

WAMC Lab Template

Math Concept(s): Unit Conversion

Source / Text: None

Developed by: Shawn Stern

E-Mail: shawn.stern@oceanbeachschools.org

Date: Jun 27, 2023

Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

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

For me this lesson would take place in an AP Environmental Science course in the Land and Water Use Unit. This and the following lesson could also be done in Chemistry or Physics class when dimensional analysis is being taught. This could be in any high school math class.

Lab Plan

Lab Title: Area of a Roof

Prerequisite skills: Students should know how to determine the area of a rectangle and express it with the proper units.

Lab objective:

- 1) Students will measure and calculate the area of a roof on a building from the ground. This will be used in the following lesson to determine the number of barrels that will be needed to collect rainwater off the roof.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards

- 4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.
- HS.N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- HS.N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standards for Mathematical Practice:

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 6. Attend to precision.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- HST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

K-12 Science Standards

- Science and Engineering Practices
 - Planning and Carrying Out Investigations
 - Using Mathematics and Computational Thinking
 - Obtaining, Evaluating, and Communicating Information

ITEEA Standards for Technology and Engineering Literacy (STEM)

- STEL-2Z. Use management processes in planning, organizing, and controlling work. Technology and Engineering Practices
- TEP-2. Creativity
- TEP-4. Critical Thinking
- TEP-7: Communication

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<input type="checkbox"/> Manage Projects
<input type="checkbox"/> Think Creatively	<input type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input type="checkbox"/> Produce Results
<input type="checkbox"/> Work Creatively with Others	<input type="checkbox"/> Use and manage Information	<input type="checkbox"/> Be Flexible	<u>Leadership and Responsibility</u>
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<input type="checkbox"/> Guide and Lead Others
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Be Responsible to Others
<input type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input type="checkbox"/> Be Self-Directed Learners	
<input type="checkbox"/> Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	<u>Social and Cross-Cultural</u>	
<input type="checkbox"/> Solve Problems		<input type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input type="checkbox"/> Work Effectively in Diverse Teams	
<input type="checkbox"/> Communicate Clearly			
<input type="checkbox"/> Collaborate with Others			

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

Materials

- Each group will need a need tape measure and a hard surface to record their measurements

Set-Up Required:

- Ensure that students have access to at least two sides of the building.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- 3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams.
- 3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.
- 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
- 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
- 3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

Cooperative Learning:

- Students will work in groups 2 or 3. One student will serve as the group manager and recorder and the remaining two take measurements

Expectations:

- It is expected that students will develop and implement a plan to determine the area of the building

Timeline:

- This lab is an introduction to the Rain Collection Lesson it should not take longer than 15 minutes.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- It is common to need to convert household measurements from one unit to another. For example you may need to convert teaspoons to tablespoons if you want to increase the servings in a recipe.

Career Applications

- Architects, facilities managers, conservation district managers, environmental scientist foresters, fishery managers, wastewater treatment managers, city managers and engineers and many others will need to make similar calculations.

Optional or Extension Activities

- This lab and lesson could be followed by a lesson where the students determine a single container that could store the rainfall throughout the year.

Area of a Roof Lab

Background

Your school's FFA (Future Farmers of America) Chapter would like to collect rainwater for use in their garden. They need to know how many rain barrels they need to purchase to collect the rain fall.

Challenge

The first step in solving this problem is to determine the area of the roof.

Before you begin, assign the following roles to your team members.

- Group manager/Recorder- keeps the group on task and records the measurements.
- Measurer 1 - does the majority of the manipulation of supplies
- Measure 2 - records information and records the group procedure

As a group, brainstorm and record your group's plan for calculating the area of the roof.

Informative/Explanatory Text Describing Your Group's Plan

Calculation of the Area of of the Roof

Rubric.

	Explanation	Calculation
5	Explains the topic completely. Effectively uses ample specific and relevant facts, definitions, details, examples, and/or other appropriate information in the explanation.	<ul style="list-style-type: none">• Length and width are displayed with units.• Length and width measurements are displayed with a decimal place appropriate for the tool.• Calculation matches measurements.• Appropriate unit is used for the area.
4	Explain the topic adequately. Explanation includes some specific and relevant facts, definitions, details, examples, and/or other appropriate information.	3 of the 4
3	Explains the topic to a limited extent or the explanation is developed unevenly. Explanation includes few or only general facts, details, and examples. Some information may be repetitious or may not be clearly relevant.	2 of the 4
2	Explains the topic by providing some information but explanation is minimal and/or superficial, and parts may be repetitious or not relevant.	1 of the 4
1	Development of the topic lacks explanation of ideas, only repeats ideas, or most ideas are not relevant. May demonstrate a lack of understanding of the purpose of explanatory writing	Random numbers are included