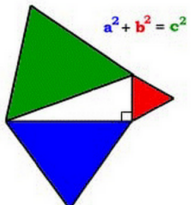
SECONDARY MATH II // MODULE 6
SIMILARITY & RIGHT TRIANGLE TRIGONOMETRY – 6.7

6. 7 Pythagoras by Proportions

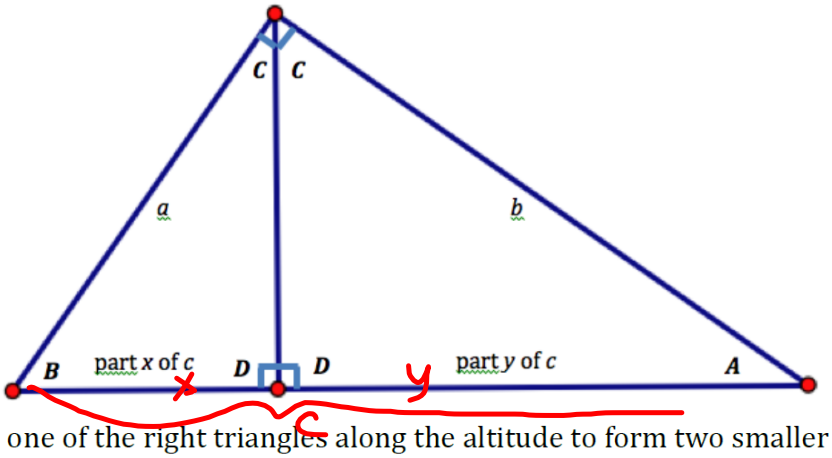
A Practice Understanding Task



Step 1: Cut a 4×6 index card along one of its diagonals to form two congruent right triangles.

Step 2: In each right triangle, draw an altitude from the right angle vertex to the hypotenuse.

Step 3: Label each triangle as shown in the following diagram. Flip each triangle over and label the matching sides and angles with the same names on the back as on the front.



Step 4: Cut one of the right triangles along the altitude to form two smaller right triangles.

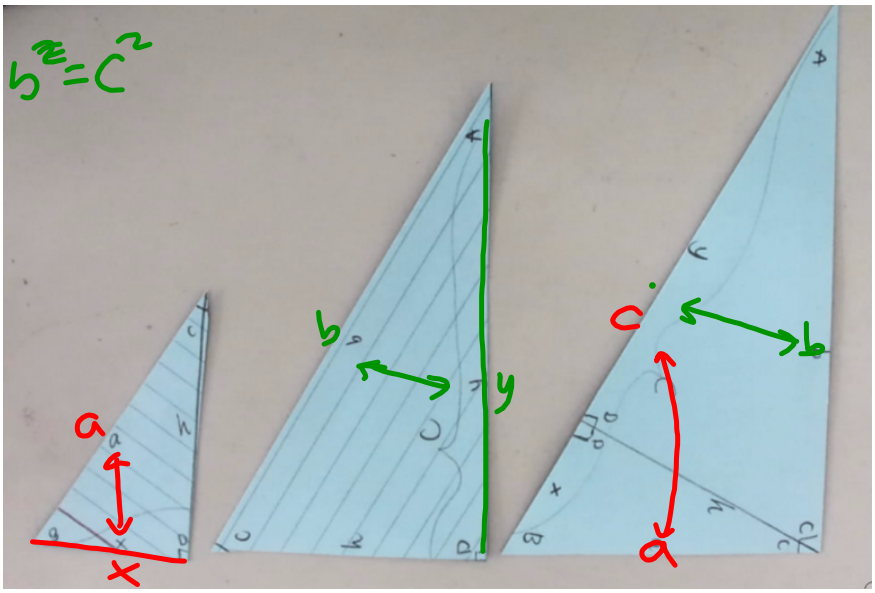
Step 5: Arrange the three triangles in a way that convinces you that all three right triangles are similar. You may need to reflect and/or rotate one or more triangles to form this arrangement.

Step 6: Write proportionality statements to represent relationships between the labeled sides of the triangles.

Step 7: Solve one of your proportions for x and the other proportion for y. (If you have not written proportions that involve x and y, study your set of triangles until you can do so.)

