

WAMC Lab Template

Math Concept(s): Analyze and solve linear equations and pairs of simultaneous linear equations.
Solve real world problems involving area, surface area, and volume.

Source / Text:

Developed by: Eric Franz, Mawiyah Fields E-Mail: Franz.eric@yakimaschools.org
msfields@seattleschools.org Date: Summer In-service 2013

Attach the following documents:

Lab Instructions: Lab takes place in the computer lab or classroom lab.

1. Students should open Google Sketchup and then go to Sketchup File #1 and #2.
2. Students should complete the two tutorials which will “walk” them through building their house. Students should maintain a written journal throughout this activity.
3. After completing the tutorials, students should add additional features to customize their house like bricks, additional rooms, and other features.
4. After creating their dream house, students should determine the dimensions of each room of their house.
5. With these dimensions students should research the formula for area from online with their computers and then use the formulas to calculate area of their house.
6. Students should determine how many square feet a gallon of paint will cover, the average cost of a gallon of paint and then calculate how many gallons of paint they would need to buy to paint the inside of their home and its cost.
7. In groups of four, students will analyze and discuss the design of each student’s dream house and check each other’s answers. Positive feedback should be provided by group members.

Student Handout(s): 2 Sketchup files

Rubric and/or Assessment Tool: See attached Rubric

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

Lab Plan

Lab Title: Dream Home

Prerequisite skills: Basic knowledge of Sketchup, excel, word

Lab objective: Create a dream home using Sketchup Pro. Collect your data a present your data.

Standards:

CCSS-M:

- M1 Perform operations fluently with positive and negative numbers, including decimals, ratios, percents, and fractions, and show reasoning to justify results.
- M6 Demonstrate understanding of, and accurately apply, place value to round off numbers.
- M9 Compute the perimeter and area of common two-dimensional figures.
- M13 Use the technique of dimensional analysis to convert units of measure (e.g., kilometers/hour to meters/minute) and apply ratios in real-world situations (e.g., scale drawings).
- 6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
- 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- **Writing:**
 - W.6.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
 - W.6.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
- **Reading:**
 - RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
 - RI 6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
 - RI 7.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.
- **Listening, Speaking:**
 - SL 7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on *grade 7 topics, texts, and issues*, building on others' ideas and expressing their own clearly.

Standards for Mathematical Practice:

MP1: Makes sense of problems and persevere in solving them

MP2: Reason abstractly and quantitatively

MP4: Model with mathematics

MP5: Use appropriate tools strategically

MP6: Attend to precision

State Standards addressed (2008 Washington State Mathematics Standards):

- **Measurement and Geometry**
- **1.0 Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems:**
 - 1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).

- 1.2 Construct and read drawings and models made to scale.
- **2.0 Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:**
- 2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.
- 2.2 Estimate and compute the area of more complex or irregular two-and three-dimensional figures by breaking the figures down into more basic geometric objects.
- 2.3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)			
<input checked="" type="checkbox"/> Global Awareness	<input checked="" type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> 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
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<u>Leadership and Responsibility</u>
<input checked="" type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input type="checkbox"/> Manage Projects
<input type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input checked="" type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input checked="" 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 checked="" type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Be Responsible to Others
<input checked="" type="checkbox"/> Reason Effectively	<input checked="" type="checkbox"/> Create Media Products	<input checked="" type="checkbox"/> Work Independently	
<input type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input checked="" type="checkbox"/> Be Self-Directed Learners	
<input checked="" type="checkbox"/> Make Judgments and Decisions	<input checked="" type="checkbox"/> Apply Technology Effectively	<u>Social and Cross-Cultural</u>	
<input checked="" type="checkbox"/> Solve Problems		<input checked="" type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input type="checkbox"/> Work Effectively in Diverse Teams	
<input checked="" type="checkbox"/> Communicate Clearly			
<input checked="" type="checkbox"/> Collaborate with Others			

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

Materials

- Computers
- Sketchup
- Excel
- Word
- Powerpoint
- 2 Sketchup Files
- Resource Links

- <http://sketchup.google.com/>

- <http://sketchup.google.com/product/gsu.html>

- <http://sketchup.google.com/training/videos.html>

Set-Up Required:

- Sketchup and Office 2010 installed
- 2 Sketchup Files

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:

- Work in groups of four to discuss how they are doing.

Cooperative Learning:

- Students get together to talk about their dream home.

Expectations:

- Students will create a dream home and figure out how much paint it will take to cover their home.

Timeline:

- 5 days

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab

- How many of you feel that this is an important skill that you need to have and why? What careers need this type of skill? So how much do you think it would cost to paint the house that you currently live in?

Career Applications

- Construction
- Interior Design
- Architecture

Optional or Extension Activities

- Have the students figure out how much it will cost to build the house using current prices of materials. (ie carpet, wallpaper, flooring costs)
- Draw out their floor plan first then build their house
- Have students design their dream home using the design process.
- Use Minecraft for students to build their house.

<https://wa-appliedmath.org/>