


Lesson 13A	Pythagorean Theorem in the Workplace <i>Applying the Pythagorean Theorem to real-world situations.</i>
Relate	<p>Introduce the lesson by having students discuss how they use math formulas in their daily lives. Explain that there are many different types of formulas that people use to solve real-life problems. Show students a carpenter's triangle or a picture of a carpenter's triangle if one is not readily available.</p>  <p>Share with students that this tool is used by carpenters to ensure that the walls that they are constructing are "square."</p>
Experience	<p>Write the formula $a^2 + b^2 = c^2$ on the board. Explain that right triangles have special properties that make it easy to calculate their dimensions. Provide students with graph paper and have them draw a right triangle in the center of the paper with legs of 3 units and 4 units respectively. Show students how to substitute these numbers into the formula and calculate the answer. The length of the hypotenuse is 5, which matches the longest side of the triangle. Have students use graph paper to draw a variety of right triangles with different dimensions. Have them use the formula to determine the hypotenuse of each triangle. After calculating, have them measure to check for accuracy. Students should be able to use the formula to find any side of a right triangle.</p>
Apply	<p>Divide the class into teams. Make copies of the handout <i>Applying the Pythagorean Theorem: Dan Roman Construction</i>. Have each team solve the problem. Students may wish to use a calculator and/or graph paper.</p>
Cooperate	<p>Have each team share their results and how they determined the answer with the class. Have students discuss how they used the Pythagorean Theorem to solve the problem.</p>
Transfer	<p>Have students brainstorm additional examples of how the formula for the Pythagorean Theorem is used in the workplace. (Examples: A builder could use the Pythagorean Theorem to calculate how many shingles are needed for a roof based on its slope. A baseball fan could use the theorem to find out how far a ball would have to be thrown from first to third base. A roofer could figure how tall a ladder would need to be to reach a second story.)</p>

Applying the Pythagorean Theorem: Dan Roman Construction

Micron Workplace Math. Retrieved from the World Wide Web at:

<http://www.micron.com/k12/math/geometry/carpenter.aspx>

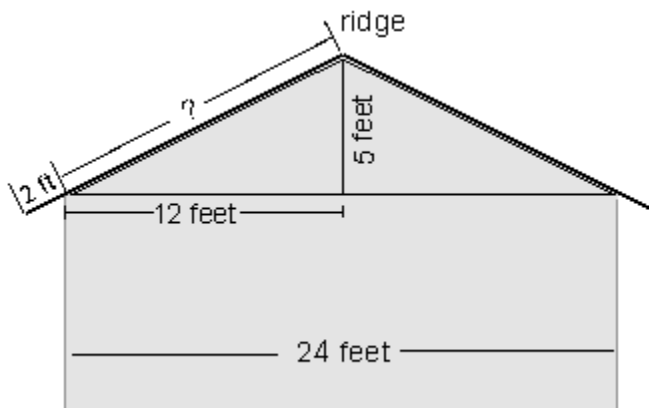
Occupation: Framing Contractor/Carpenter

Problem:

A customer would like a bonus room to be added to an existing home. The new room is to be 26' x 24' with an 8' ceiling and a 2' roof overhang. The ridge of the roof is to be centered over the 24 foot wall and 5 feet above the top of the wall of the bonus room.

Assuming the builder uses standard 4' x 8' plywood sheets, determine the following:

1. How many plywood sheets will be needed to cover the walls of the bonus room (not accounting for doors or windows)?
2. How many plywood sheets will be necessary to cover the roof over the bonus room?



Answer - Applying the Pythagorean Theorem: Dan Roman Construction

- To find out how many sheets will be necessary for the four walls, divide the area of the walls by the area of plywood sheet (not allowing for doors or windows).

$$26' \times 8' (2 \text{ walls}) + 24' \times 8' (2 \text{ walls})$$

4' x 8' plywood sheet

$$(2 \times 208 \text{ sq. ft.}) + (2 \times 192 \text{ sq. ft.}) / 32 \text{ sq. ft.} =$$

$$416 \text{ sq. ft.} + 384 \text{ sq. ft.} / 32 \text{ sq. ft.} =$$

$$800 \text{ sq. ft.} / 32 \text{ sq. ft.} =$$

25 sheets of plywood for the walls

- To find out how many sheets will be necessary for the roof, divide the total area of the roof (two equal sides) by the area of a plywood sheet. The ridge of the roof is 26 feet and the overhang is 2 feet. The height of the roof is 5 feet. Find the area of each side of the roof by using the Pythagorean Theorem to calculate the length from the ridge to the edge ($a^2 + b^2 = c^2$), adding the overhang, and multiplying the total length by the width (ridge).

$$5^2 + 12^2 = C^2$$

$$25 + 144 = C^2$$

$$C = 13 \text{ ft.}$$

$$\text{Roof area: } (2' + 13') \times 26' = 390 \text{ sq. ft.} \times 2 \text{ (both sides)} = 780 \text{ sq. ft.}$$

Now divide by the plywood sheet dimension:

$$780 \text{ sq. ft.} / 2' \times 8' \text{ sheets} = 24.375 \text{ or } 25 \text{ sheets of plywood for the roof}$$

