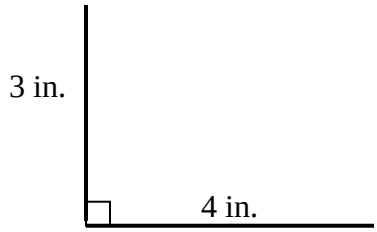
EXPONENTS-RADICALS-PYTHAGOREAN THEOREM

I. **Pythagorean Theorem**

1. Use your ruler and a protractor and draw one leg of a triangle to be 3 inches, form a 90°, and draw the second leg 4 inches. Measure the distance between the two ends. What is it?



2. Use your ruler and protractor and draw one leg of a triangle to be 5 centimeters, form a 90°, and draw a second leg 12 centimeters. Measure the distance between the two ends. What is it?

Let's look at the values:

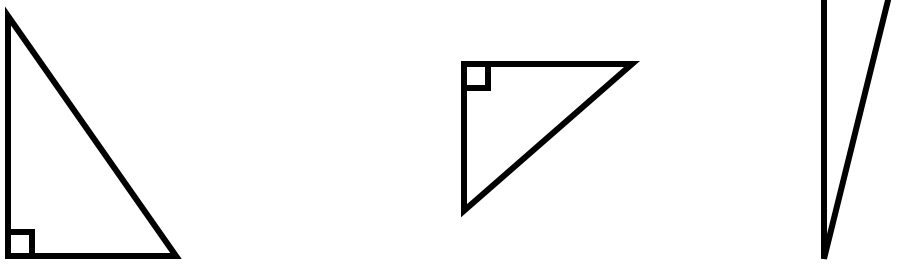
1. 3 – 4 – 5 Thinking about exponents, can you see a connection?
   Hint: Square each of the values.
   Second Hint: Add the square of the two smaller values.
   $3^2 + 4^2 = 5^2$
   $9 + 16 = 25$

2. Does it work with the second set of values? 5 – 12 – 13? Yes!
   $5^2 + 12^2 = 13^2$
   $25 + 144 = 169$

Pythagoras, a Greek Philosopher from 500 B.C., noticed this too! In fact, he recognized it to the point, he developed a rule: The Pythagorean Theorem.

It states: **$a^2 + b^2 = c^2$**, a and b are the two shorter sides of a right triangle, and c is the longest side. This theorem only works with Right Triangles. Also, it works as long as you make sure "c" represents the longest side of the triangle. This side is called the **hypotenuse**; this side is ALWAYS opposite the 90° angle.

Which are the legs and which is the hypotenuse? It doesn't matter which legs you label "a" and "b", as long as you correctly label the "c".



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Sample Problems:

1. Given the following, find the missing length of the right triangle:
   a. Leg = 5 cm Leg = 12 cm Hypotenuse = ?
      $a^2 + b^2 = c^2$
      $5^2 + 12^2 = c^2$
      $25 + 144 = c^2$
      $169 = c^2$
      13 = c (hypotenuse)

   b. Leg = 6 cm Leg = 8 cm Hypotenuse = ?
      $a^2 + b^2 = c^2$
      $6^2 + 8^2 = c^2$
      $36 + 64 = c^2$
      $100 = c^2$
      10 = c (hypotenuse)

   c. Leg = 7 cm Leg = x cm Hypotenuse = 25 cm
      $a^2 + b^2 = c^2$
      $7^2 + x^2 = 25^2$
      $49 + x^2 = 625$
      $x^2 = 576$
      24 = x (hypotenuse)

   d. Do the following measurements form a right triangle? 4 cm, 8 cm, 12 cm.?
      NO. $4^2 + 8^2 \neq 12^2$

   e. Do the following form a right triangle? 0.8 in., 0.6 in.,1.0 in.?
      YES.

PRE-ALGEBRA HOMEWORK:

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