Student Activity

Pythagorean Theorem Investigation: It’s As Easy As… a, b, c

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Near the center of the grid below form a *right angle* by drawing one 3-unit length and one 4-unit length. After drawing the two lengths, create a *right triangle* by connecting the ends of the two lengths with a third side, called side “c”. This side is called the ***hypotenuse***. Label the 3-unit length as side “a” and the 4-unit length as side “b”. These are called the ***legs***.
2. With your partner and **WITHOUT** measuring, make a conjecture as to which is longer: a + b or c or if they would be the same size and explain your reasoning.

Conjecture (circle one): a + b is longer c is longer a + b and c are the same length

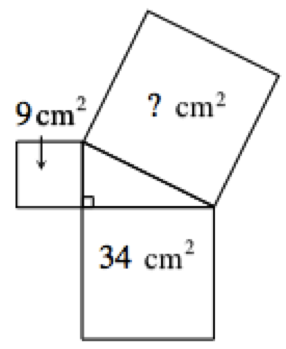
Rationale:

1. Choose one color. Using side “a” form a square on the diagram you have already created below. Choose another color and using side “b” form a second square on the same diagram.
2. Cut out only the colored squares you just created. Using only these squares (you may need to cut them up into smaller squares), create one bigger square. What do you notice about this largest square and the other two original squares? How does the side of the hypotenuse relate to the side of the new triangle you created?

**Pythagorean Theorem**: states that in a right triangle, the length of one leg squared plus the length of the other leg squared is equal to the length of the hypotenuse squared.  It can be written as an equation like this:

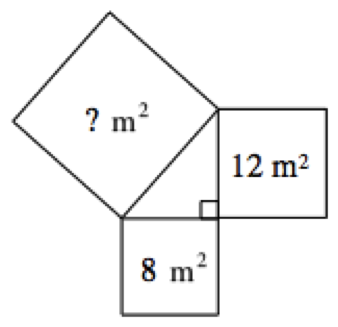
(leg a)2 + (leg b)2 = (hypotenuse)2

1. Use the Pythagorean Theorem to find the missing value for each diagram below.



5 ft

? ft



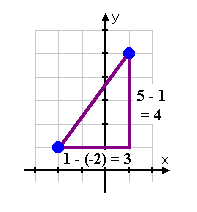
36 cm2

64 cm2

?? cm2

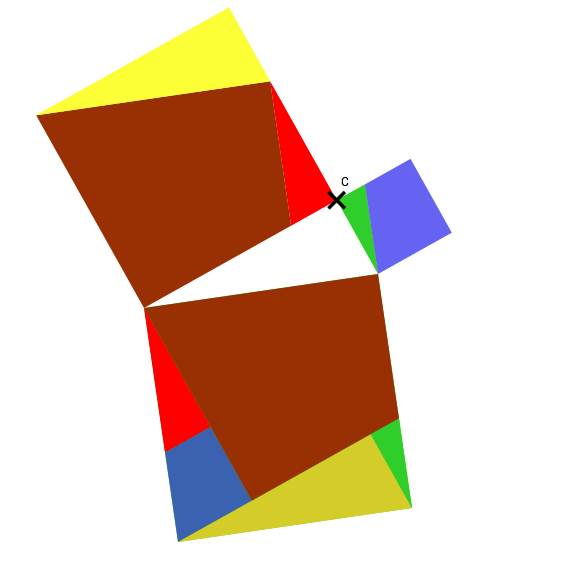
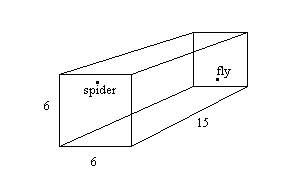
13 ft

1. Using the diagram provided, demonstrate why the Pythagorean Theorem ( ) and the distance formula ( are equivalent.



**(1,5)**

**(-2,1)**

1. Find the distance between the points located on the coordinate plane at (6, 8) and (-10, -2). Show on a figure how the Pythagorean Theorem was used.
2. Go to <http://www.cut-the-knot.org/pythagoras/> and demonstrate proof 3, 4, 5, or 10 by using cutout triangles you create. Include the algebraic support alongside the manipulatives and convince a classmate that the Pythagorean theorem is true.
3. The following figure is from [TedCoe.com](http://tedcoe.com/math/geometry/wordless-pythagorean). Explain why the “Wordless Pythagorean” should be convincing evidence that the Pythagorean Theorem is true.
4. Watch the clip from the Wizard of Oz at <https://www.youtube.com/watch?v=jbvip1Ot6jQ> showing the Scarecrow getting his brain from the Wizard. Explain what the error is in his quoting the Pythagorean Theorem and what he SHOULD have said instead. Use a diagram (or diagrams) to compare and contrast the incorrect quote and the actual theorem.
5. Challenge/Extension problem: After viewing (and reviewing): [a video of the Pythagorean Theorem in 3D](https://learnzillion.com/lessons/1303-apply-the-pythagorean-theorem-to-three-dimensional-figures-using-right-triangles), solve the following problem. Note the video is a hint for what may need to be done to solve the problem.

A spider and a fly are in the same room. The fly is fast asleep and the spider is hungry. What is the shortest route the spider can take to get the fly? One stipulation is that the spider must crawl along the walls, ceiling, and/or floor and may not slingshot herself across the room. The room is 15 meters long, 6 meters wide, and 6 meters high as shown. The spider is 0.5 meters from the ceiling and 3 meters from each wall. The fly is 0.5 meters from the floor and 3 meters from each wall. Another hint: The answer is NOT 21 meters.