Geometry 8.1

Find the geometric mean between two numbers

Solve problems involving relationships between parts of a right triangle

ratio

proportion

~~mean~~

geometric mean

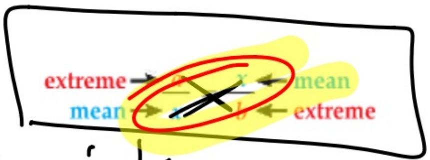
altitude

right triangle

hypotenuse

leg

$\frac{B}{G}\ \frac{7}{5}$ $\qquad \frac{B}{T}\ \frac{7}{12}$ $\qquad \frac{G}{T}\ \frac{5}{12}$



$\frac{7}{5} = \frac{350}{x}$

$7x = 1750$

250 girls

activity: mama bear, papa bear, baby bear

KeyConcept Geometric Mean

Words	The geometric mean of two positive numbers a and b is the number x such that $\boxed{\frac{a}{x} = \frac{x}{b}}$. So, $x^2 = ab$ and $x = \sqrt{ab}$.
Example	The geometric mean of $a = 9$ and $b = 4$ is 6, because $6 = \sqrt{9 \cdot 4}$.

Example 1 Geometric Mean

Find the geometric mean between 8 and 10.

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

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

Find the geometric mean between each pair of numbers.

1A. 5 and 45

1B. 12 and 15

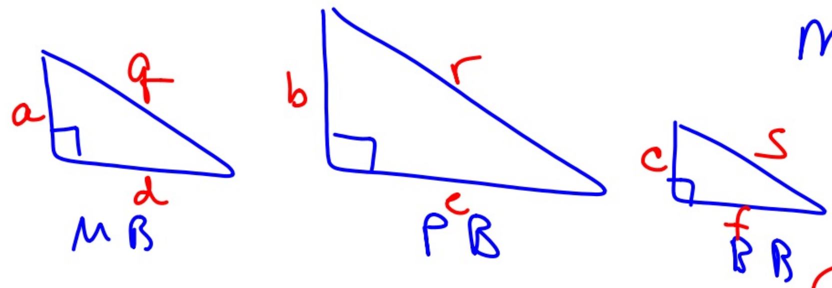
Activity: $\boxed{\text{Mama bear, papa bear, baby bear}}$

3 ~ Δ's

PB ~ MB

MB ~ BB

BB ~ PB



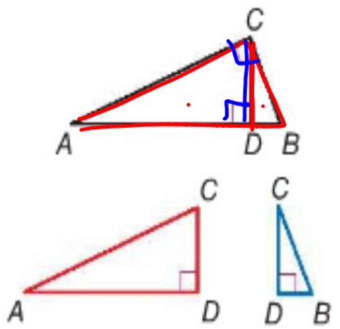
$\boxed{\text{proportional SF}}$

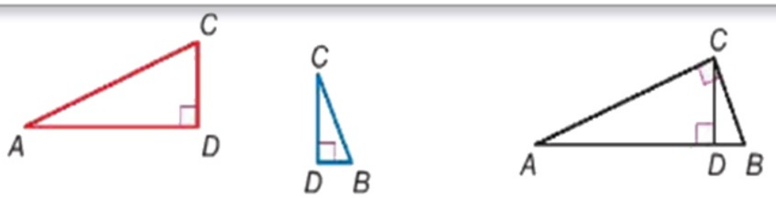
Are the 3 triangles similar?

Theorem 8.1

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.

Example If $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$ of right $\triangle ABC$, then $\triangle \boldsymbol{ACD} \sim \triangle \boldsymbol{ABC}$, $\triangle \boldsymbol{CBD} \sim \triangle \boldsymbol{ABC}$, and $\triangle \boldsymbol{ACD} \sim \triangle \boldsymbol{CBD}$.

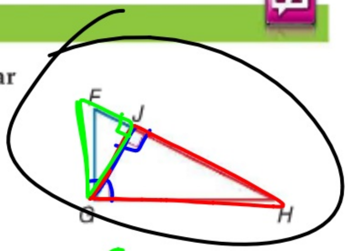


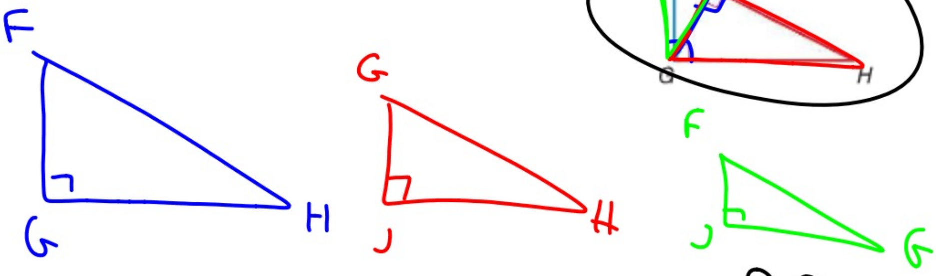


mama bear, papa bear, baby bear

Example 2 Identify Similar Right Triangles

Write a similarity statement identifying the three similar right triangles in the figure.





