

Lesson 5: Right Triangles in Construction

SPECIFIC OBJECTIVES

Use Pythagorean Theorem to determine the missing side of a right triangle and to create a 90 degree angle.

By the end of this lesson you will understand that...

- Pythagorean Theorem is a formula that allows you to find the missing side of a right triangle
- A right triangle has one 90 degree angle
- Right triangles are used in construction to create/confirm right angles
- A Pythagorean Triple is a set of whole numbers that make the Pythagorean Theorem true

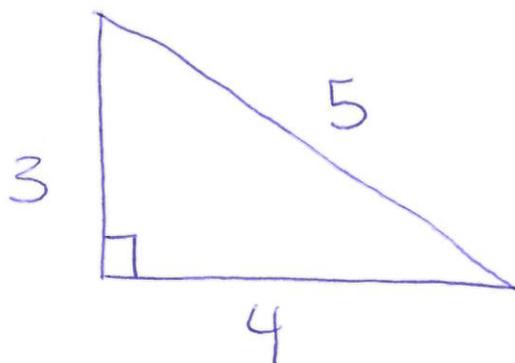
By the end of this lesson you will be able to...

- Use square roots to solve the Pythagorean Theorem for a missing side of a triangle
- Use a Pythagorean Triple to confirm or create an angle that is exactly 90 degrees.
- Use the construction master calculator to solve for the missing side of a right triangle

PROBLEM SITUATION #1 : Exploring Right Angles

In this problem situation, you will be going into the shop in your group and working together to figure out how to connect 3 of the pieces of masonite provided, to create a right (90°) triangle. You may use a framing square when you are done to check that your angle is about 90 degrees.

1. Use 3 of the pieces to create a right angle. Sketch the shape you created and label it with as much information as you know.



- r done* *at least two other groups*
2. Once you see another group done with their work, check out their shape and compare it to yours.

- a. Describe all of the ways that the shapes are similar.

All have 90° angles
3-4-5

- b. Describe all of the ways that the shapes are different.

Different colors
Different sizes

3. Repeat 2a and 2b with another group.

- a. Similarities

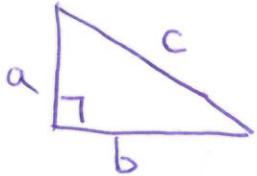
- b. Differences

Now, let your instructor know you are done and wait for your instructor to lead a whole class conversation...

PROBLEM SITUATION #2 : Pythagoras

In this part of the lesson, you will need to wait until your instructor gives you guidelines on next steps. Take notes on what is shared in the space below:

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



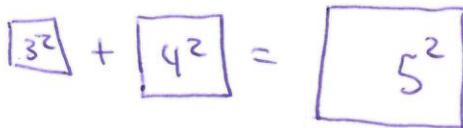
bogged down - Use grid paper that is bigger grid so squares are actually 3x3, etc...

3-4-5 Right Triangle

Pythagorean Triple

36" - 48" - 60"

4. How can you use the 3 squares your instructor made to prove that the areas of the two smaller squares = the area of the larger square ($a^2 + b^2 = c^2$). Write down your strategy below. *Challenge: try to come up with more than one strategy.*



take all individual squares of a^2 & b^2 and they should all fit perfectly into c^2

5. Now take the measurements you wrote down for the triangle you created in problem situation #1 and substitute those 3 numbers into the Pythagorean Theorem. Calculate and determine if they make the equation true. Show your work below.

unit x 3 $21\frac{3}{4}"$

$$\left(21\frac{3}{4}\right)^2 + (24)^2 \stackrel{?}{=} \left(36\frac{1}{4}\right)^2$$

TRUE?

All be true

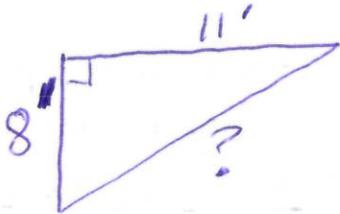
Maybe change to bring the 1 unit piece in (skip measuring) ok this, then go back & confirm?

OR add a problem where these numbers 21, 24, 36

use \sqrt{x} ←

6. What if you want to make a right angle, how can you use the Pythagorean Theorem to help you? Discuss in your group and write down your explanation below.

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

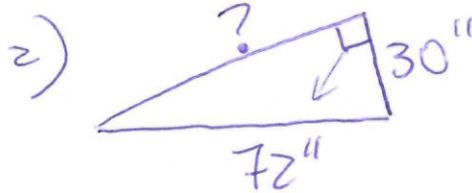


1) $8^2 + 11^2 = c^2$
 $64 \text{ ft}^2 + 121 \text{ ft}^2 = c^2$

$$185 \text{ ft}^2 = c^2$$

$$13' 7 \frac{3}{10}''$$

$$13.6 \text{ feet}$$



$$a^2 + 30^2 = 72^2$$

$$a^2 + 900 = 5184$$

$$a^2 = 5184 - 900$$

$$a^2 = 4284$$

$$a = 65.45 \text{ inches}$$

$$65 \frac{7}{10}''$$

PROBLEM SITUATION #3: Uses for the Pythagorean Theorem in construction

7. With your group, brainstorm as many ways a possible that you think you could use a 3-4-5 right triangle to help you on a construction site. Once all groups have shared their ideas, we will select one of the applications you came up for #8 below.

Squaring anything - walls foundations, floors
rafters
check angles

8. State the *best* way you think you could use a 3-4-5 right triangle for the task.

9. Let's go out to the shop and practice squaring a wall using 2 tape measures. Once you are in the shop, listen to the instructions from your instructor and then write down your values of a and b below:

a = 6'

b = 8'

10. Calculate your hypotenuse (diagonal) using the Pythagorean Theorem ($a^2 + b^2 = c^2$). Show your work below.

11. Check your work by measuring out your triangle. Did it work?

12. Find another group to verify your measurements are correct and have them sign off on your numbers from 10 and 11.

MAKING CONNECTIONS

Record the important mathematical ideas from the discussion.

3-4-5 right triangle is always 90° because it
make $a^2 + b^2 = c^2$ TRUE

Any triangle that makes $a^2 + b^2 = c^2$ true is a RIGHT
Triangle

PRACTICE

Pg 128 5

Pg 129 7, 8, 10

Pg 130 11, 12

Pg 131 19

