Pythagorean Theorem **Name: _____**

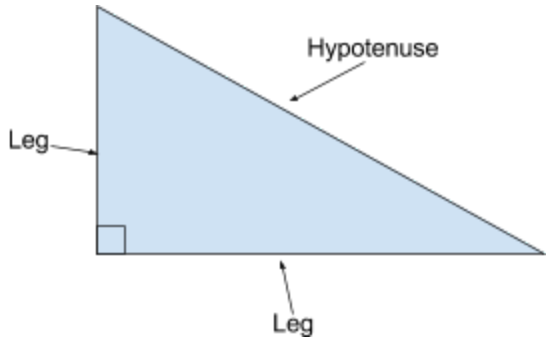
Lesson A - Solving for the hypotenuse.

Key Terms:

Right Triangle: Triangle with a ninety (90) degree angle.

Hypotenuse: Side directly across from the 90^o angle. The longest side of a right triangle.

Legs: The two sides whose vertex make up the 90^o angle in a right triangle. The two sides that are NOT the hypotenuse.



Exploration #1

You will need the following materials for this exploration:

- Scissors
- Grid Paper (provided)
- Card Stock

1. Cut out the triangle and the grid below.

2. Make each side of the triangle the length of a square. Using the grid paper provided, cut out a square that corresponds to each length.

3. Glue your triangle and grids onto the cardstock provided.

4. Color the squares that correspond to each leg the same color.

5. Color the square that corresponds to the hypotenuse a different color.

Questions:

1. What is the area of the square you extended from leg 1?

2. What is the area of the square you extended from leg 2?

3. What is the area of the square you extended from the hypotenuse?

4. What is the length of the hypotenuse?

5. How do the lengths of the three sides relate?

Questions - Reponses

1. The area extended from leg #1 was
   3 units x 3 units = 9 units^2

2. The area of the square extended from leg #2 was
   4 units x 4 units = 16 units^2

3. The area of the square extended from the hypotenuse was
   25 units^2

4. The length of the hypotenuse was
   5 units

5. The relationship between the three sides is as follows. The sum of the square of the two legs is equal to the square of the hypotenuse.

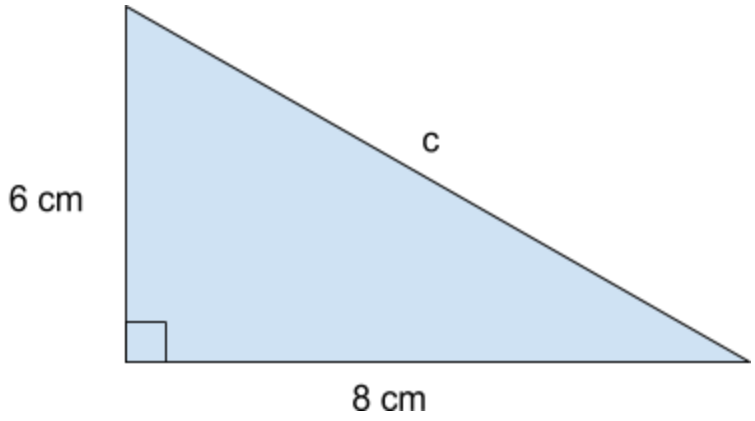
Pythagorean Theorem demonstrates the relationship between the three side lengths of a right-angled triangle.

In the previous activity, it was found that…

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

Where a and b represent the lengths of each leg and c represents the length of the hypotenuse.

Try applying the theorem to solve for the missing side below.



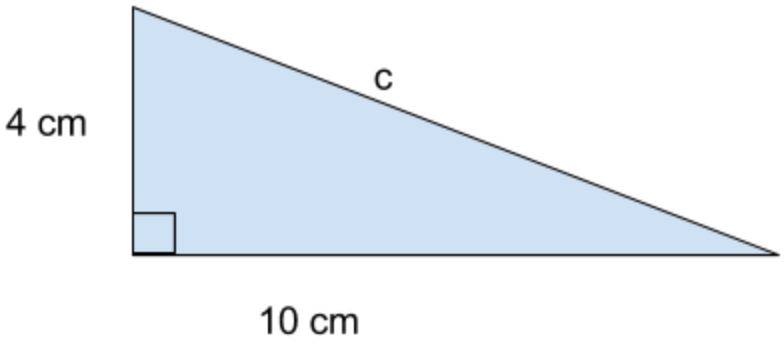
$a^2 + b^2 = c^2$ Start with the theorem.
$6^2 + 8^2 = c^2$ Sub in the lengths of the legs for a and b
$36 + 64 = c^2$ Simplify.
$100 = c^2$ Find the number, that when squared, equals 100 ($\sqrt{100}$)
$10 = c$

