

## Lesson 6: Pouring Concrete

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### SPECIFIC OBJECTIVES

By the end of this lesson, you should understand

- The following math concepts related to circles: Circumference, radius, diameter, and formulas for area and circumference.
- The following math concepts related to volumes: Volume formula for a cylinder and calculating the volume of a rectangular solid
- That materials such as concrete, gravel, soil and sand are ordered in cubic units (usually cubic yards or "yards".)

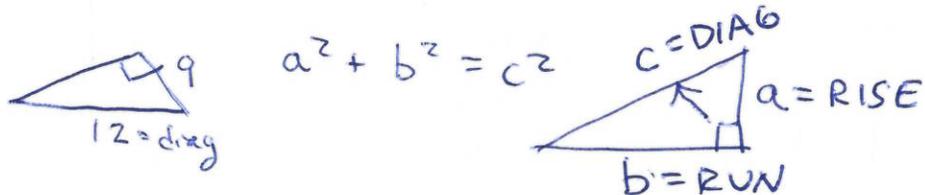
By the end of this lesson, you should be able to

- Calculate the missing side of a right triangle using the Construction Master Calculator
- Calculate volume for right cylindrical columns.
- Convert units from cubic inches and cubic feet to cubic yards

### PROBLEM SITUATION #1 : Pythagorean Theorem on the Construction Master Calculator

Before moving on to the next topic, we're going to spend a few more minutes on the Pythagorean Theorem because it is so important in construction. Take out your homework from Lesson 5 (the previous lesson), and use it to answer Question 1 below.

1. Show your work for problem # 8 on page 129 from the Lesson 5 Homework Below



$$\text{rise} = 12' \quad \text{run} = 16' \quad \text{Diagonal} = 20'$$

$$12 \boxed{\text{FT}} \boxed{\text{RISE}} \quad 16 \boxed{\text{FT}} \boxed{\text{RUN}} \quad \boxed{\text{DIAG}}$$

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ACT 3:

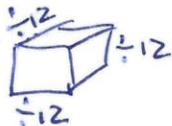
8. Take a minute to reflect on what you learned. Did your answer match your prediction? Why or why not? Write down everything you learned below.

9. Convert the units in your answer to the units your instructor tells you below:

- a) Set up the calculation by hand and then type it into your calculator. Write down what you typed into your calculator below:

$$81.77 \text{ in}^3 \rightarrow \text{into } \text{ft}^3$$

$$12 \text{ in} \times 12 \text{ in} \times 12 \text{ in} = \underline{1,728 \text{ in}^3} \rightarrow \underline{1 \text{ ft}^3}$$

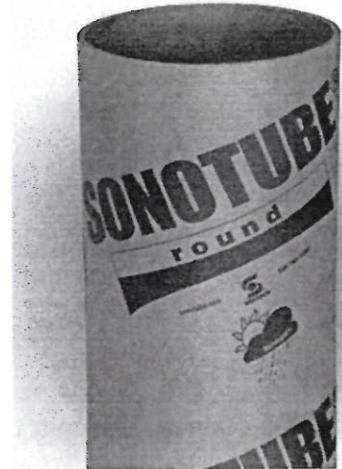


$$81.77 \div 1,728 = \boxed{\begin{array}{c} 0.0473 \\ \text{ft}^3 \end{array}}$$

- b) Now use your calculator function to do the unit conversion for you
- c) Do your answers match? If not, why not?

**PROBLEM SITUATION #3 : Concrete Columns**

You're building a deck. The building code for your area says that a deck of the size you are building needs to have 6 posts to support the deck. Each post needs to sit on a concrete base. According to code, the bottom of the supporting column must be at least 4' below the ground to get below the frost line. You'll use six sonotubes to form the six concrete bases you'll need to pour.

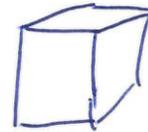


According to common residential deck building practice, the supporting columns typically have a diameter of 12".

10. Spend a minute thinking on your own... what strategy could use to do a quick estimate of the total concrete you'll need for the job?

a. Write down your strategy below.

