

## **WAMC Lab Template**

Math Concept(s): Ratios and Proportions

Source / Text:

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### **Attach the following documents:**

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

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

This activity has the students using ratios and proportions to assist them in creating a scale drawing of a room. This lab will take place after students explore the topic of “Ratios and Proportions.” This hands-on activity provides students an opportunity to apply their knowledge about ratios and proportions through the process of collecting measurements and using the measurements to create a scale drawing of a room.

### **Lab Plan**

Lab Title: Using ratios to make scale drawings

Prerequisite skills: Students should have basic knowledge of ratios and proportions and be familiar with scale drawings. Students should also have basic knowledge on how to use tools to measure and calculate the area of a room.

Lab objective: The objective of this lab is to help students apply their knowledge of ratios and proportions to create a scale drawing of their classroom (a conference room will also work with this lab, too).

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

Mathematics K–12 Learning Standards:

- HSG-CO.D: Make geometric constructions
- HSG-MG.A: Apply geometric concepts in modeling situations
- HSN-Q: Reason quantitatively and use units to solve problems

Standards for Mathematical Practice:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Model with mathematics

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

- Speaking and listening. Comprehension and Collaboration
- Work with peers and set rules for collegial discussions and decision making
- Propel conversations by posing and responding to questions that relate to the current information

K-12 Science Standards

- HS-ETS 1-3. Engineering Design

Technology

- 5.b Students collect data or identify relevant data sets, use digital tools to analyze them and represent data in various ways to facilitate problem solving and decision making.

Engineering

- HS-ETS 1-3. Engineering Design

Leadership/21st Century Skills:

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

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

### Materials

- Tape measure
- Paper (8.5" x 11") and pencil
- Ruler
- Calculator

### Set-Up Required:

- Classroom or another room that preferably has windows or doors.

### **Lab Organization Strategies:**

Leadership (Connect to 21<sup>st</sup> Century Skills selected):

### Cooperative Learning:

- Students will be working in groups of 3-4 people. Two people to measure the dimensions of the room, one person to record the measurements, and another person to operate the calculator to perform the proportions needed to complete the scale drawing.

### Expectations:

- It is expected that students will gain an understanding on ratios and proportions, specifically when it comes to scale drawings of bigger objects and/or areas.

### Timeline:

- This should be a lab that can be completed in 45-60 minutes. The measuring and calculations should take 10-15 minutes maximum, and the 35-45 minutes is used to calculate how to scale down the measurements that will provide an accurate scale drawing on an 8.5" x 11" piece of paper.

### **Post Lab Follow-Up/Conclusions:**

Discuss real world application of learning from lab

- A good understanding of space and an accurate depiction of that space is necessary in many applications. These sorts of scale drawings are done ALL THE TIME by architects and engineers. Construction workers need to understand scale drawings to build buildings so that they don't fall down. If you want to be a landscape designer, a room stager, or a football coach (or a coach of any sport for that matter), you need to have a strong understanding of how to design and utilize space.

### Career Applications

- Construction, Engineering, Interior Design

### Optional or Extension Activities

- This lab is very diverse. You can use your scale drawing as a model to determine hypotheticals such as how much bigger would the door entrance need to be for 4 students to walk through the door at the same time. This lab can also expand to determining how many student desks can adequately fit in the classroom space. The lab can also be adjusted to work backwards where students need to calculate the area a classroom needs to be to fit a certain number of students desks plus a teacher's desk. You can also add other things such as window space available.

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## STUDENT INSTRUCTIONS

### Statement of Problem

In this activity, you will use proportions to make a scale drawing of the classroom floor and of one of the classroom walls.

### Grouping Instructions and Roles

You will be divided into groups of 3-4 people.

Two people will measure the dimensions of the room

One person will record the measurements

One person will operate the calculator to perform the proportions needed to complete the scale drawing.

### Procedures

1. Measure the length and width of the classroom. Write these measurements on a sheet of data paper.
2. Measure length and width of the teacher's desk and the distance from one corner of the desk to each of the two nearest walls. Write these measurements on a sheet of data paper.
3. Choose a classroom wall with several windows or a wall with a door if no windows exist. Measure the length and height of the wall. Measure the length and height of one window or door. Make appropriate measurements to locate the position of the window or door in the wall. Write these measurements on a sheet of data paper.

### Outcome Instructions

1. After the measurements are recorded, the group gathers to calculate the area of the room.
2. Each group member creates a scale drawing of the floor plan of the classroom, showing the position of the teacher's desk. The scale used in the scale drawing should be adequate to fit onto a piece of 8.5" x 11" piece of paper (use your ruler).
3. On the back side of the paper, using the same scale and the wall/window measurements your group calculated, draw the wall plan accurately, locating the windows or door where they belong. Draw accurate scale measurements of the windows and/or doorway.

### Assessment Criteria (what will you be assessed on?)

Accuracy of Measurements

Proper calculation of the area of the room

Accurate "length:width" ratio

Accurate and adequate scale drawing of the classroom and wall

Make sure you label your drawing and include the scale you used

## Student Lab Data Sheet

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Lab Title: \_\_\_\_\_

Write the objective (in your own words) of the lab you are performing.

### Data Collection:

Length of Room: \_\_\_\_\_

Width of Room: \_\_\_\_\_

Length of Teacher's Desk: \_\_\_\_\_

Width of Teacher's Desk: \_\_\_\_\_

Use the following table to record your measurements for windows and/or doorway.

Length					
Width					

### Calculations

Area of the room: \_\_\_\_\_

Ratio of length/width: \_\_\_\_\_

### Scale Drawing

Use a piece of 8.5" x 11" paper to complete your scale drawing of the room.

Staple or paperclip your scale drawing of the room to your Lab Data Sheet.

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## Lab Grading Rubric: Using Ratios to Make Scale Drawings

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Class: \_\_\_\_\_

Topic	Points Possible	Points Earned
Accuracy of Measurements	5	
Calculation of Area	5	
Length/Width Ratio	5	
Accurate & Adequate Scale Drawing of	15	

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