = \sqrt{35}$$

$$x = \sqrt{35}$$

$$\frac{\text{leg } 5}{\text{hyp. } y} = \frac{y}{12 \text{ hyp.}}$$

$$y^2 = 60$$

$$y = 2\sqrt{15}$$

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