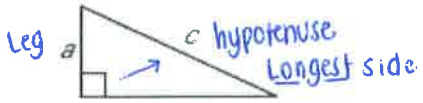
Geometry A
Section 7.1 – Pythagorean Theorem Notes

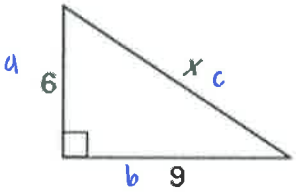
Name : Key
Date : _____ Period : ___

- I can use the Pythagorean Theorem to find side lengths in triangles.

Pythagorean Theorem	In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.	 $c^2 = a^2 + b^2$

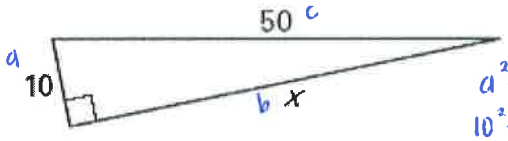
Examples: Identify the unknown side as a *leg* or *hypotenuse*. Then, use the Pythagorean Theorem to find length of missing side of a right triangle. Write your answer in simplest radical form.

1. Solve for x.



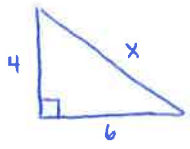
$a^2+b^2=c^2$
$6^2+9^2=c^2$
$36+81=c^2$
$117=c^2$
$c=\sqrt{117}$
$c=\sqrt{9}\sqrt{13}$
$\boxed{c=3\sqrt{13}}$

2. Solve for x.

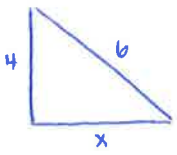


$a^2+b^2=c^2$
$10^2+x^2=50^2$
$100+x^2=2500$
$x^2=2400$
$x=\sqrt{2400}$
$x=\sqrt{100}\sqrt{24}$
$x=10\sqrt{4}\sqrt{6}$
$x=10\cdot 2\sqrt{6}$
$\boxed{x=20\sqrt{6}}$

Example 3: Two sides of a right triangle are 4 and 6. Please find all of the possible lengths for the missing side and state whether the missing side is a leg or a hypotenuse.



$4^2+6^2=x^2$
$16+36=x^2$
$52=x^2$
$x=\sqrt{52}$
$x=\sqrt{4}\sqrt{13}$
$\boxed{x=2\sqrt{13}}$ hypotenuse



$x^2+4^2=6^2$
$x^2+16=36$
$x^2=20$
$x=\sqrt{20}$
$x=\sqrt{4}\sqrt{5}$
$\boxed{x=2\sqrt{5}}$ Leg

Example 4: Use Pythagorean Theorem to solve real-world problems.

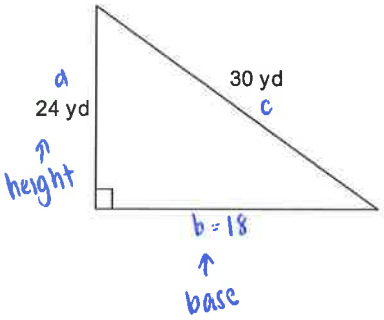
A ladder rests against a house. The foot of the ladder is 8 feet from the house. The top of the ladder rests 15 feet above the ground. What is the length of the ladder?

$a^2+b^2=c^2$
$15^2+8^2=c^2$
$225+64=c^2$
$289=c^2$
$c=\sqrt{289}$
$c=17$

The ladder is 17 ft long

Example 5: Find area and perimeter of a right triangle

A developer is planning a new park in the shape of a right triangle, as represented in the diagram below. Find the perimeter and area of the new park.



* First find missing side of the Δ using Pythag. Theorem

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

$24^2+b^2=30^2$

$576+b^2=900$

$b^2=324$

$b=18$

Perimeter = 24+30+18

$P = 72\text{yds}$

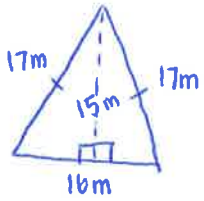
Area = $\frac{1}{2}$(base)(height)

$= \frac{1}{2}(18)(24)$

$A = 216\text{yd}^2$

Example 6: Find the area of an isosceles triangle.

Find the area of the isosceles triangle with side lengths 16 meters, 17 meters, and 17 meters.

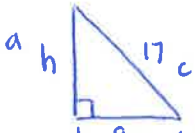


Base = 16m

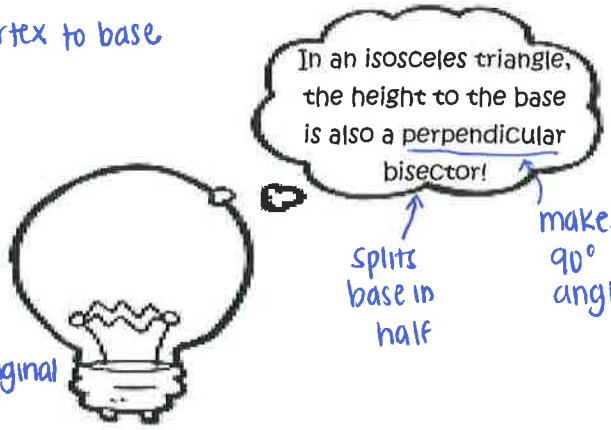
Height = 15m

* First draw height of Δ from top vertex to base as the perpendicular bisector

* Then split Δ in two to find height



← base is now half the original



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

$h^2+8^2=17^2$

$h^2+64=289$

$h^2=225$

$h=\sqrt{225}$

$h=15$

* Find area of entire isosceles Δ: $A = \frac{1}{2}$(base)(height)

$= \frac{1}{2}(16)(15)$

$A = 120\text{m}^2$