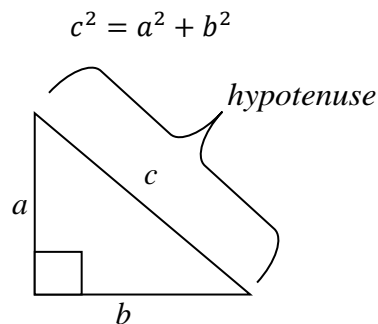# Pythagorean Theorem Guide Notes

PYTHAGOREAN THEOREM

One of the most famous theorems in mathematics provides a way to determine the length of one of the sides of a right triangle given the length of the other two.

The theorem was named after Pythagoras, a Greek mathematician. It was believed that he was the first one to present a proof for the relationship. Other's proofs were presented after his time.

PYTHAGOREAN THEOREM In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the length of the legs.

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

CONVERSE OF THE PYTHAGOREAN THEOREM

If the side of a triangle has lengths a, b, and c such that $c^2 = a^2 + b^2$, then the triangle is a right triangle.

Example:

Is the triangle whose sides with the given lengths a right triangle?

a) 4, 5, 7
b) 5, 12, 13

Solution:

$$4^2 + 5^2 = 7^2$$
$$16 + 25 = 49$$
$$41 \neq 49$$
Not a Right Triangle

$$5^2 + 12^2 = 13^2$$
$$25 + 144 = 169$$
$$169 = 169$$
Right Triangle

Sample Problem 1:

Tell whether the following triangle is a right triangle or not given their sides.

1. 3, 4, 5

2. 6, 8, 12

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Sample Problem 2:

Find the hypotenuse side of the following right triangle.

3. $a = 6, b = 8$

4. $a = 4, b = 5$

Sample Problem 3:

Find the missing sides of the following right triangle given their hypotenuse and one other side.

5. $a = 6, c = 8$

6. $b = 4, c = 5$