Step 8: Work with the equations you wrote in step 7 until you can show algebraically that $a^2 + b^2 = c^2$. (Remember, $x + y = c$.)

$a^2+b^2=c^2$



Step 6 ✱ $\frac{cx}{a}=\frac{a(a)}{c}$ $\frac{cy}{b}=\frac{b(b)}{c}$

Step 7 $a^2=cx$ $b^2=cy$

Step 8 $x+y=c$

$a^2+b^2=c^2$

$cx+cy=c^2$

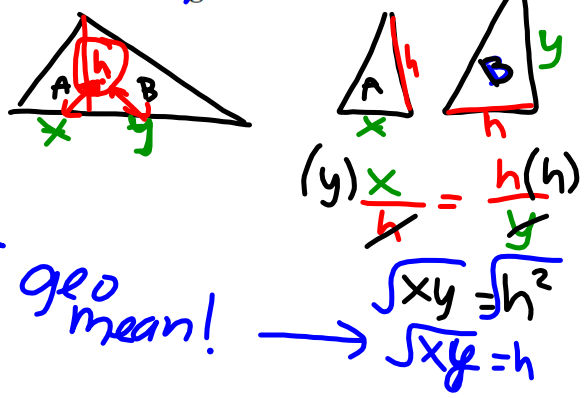
$c(x+y)=c^2$

$c(c)$

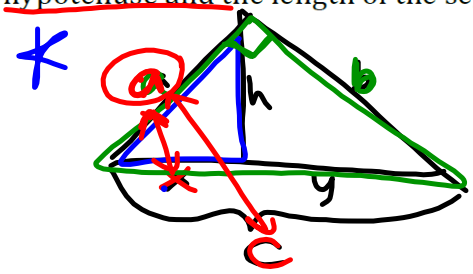
$c^2=c^2$ ✓

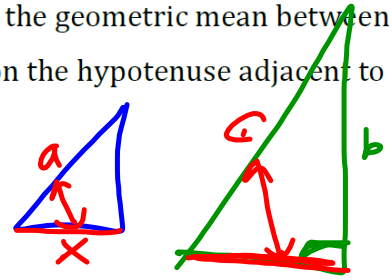
Use your set of triangles to help you prove the following two theorems algebraically. For this work, you will want to label the length of the altitude of the original right triangle *h*. The appropriate legs of the smaller right triangles should also be labeled *h*.

Right Triangle Altitude Theorem 1: If an altitude is drawn to the hypotenuse of a right triangle, the length of the altitude is the geometric mean between the lengths of the two segments formed on the hypotenuse.



Right Triangle Altitude Theorem 2: If an altitude is drawn to the hypotenuse of a right triangle, the length of each leg of the right triangle is the geometric mean between the length of the hypotenuse and the length of the segment on the hypotenuse adjacent to the leg.





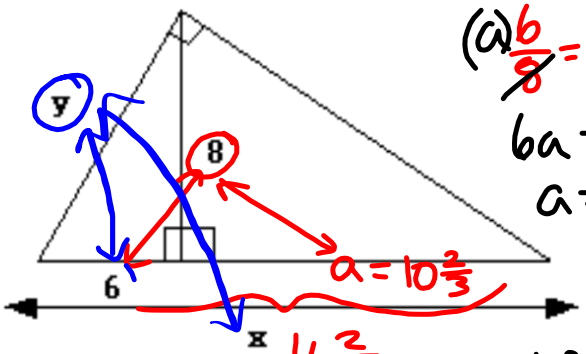
$\frac{a}{x} = \frac{c}{a}$

$a^2 = cx$

geo mean $\rightarrow a = \sqrt{cx}$

AS Notes

Use your set of triangles to help you find the values of x and y in the following diagram.



(a) $\frac{6}{8} = \frac{8}{a}$

$6a = 64$

$a = 10.\overline{6} \sim 10\frac{2}{3}$

T1 geo mean

$\sqrt{6 \cdot 10\frac{2}{3}} = 8$?