Pretend the posts have a square cross-section



b. Now use the strategy to estimate the amount of concrete you'll need.

$$1' \times 1' = 1 \text{ ft}^2 \times 4' = 4 \text{ cubic feet in 1 post}$$

$$6 \times 4 = \underline{24 \text{ cubic feet}}$$

11. Determine the total amount of concrete you need to order for the job. An important consideration when placing your order is that the ground will not be perfectly level. To address that, you will need to do the standard practice of most contractors. You will need to calculate the total volume needed and then add 10% to the total concrete order. Round your answer to the nearest hundredth (2 decimal places).

$$\pi r^2 h = V$$

$$0.6981 * 1.1 = \boxed{0.77 \text{ yds}^3}$$

$$\pi \times 6^2 \times 4 \leftarrow 1 \text{ post}$$

$$1 \text{ post} \left( \frac{\pi \times (6 \text{ in})^2 \times (4')}{\pi \times (0.5 \text{ ft})^2 \times (4')} = 0.1164^* \times 6 = 0.6981 \text{ yds}^3 \right)$$

$$*6 = 18.84 \text{ ft}^3$$

$$\times 1.1 \text{ 4 | Page}$$

$$\boxed{20.72 \text{ ft}^3}$$

12. Now, convert the units for the total amount of concrete. If your answer in #11 was in cubic yards, convert it to cubic feet. If your answer was in cubic feet, convert it to cubic yards.

- a. First do the conversion *without using your units button on your calculator* Set up the calculation by hand and then type it into your calculator. Write down what you typed into your calculator below:

$$20.74 \text{ ft}^3$$

$$\frac{20.74 \text{ ft}^3}{27 \text{ ft}^3} = 0.77 \text{ yd}^3$$

$$3 \text{ feet} = 1 \text{ yard}$$

$$3 \text{ ft} \times 3 \text{ ft} \times 3 \text{ ft} = 27 \text{ ft}^3$$

$$27 \text{ ft}^3 = 1 \text{ yd}^3$$

- b. Check your answer by using the units button on your calculator to make sure you are correct. If not, go back to part a and fix your work.

**PROBLEM SITUATION #4 : Pouring a Concrete Slab for a Shed**

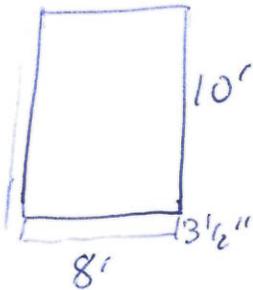
Exciting news! There is a buyer for one of the sheds out back. The new potential owners need help determining additional costs. How much will the concrete cost for the concrete slab they need to pour?

13. Talk to your group. What do you need to know to figure out the cost?

cost of labor  
 volume of concrete  
 dimensions of concrete slab  
 cost of the concrete

14. Determine the total cost of 3000 psi concrete you would order in cubic yards if you order the concrete from Wingra Stone (<https://www.wingrastone.com/wingra-redi-mix/pricing/>)

\$152.50 / cubic yard min fee: \$125.-



$8' \times 10' \times 3\frac{1}{2}'' = 0.86 \text{ yd}^3$

$\$152.50 / \text{cubic yard} * 0.86 \text{ yd}^3 = \$131.15$

125

→ **\$256.15**

15. Another option to purchase the concrete is to buy it in bags. If 1 bag of concrete costs \$3.99 and covers  $\frac{2}{3}$  of a cubic foot, determine the total number of bags you would order and the cost (assume no tax).

0.864<sup>98</sup> cubic yards  
23.33 cubic feet

$$\frac{2}{3} = 0.6667 \text{ cubic feet}$$

$$23.33 \text{ cubic feet} \div 0.6667 \text{ cubic feet/bag} = 34.97$$

35 bags or 36 \* \$3.99/bag = \$139.65

16. Which way would you go... bags or truck and Why?

cheaper ← easier ↓

## MAKING CONNECTIONS

State the main idea of the lesson

Buying concrete means calculating volume

- slab
- driveway
- foundation
- sidewalks
- columns

## Practice/Homework

Pg 105 1, 3, 4, 6

Pg 106 11, 17

Pg 113 3

Pg 113 4 (extra credit)

Pg 115 13 (extra credit)