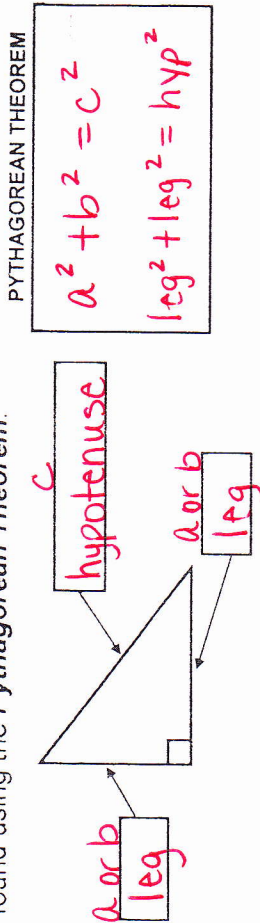


### NOTES 9.1: PYTHAGOREAN THEOREM

When two of three sides of a right triangle are known, the third side can be found using the *Pythagorean Theorem*.



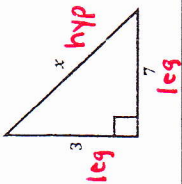
EXAMPLE 1: Find the value of 'x'.

$$3^2 + 7^2 = x^2$$

$$9 + 49 = x^2$$

$$58 = x^2$$

$$\sqrt{58} = x$$



$$2 \overline{) 58}$$

No pairs!

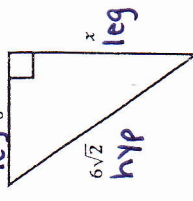
EXAMPLE 2: Find the value of 'x'.

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

$$36 + x^2 = 72$$

$$x^2 = 36$$

$$x = 6$$



Square both!

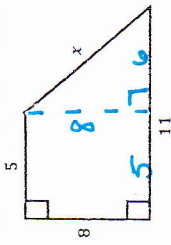
EXAMPLE 3: Find the value of 'x'.

$$8^2 + 6^2 = x^2$$

$$64 + 36 = x^2$$

$$100 = x^2$$

$$10 = x$$



Any group of three positive integers  $a$ ,  $b$ , and  $c$ , such that  $c^2 = a^2 + b^2$  is known as a *Pythagorean Triple*.

EXAMPLE 4: Is 3, 4, 5 a Pythagorean Triple?

Does  $3^2 + 4^2 = 5^2$ ?

$$9 + 16 = 25$$

$$25 = 25$$

Yes!

Name other Pythagorean Triples:

- a) 5, 12, 13      b) 7, 24, 25
- c) 8, 15, 17      d) \_\_\_\_\_

Recall that one way to classify triangles is by *angles*. A triangle can be *acute*, *obtuse*, or *right*.

If a triangle can be formed, you can determine the type of triangle formed by comparing the square of the longest side ( $c$ ) to the sum of the squares of the shorter sides ( $a$  &  $b$ ).

A **RIGHT TRIANGLE** can be formed when:  $a^2 + b^2 = c^2$   
 An **ACUTE TRIANGLE** can be formed when:  $a^2 + b^2 > c^2$   
 An **OBTUSE TRIANGLE** can be formed when:  $a^2 + b^2 < c^2$

EXAMPLE 5: Determine if a triangle can be formed, and if so,

$a$   $c$   $b$  classify it.

(a) 5, 12, 4      YES or NO

Is  $a+b > c$ ?

$$5+4 > 12$$

$$9 > 12$$

Classify: Not a  $\Delta$ .

(b) 6, 7, 8

Is  $a+b > c$ ?

$$6+7 > 8$$

$$13 > 8$$

Classify: Acute

YES or NO

Is  $a+b > c$ ?

$$6^2 + 7^2 > 8^2$$

$$36 + 49 > 64$$

$$85 > 64$$

(c) 1, 3,  $\sqrt{10}$  classify it.

YES or NO

Is  $a+b > c$ ?

$$1+3 > \sqrt{10}$$

$$4 > \sqrt{10}$$

Classify: Right

(d)  $\sqrt{9}$ ,  $\sqrt{16}$ ,  $\sqrt{27}$

YES or NO

Is  $a+b > c$ ?

$$3+4 > \sqrt{27}$$

$$7 > \sqrt{27}$$

Classify: Obtuse

\*Approximate roots to find "c" (the biggest side).  
 Do not use approximations in calculations!