$\sqrt{64} = 8$ ✓

$16\frac{2}{3}(6) = y(y)$

$\frac{y}{y} = \frac{16\frac{2}{3}}{16\frac{2}{3}}$

$100 = y^2$

$10 = y$

T2 geo mean

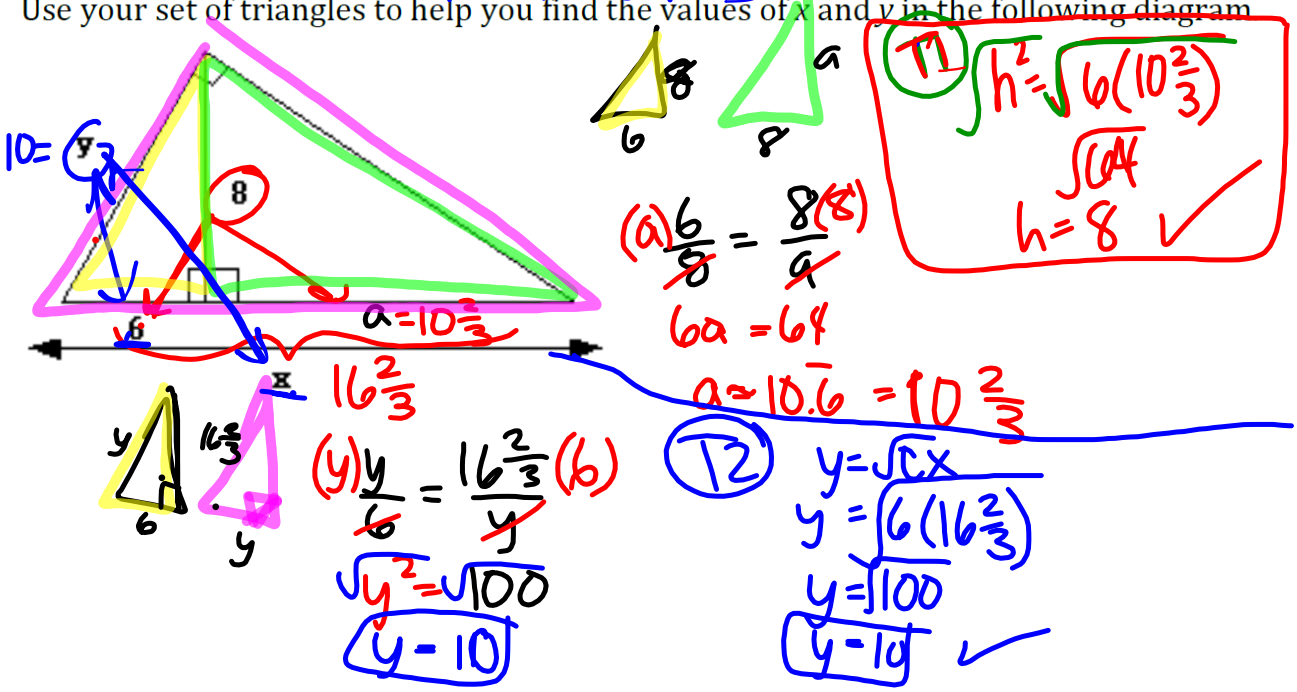
$y = \sqrt{6 \cdot 16\frac{2}{3}}$

$y = \sqrt{100}$

$y = 10$

A7 Notes

Use your set of triangles to help you find the values of x and y in the following diagram.



