Objectives:

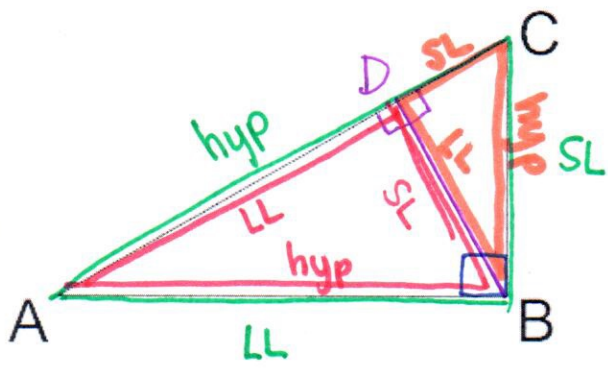
- I know that the altitude divides a right triangle into 2 similar triangles that are also similar to the original triangle and can use the similarity of triangles to find unknown lengths.

Vocabulary:

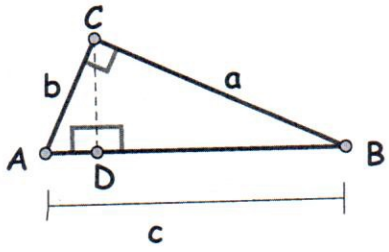
Hypotenuse - the longest side of a right △. Always across from the right angle. $\overline{AC}$

Legs - the other two sides of a right △. $\overline{AB}$, $\overline{BC}$

Altitude - line from right angle to hypotenuse, creating 2 new right angles. $\overline{BD}$



Can you write a similarity statement that relates these three triangles?



△ABC ~ △ACD

△ABC ~ △BCD

△ACD ~ △BCD

△ABC ~ △ACD ~ △BCD

We can use this to prove the Pythagorean theorem.

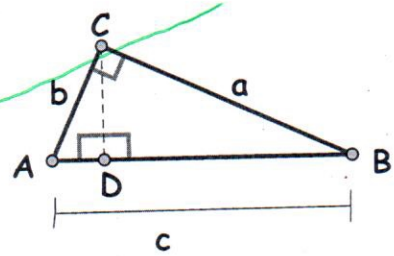
Recall that corresponding sides of similar triangles are proportional.

a. What is $\frac{c}{b}$ equal to? (hint: use △ACD)

b. What is $\frac{c}{a}$ equal to? (hint: use △CBD)

c. Simplify the two above equations by using cross multiplication.

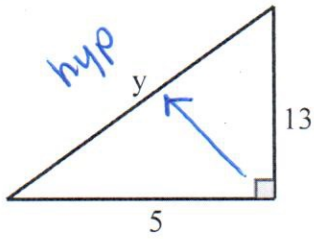
d. Use the above information to **prove the Pythagorean theorem**



$a^2+b^2=c^2$ OR $SL^2+LL^2=hyp^2$

Use the Pythagorean Theorem to find the unknown side length.

1.



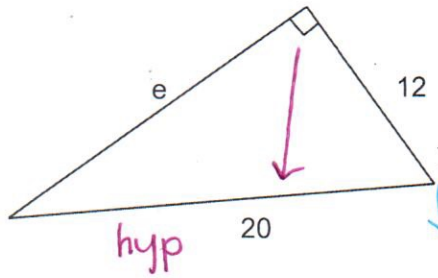
$5^2+13^2=y^2$

$25+169=y^2$

$\sqrt{194}=\sqrt{y^2}$

$y=13.93$

2.



$e^2+12^2=20^2$

$e^2+144=400$

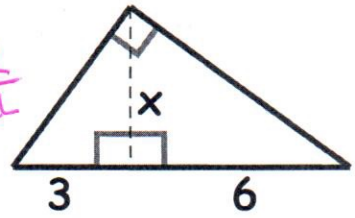
$-144 \quad -144$

$\sqrt{e^2}=\sqrt{256}$

$e=16$

Example Set: Find the variables for each set of triangles.

1.



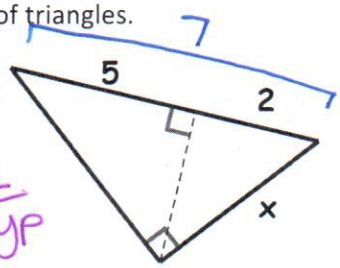
$\frac{SL}{LL}=\frac{SL}{LL}$

$\frac{3}{x}=\frac{x}{6}$

$\sqrt{x^2}=\sqrt{18}$

$x=4.24$

2.



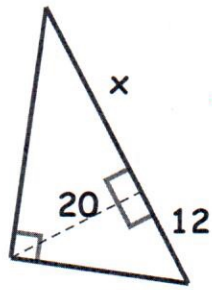
$\frac{SL}{Hyp}$

$\frac{2}{x}=\frac{x}{7}$

$\sqrt{x^2}=\sqrt{14}$

$x=3.74$

3.



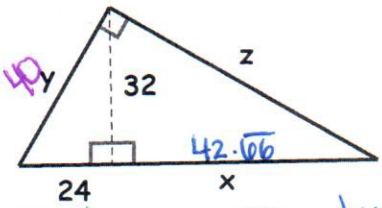
$\frac{SL}{LL}$

$\frac{12}{20}=\frac{20}{x}$

$\frac{12x}{12}=\frac{400}{12}$

$x=33.\overline{33}$

4.



$24^2+32^2=y^2$

$576+1024=y^2$

$\sqrt{1600}=\sqrt{y^2}$

$y=40$

$\frac{24}{32}=\frac{32}{x}$

$\frac{24x}{24}=\frac{1024}{24}$

$x=42.\overline{66}$

$40^2+z^2=(66.66)^2$

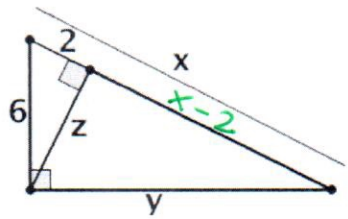
$1600+z^2=4443.56$

$-1600 \quad -1600$

$\sqrt{z^2}=\sqrt{2843.56}$

$z=53.33$

5.



$2^2+z^2=6^2$

$4+z^2=36$

$-4 \quad -4$

$\sqrt{z^2}=\sqrt{32}$

$z=5.66$

$\frac{2}{z}=\frac{z}{x-2}$

$2x-4=z^2$

$2x-4=32$

$+4 \quad +4$

$\frac{2x}{2}=\frac{36}{2}$

$x=18$

$6^2+y^2=18^2$

$36+y^2=324$

$-36 \quad -36$

$y^2=288$

$y=16.97$