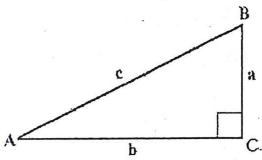


Pythagorean Theorem

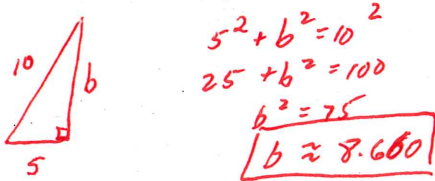
Learning Objectives:

1. Review properties of similar right triangles.
2. Review Pythagorean Theorem.
3. Introduce Pythagorean Triples.

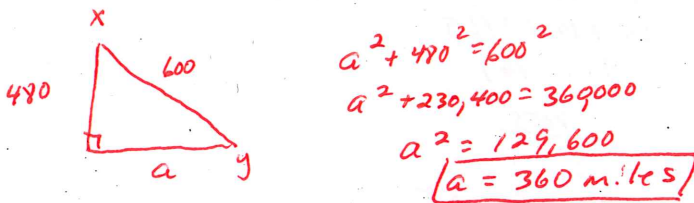
Pythagorean Theorem: $a^2 + b^2 = c^2$



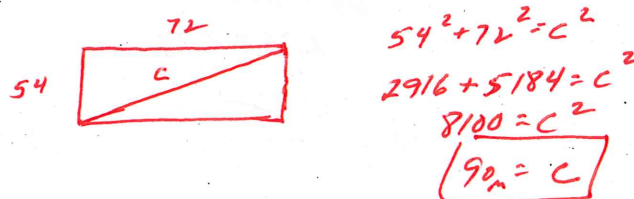
Example 1: A 10-meter ladder is leaning against a building. The bottom of the ladder is 5 meters from the building. How many meters high is the top of the ladder?



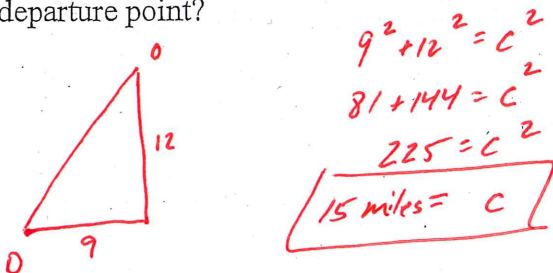
Example 2: Two ships leave port at same time. Ship x is heading due north and ship y is heading east. Twelve hours later they are 600 miles apart. If ship x had traveled 480 miles from the port, how many miles had ship y traveled?



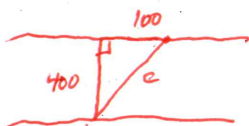
Example 3: If a rectangle measures 54 meters by 72 meters, what is the length, in meters, of the diagonal of the rectangle?



Example 4: A boat departs from Port Isabelle, Texas, traveling to an oilrig. The oilrig is located 9 miles east and 12 miles north of the boat's departure point. About how many miles is the oilrig from the departure point?



Example 5: Scott wants to swim across a river that is 400 meters wide. He begins swimming perpendicular to the shore he started from but ends up 100 meters down river from where he started because of the current. How far did he actually swim?



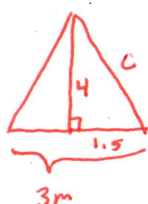
$$100^2 + 400^2 = c^2$$

$$10,000 + 160,000 = c^2$$

$$170,000 = c^2$$

$$\boxed{412.311 \approx c}$$

Example 6: In the Old West, settlers often fashioned tents out of a piece of cloth thrown over tent poles and then secured to the ground with stakes forming an isosceles triangle. How long would the cloth have to be so that the opening of the tent was 4 meters high and 3 meters wide?



$$1.5^2 + 4^2 = c^2$$

$$2.25 + 16 = c^2$$

$$18.25 = c^2$$

$$4.272 = c$$

$$\boxed{2c = 8.544 \text{ m}}$$

Pythagorean Triples

Use the Pythagorean Theorem to show that each set of numbers represents the side-lengths of a right triangle.

{3, 4, 5}

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

$$9 + 16 = 25$$

$$25 = 25$$

YES

{7, 24, 25}

$$7^2 + 24^2 = 25^2$$

$$49 + 576 = 625$$

$$625 = 625$$

YES

{5, 12, 13}

$$5^2 + 12^2 = 13^2$$

$$25 + 144 = 169$$

$$169 = 169$$

YES

{8, 15, 17}

$$8^2 + 15^2 = 17^2$$

$$64 + 225 = 289$$

$$289 = 289$$

YES

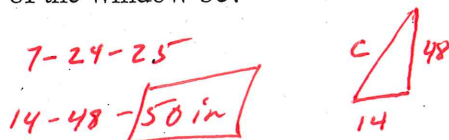
Any time a triangle has these sides lengths, it is a right triangle.

If you are told you have a right triangle with two of the sides lengths of a triple, the missing side is automatically the remaining number in the triple. [as long as the longest side represents the hypotenuse].

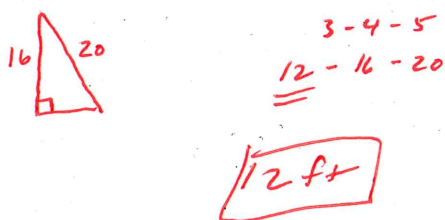
This rule also holds for multiples of the triples. For example, a triangle with sides 6, 8, and 10 is a right triangle.

If a Pythagorean Triple represents a right triangle's side lengths, you do not need to show work for finding the missing side length.

Example 1: Travis is building a house that will have decorative right triangular windows. His clients decide that they want the legs of the windows to be 14 and 48 inches. How long should the other side of the window be?



Example 2: Josie is making a triangular flowerbed in her back yard. She wants it to be a right triangle and decided the longest side would be 20 feet and another side would be 16 feet. How many feet will the other side of her flowerbed be?



Example 3: A ship sails 10 miles east and 24 miles north. How many miles is it from port?