T1 $h^2 = \sqrt{6(10\frac{2}{3})}$

$\sqrt{64}$

$h = 8$ ✓

$(a)\frac{6}{8} = \frac{8}{a}$

$6a = 64$

$a = 10.\overline{6} = 10\frac{2}{3}$

$(y)\frac{y}{6} = \frac{16\frac{2}{3}}{y}(6)$

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

$y = 10$

T2 $y = \sqrt{6x}$

$y = \sqrt{6(16\frac{2}{3})}$

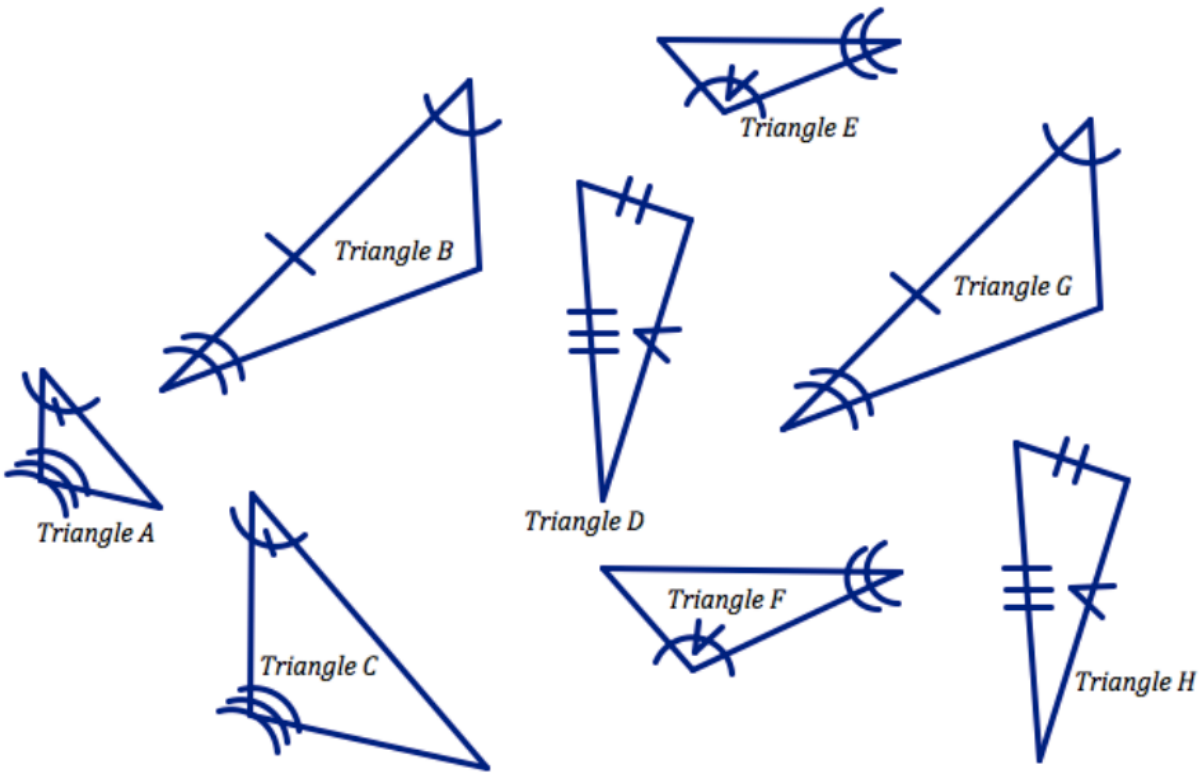
$y = \sqrt{100}$

$y = 10$ ✓

READY

Topic: Determining similarity and congruence in triangles

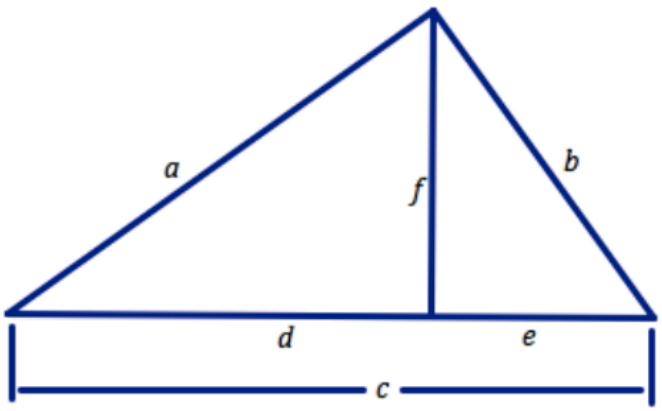
1. Determine which of the triangles below are similar and which are congruent. Justify your conclusions. Give your reasoning for the triangles you pick to be similar and congruent.



SET

Topic: Similarity in right triangles

Use the given right triangles with altitudes drawn to the hypotenuse to correctly complete the proportions.