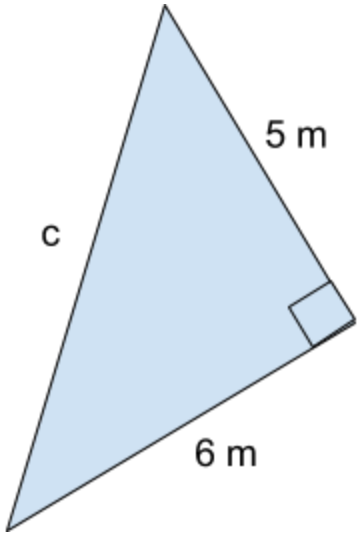
The example above, and the example demonstrated in the initial exploration are both examples of Pythagorean triples. A pythagorean triple occurs when all three sides of a right angled triangle are positive integers.

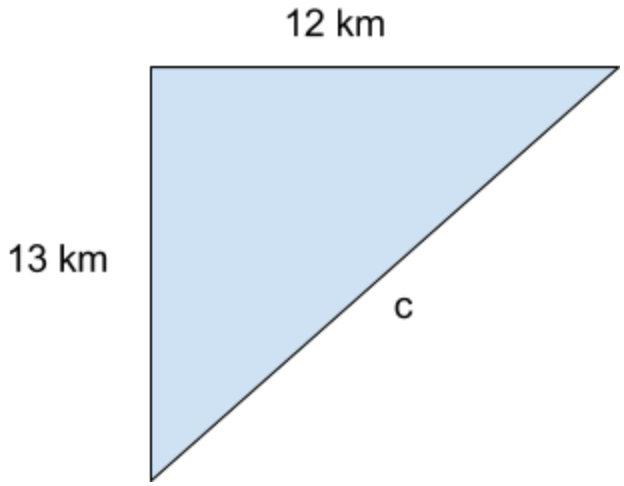
Not all right triangles will be pythagorean triples, meaning you may encounter decimal values for some of your sides.

Questions: Non-Triples

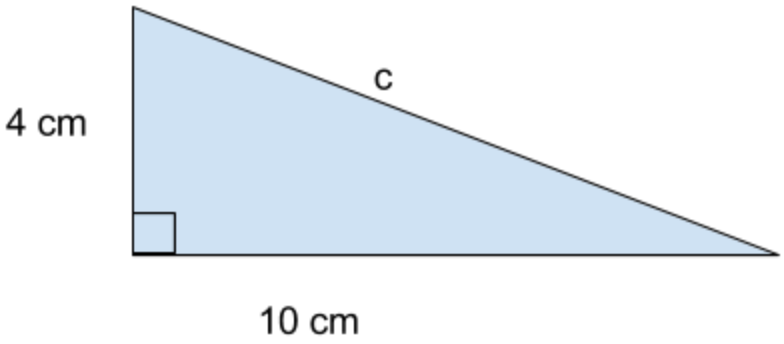
Find the hypotenuse for each of the following triangles.

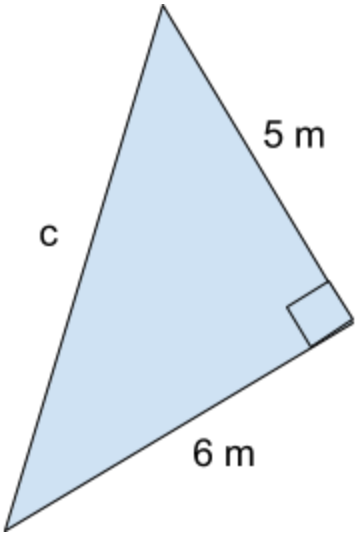


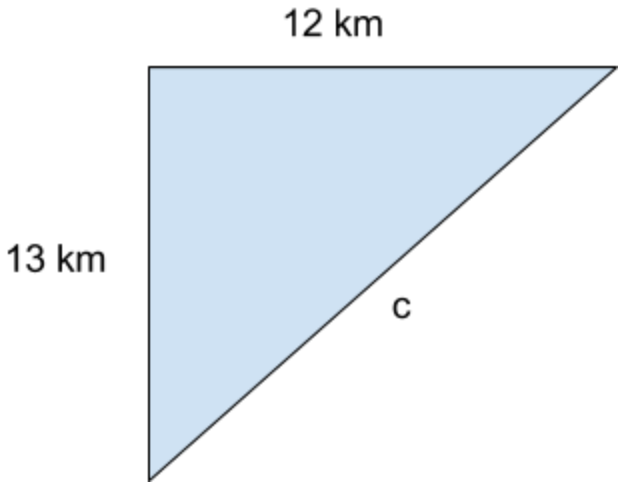




Answers:


c
4 cm
10 cm


5 m
c
6 m


12 km
13 km
c