Algebra 1B **Name**____________________

11.4 Pythagorean Theorem

A Little Geometry Vocabulary

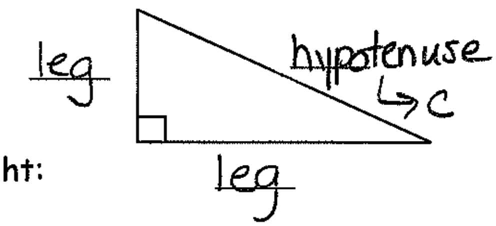
Right Triangle: A triangle containing a right (90°) angle.

Hypotenuse: The longest side of a right triangle, which is opposite the right angle.

Legs: The two sides that form the right ~~tri~~angle.

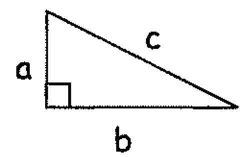
**Label the legs and hypotenuse in the right triangle to the right:

Theorem: a statement that can be proven true.



What does the **PYTHAGOREAN THEOREM** say??

In a right triangle, the sum of the squares of the measures of the legs equals the square of the hypotenuse. In other words, **leg² + leg² = hypotenuse²**, or for the triangle at the right, $a^2 + b^2 = c^2$



What makes a triangle right?

If the sum of the squares of the measures of two sides of a triangle equals the square of the longest side, then the triangle is a right triangle. So for 3 sides lengths of a triangle, a, b, and c, where c is the longest side, if $a^2 + b^2 = c^2$, then the triangle is a right triangle

Examples-For each of the following, find the missing length. Write all exact answers-simplified radicals!

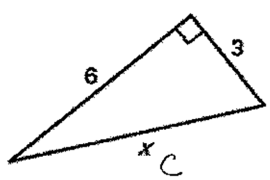
1. $3^2+6^2=x^2$

$9+36=x^2$

$\sqrt{45}=\sqrt{x^2}$

$x=\pm 3\sqrt{5}$

$\boxed{x=3\sqrt{5}}$



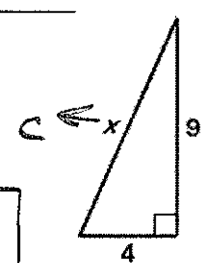
2. $4^2+9^2=x^2$

$16+81=x^2$

$97=x^2$

$\pm\sqrt{97}=x$

$\boxed{x=\sqrt{97}}$



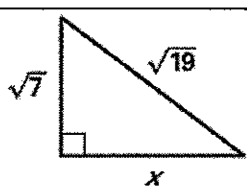
3. $x^2+(\sqrt{7})^2=(\sqrt{19})^2$

$x^2+7=19$

$x^2=12$

$x=\pm\sqrt{12}$

$\boxed{x=2\sqrt{3}}$



4. $x^2+(4\sqrt{10})^2=(8\sqrt{6})^2$

$x^2+(4\sqrt{10})(4\sqrt{10})=(8\sqrt{6})(8\sqrt{6})$

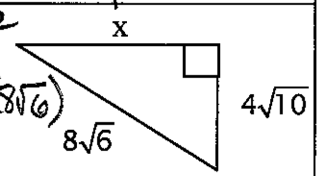
$x^2+16\cdot 10=64\cdot 6$

$x^2+160=384$

$\sqrt{x^2}=\pm\sqrt{224}$

$x=\sqrt{16\cdot 14}$

$\boxed{x=4\sqrt{14}}$



Determine whether a right triangle can be formed by the given side lengths: $\rightarrow c$