2. $\frac{a}{c} = \frac{f}{?}$

3. $\frac{a}{f} = \frac{c}{?}$

4. $\frac{a}{b} = \frac{f}{?}$

5. $\frac{a}{d} = \frac{c}{?}$

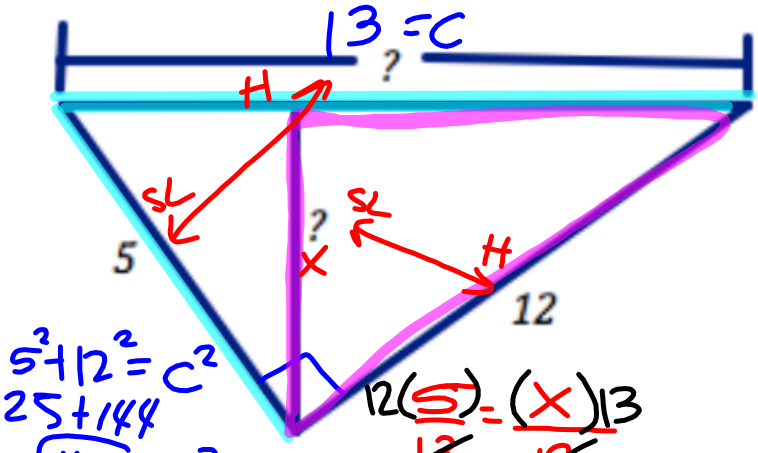
6. $\frac{f}{d} = \frac{e}{?}$

7. $\frac{b}{c} = \frac{e}{?}$

Find the missing value for each right triangle with altitude.

Find the missing value for each right triangle with altitude.

8.



$5^2+12^2=c^2$

$25+144$

$\sqrt{169}=c^2$

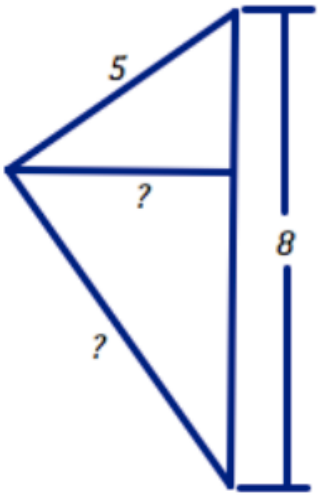
$13=c$

$12\left(\frac{5}{13}\right)=\left(\frac{x}{12}\right)13$

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

$x=4.6$

9.

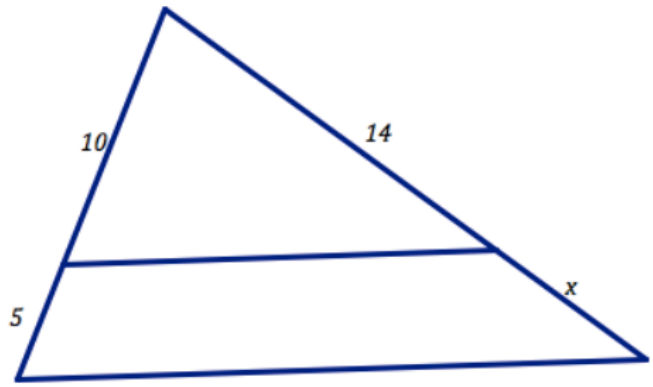


GO

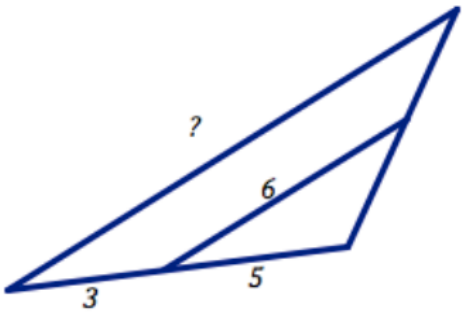
Topic: Use similarity and parallel lines to solve problems.

In each problem determine the desired values using the similar triangles parallel lines and proportional relationships. Write a proportion and solve.

10.



11.



Analyze each table below closely and determine the missing values based on the given information and values in the table. Start 6.7 Go

12. An Arithmetic Sequence

Term	1	2	3	4
Value	7	12	17	22

+5 +5 +5 15/3 = 5

13. A Geometric Sequence

Term	1	2	3	4
Value	7	14	28	56

Geo-mean ×2 ×2 $\sqrt[3]{8} = 2$

14. An Arithmetic Sequence

Term	5	6	7	8
Value	10			43

15. A Geometric Sequence

Term	7	8	9	10
Value	3			24