PB MB BB

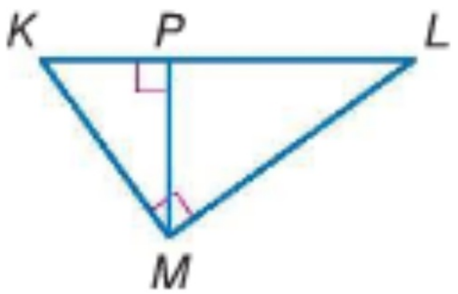
$\triangle GFH \sim \triangle JGH \sim \triangle JFG$

Altitude to the hypotenuse...

(MB PB BB)

Guided Practice

2A.



2B.

Alt is geometric mean bec MB PB BB...

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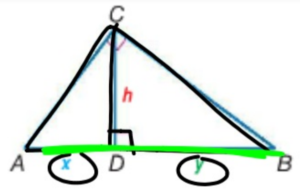
Theorems Right Triangle Geometric Mean Theorems

8.2 Geometric Mean (Altitude) Theorem The altitude drawn to the hypotenuse of a right triangle separates the hypotenuse into two segments. The length of this altitude is the geometric mean between the lengths of these two segments.



Example If $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$ of right $\triangle ABC$, then $\boxed{\frac{x}{h} = \frac{h}{y}}$ or $h = \sqrt{xy}$.

$$\frac{x}{h} = \frac{h}{y}$$

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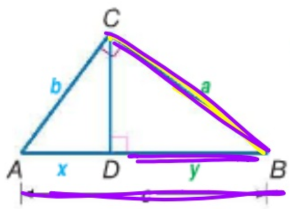
leg is geometric mean bec MB PB BB

8.3 Geometric Mean (Leg) Theorem The altitude drawn to the hypotenuse of a right triangle separates the hypotenuse into two segments. The length of a leg of this triangle is the geometric mean between the length of the hypotenuse and the segment of the hypotenuse adjacent to that leg.



$$\frac{y}{a} = \frac{a}{c}$$

Example If $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$ of right $\triangle ABC$, then $\frac{c}{b} = \frac{b}{x}$ or $b = \sqrt{xc}$ and $\frac{c}{a} = \frac{a}{y}$ or $a = \sqrt{yc}$.

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

$$\frac{}{?} = \frac{?}{}$$

Example 3 Use Geometric Mean with Right Triangles

Find x, y, and z.

Try these:
1. pythag theorem
2. alt is geometric mean
3. leg is geometric mean
4. pythag theorem (again)

$20^2+10^2=z^2$

$400+100=z^2$

$500=z^2$

25

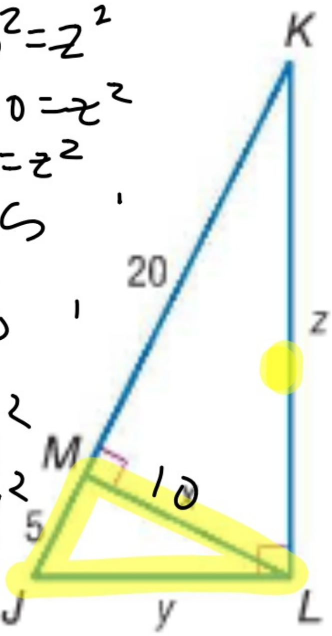
$z=\sqrt{500}$

$5^2+10^2=y^2$

$25+100=y^2$

$125=y^2$

$y=11.2$



$$\frac{20}{x}=\frac{x}{5}$$

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

$$x=10$$

$x = 10$

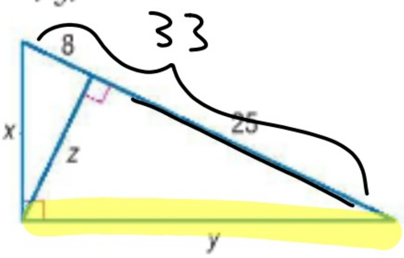
$y \approx 11.2$

$z \approx 22.4$

Guided Practice

Find *x*, *y*, and *z*.

3A.



$$\frac{\quad}{x} = \frac{x}{\quad}$$

$$\frac{8}{x} = \frac{x}{33}$$

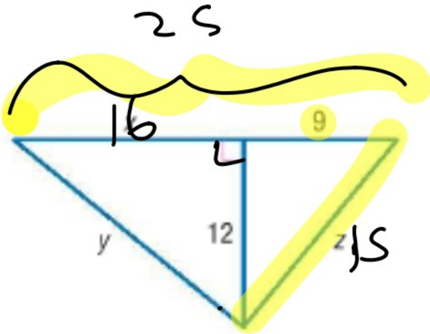
$$x^2 = 264$$

$$\frac{25}{y} = \frac{y}{33}$$

$$y^2 = 825$$

$$\boxed{\begin{array}{l} x \approx 16.2 \\ y \approx 28.7 \\ z \approx 14.1 \end{array}}$$

3B.



$\frac{9}{15}=\frac{15}{x+9}$

$9(x+9)=225$

$9x+81=225$

$9x=144$

$x=16$

$y=$

$z=15$

$9^2+12^2=z^2$

$81+144=z^2$

$225=z^2$

$15=z$

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9-37 odd