WAMC Lab Template

Math Concept(s): Geometric Measurement and Dimensions; Modeling with Geometry

Source / Text: Mathematics for Carpentry and the Construction Trades

Developed by: Sara, Taylor, Jonathan, William, Rick

E-Mail: Date: Summer In-service 2013

Attach the following documents:

Lab Instructions

Student Handout(s)

Rubric and/or Assessment Tool

- Formative – verbal cues taken from group observation
- Summative – paper pencil quiz using various shapes (cylinder and rectangular prisms), converting cubic feet to cubic yards.

Short Description (Be sure to include where in your instruction this lab takes place):

Students will use prior knowledge of calculating volume to determine the cubic yards of cement needed for various cement slaps on the school grounds. Lab will take place outside the school building.

Lab Plan

Lab Title: Slab lab

Prerequisite skills: Using correct units of measurement, volume and area formulas of various geometric shapes.

Lab objective: To calculate the cubic yards of cement needed for various concrete slabs.

Standards:

CCSS-M:

- Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems
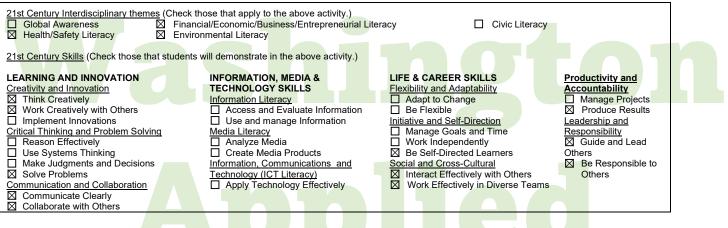- Apply geometric methods to solve design problems
-

Standards for Mathematical Practice:

- MP.1 All
- MP.2.7
- MP.3.4 & 5
- MP.4.1, 3, 6 & 7
- MP.5 All
- MP.6 All

Reading:
-

Writing:
-

Leadership/21st Century Skills:

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials
- Tape measures
- Safety glasses
- Paper and pencil
- Calculators
- Lab sheet to record data

Set-Up Required:
- none

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:
- groups of 4 (all with equal responsibilities)

Expectations:
- Students will be able to calculate the cubic yards of cement needed for various concrete slabs.

Timeline:
- 2 days

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab
- Building trades

Career Applications
- Construction

- Engineering
- Architecture
- Material estimator
- Honey-do-projects

Optional or Extension Activities
- Reinforced concrete
- Weather considerations
- Climate

Washington
Applied
Math
Council

https://wa-appliedmath.org/

Name(s): Sara Sly, Brian Wilson, Jonathan Clark, William Clifton, Rick Feller
Lesson Title: Estimating and Calculating Volume

Date: 6/27/13
Text: Mathematics for Carpentry and the Constructions Trades
Lesson Length: 1-2 days

Domain: Geometric Measurement and Dimensions, Modeling with Geometry.	
Big Idea (Cluster): Explain Volume Formulas and use them to solve problems; Apply geometric methods to solve design problems.	
Common Core State Standards: Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems; Apply geometric methods to solve design problems.	
Mathematical Practice(s): MP.1 All; MP.2.7; MP.3.4 & 5; MP.4.1, 3, 6 & 7; MP.5 All; MP.6 All	
Content Objectives: To calculate the cubic yards of concrete needed for various concrete slabs.	Language Objectives: Use correct math /construction terminology
Vocabulary: volume, cubic yards, rectangular prism, slab, length, width and height.	Connections Prior to Learning: correct units of measurement, volume and area formulas of various geometric shapes.
Questions to Develop Mathematical Thinking: • How does a contractor know how much cement he/she needs to order? • Does the shape of the slab affect the mathematical calculations? • What tools will you need to make the mathematical calculations?	Common Misconceptions: • Thickness of slab does not matter. • You can approximate the amount of concrete without taking measurements and doing calculations.

Assessment (Formative and Summative):

• Formative – verbal cues taken from group observation • Summative – paper pencil quiz using various concrete structures, calculate volume and convert cubic feet to cubic yards.

Materials:

• Tape Measures • Safety glasses • Paper and Pencil • Calculators • Student Worksheet • Computer and Projector

Instruction Plan:

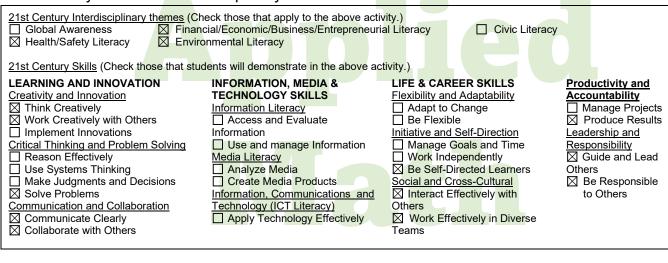| Launch: What role does concrete play in construction? Introduction to concrete construction video series. What factors must be considered when pouring cement? Why is it important to know how many cubic yards are needed when placing an order for concrete? |
|---|
| Explore: From previous lessons on volume students have learned area, volume, length, width and height. |
| When I observe students: Is correct mathematical terminology be used in their conversation? Are all students actively engaged? |
| Questions to Develop Mathematical Thinking as you observe: 1. What determines the thickness (height)? 2. What volume formula do you need to use? 3. What unit of measure is used when taking measurements? 4. Why do we need to divide by 27? |

Answers: 1. Determined by building codes and the load placed upon the slab. 2. Determined by the shape (most common l x w x h / 27). 3. All measurements need to be taken in feet/inches. 4. To change from cubic feet to cubic yards.

Summarize: Have the small groups discuss what they have learned from the experience. Have small groups share their discoveries and ideas with the class as a whole.

Career Application(s):

- Construction
- Engineering
- Architecture
- Material Estimator
- Personal Home Maintenance/Repair

21st Century Skills and Interdisciplinary Themes:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
☐ Global Awareness   ☒ Financial/Economic/Business/Entrepreneurial Literacy   ☐ Civic Literacy
☒ Health/Safety Literacy ☒ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
Creativity and Innovation	**Information Literacy**	**Flexibility and Adaptability**	☐ Manage Projects
☒ Think Creatively	☐ Access and Evaluate Information	☐ Adapt to Change	☒ Produce Results
☒ Work Creatively with Others	☐ Use and manage Information	☐ Be Flexible	**Leadership and Responsibility**
☐ Implement Innovations	**Media Literacy**	**Initiative and Self-Direction**	☒ Guide and Lead Others
Critical Thinking and Problem Solving	☐ Analyze Media	☐ Manage Goals and Time	☒ Be Responsible to Others
☐ Reason Effectively	☐ Create Media Products	☐ Work Independently	
☐ Use Systems Thinking	**Information, Communications and Technology (ICT Literacy)**	☒ Be Self-Directed Learners	
☐ Make Judgments and Decisions	☐ Apply Technology Effectively	**Social and Cross-Cultural**	
☒ Solve Problems		☒ Interact Effectively with Others	
Communication and Collaboration		☒ Work Effectively in Diverse Teams	
☒ Communicate Clearly			
☒ Collaborate with Others			

https://wa-appliedmath.org/

Student Worksheet/ Slab Lab

Name/Team: _____   **Date:_____**

Instructions: Your objective is to locate 3 different concrete slabs on the school property and estimate the amount of concrete that was used to build it. Use the table below to record your data and show your work on all of the calculations. Use the back of this work sheet for any sketches of the slabs that you locate (be sure to label the sketch).

Slab Location	Length	Width	Depth	Cubic Yards (Show Work)