5. 6in, 8in, 7in $\rightarrow c$	6. $\sqrt{3}, \sqrt{4}, \sqrt{5} \rightarrow c$	7. $9, 3\sqrt{34}, 15$
$6^2 + 7^2 \quad 8^2$ $36 + 49 \quad 64$ $85 \neq 64$ Not a right Δ	$(\sqrt{3})^2 + (\sqrt{4})^2 \stackrel{?}{=} (\sqrt{5})^2$ $3 + 4 \stackrel{?}{=} 5$ $7 \neq 5$ Not a right Δ	$9^2 + 15^2 \stackrel{?}{=} (3\sqrt{34})^2$ $81 + 225 \stackrel{?}{=} (3\sqrt{34})(3\sqrt{34})$ $306 \stackrel{?}{=} 9 \cdot 34$ $306 = 306$ ✓ Right Δ

Homework

The table below shows the sides lengths of 4 different triangles. Find in the missing lengths as simplified radicals and show all work to the right:

	Leg	Leg	Hypotenuse
1.	8	15	17
2.	6	$\sqrt{13}$	7
3.	$\sqrt{5}$	$\sqrt{15}$	$2\sqrt{5}$
4.	2	$2\sqrt{3}$	4

Work:

$8^2 + 15^2 = c^2$
$64 + 225 = c^2$
$289 = c^2$
$17 = c$

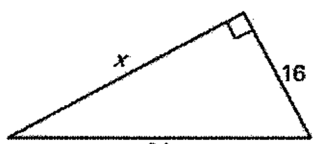
$6^2 + b^2 = 7^2$
$36 + b^2 = 49$
$b^2 = 13$
$b = \sqrt{13}$

$(\sqrt{5})^2 + (\sqrt{15})^2 = c^2$
$5 + 15 = c^2$
$\sqrt{20} = \sqrt{c^2}$
$2\sqrt{5} = c$

$a^2 + (2\sqrt{3})^2 = 4^2$
$a^2 + (2\sqrt{3})(2\sqrt{3}) = 16$
$a^2 + 4 \cdot 3 = 16$
$a^2 + 12 = 16$
$a^2 = 4$
$a = 2$

In 5-10, identify the unknown side as a *leg or hypotenuse*. Then, find the unknown side length of the right triangle. Write your answer in simplest radical form.

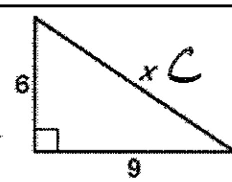
5.



c

$x^2 + 16^2 = 34^2$
$x^2 + 256 = 1156$
$x^2 = 900$
$\boxed{x = 30}$

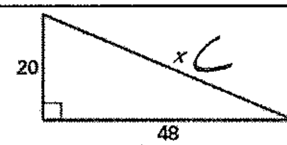
6.



c

$6^2 + 9^2 = x^2$
$36 + 81 = x^2$
$117 = x^2$
$x = \sqrt{117}$
$x = \sqrt{9 \cdot 13}$
$\boxed{x = 3\sqrt{13}}$

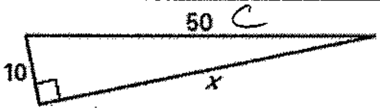
7.



c

$20^2 + 48^2 = x^2$
$400 + 2304 = x^2$
$2704 = x^2$
$\boxed{52 = x}$

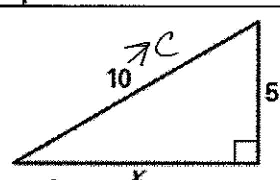
8.



c

$x^2 + 10^2 = 50^2$
$x^2 + 100 = 2500$
$x^2 = 2400$
$x = \sqrt{2400}$
$x = \sqrt{400 \cdot 6}$
$\boxed{x = 20\sqrt{6}}$

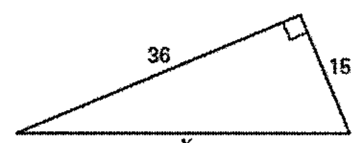
9.



$\rightarrow c$

$x^2 + 5^2 = 10^2$
$x^2 + 25 = 100$
$x^2 = 75$
$x = \sqrt{75}$
$\boxed{x = 5\sqrt{3}}$

10.



$\rightarrow c$

$15^2 + 36^2 = x^2$
$225 + 1296 = x^2$