

WAMC Lab Template

Math Concept(s): Area

Source / Text: N/A

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Date: Summer Conference 2021

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):

At the beginning of the year—to emphasize the importance of precision—In a group, students will create an island that they calculate the area of given various area bases (square inches, square centimeters, etc.) As the students work their way in calculating the area of their island given shrinking units of measurements, students will learn the importance of precision measurement.

Ex: if the students island overlaps onto a part of a square inch, then that inch is added to it's overall area.

Lab Plan

Lab Title: Area Island

Prerequisite skills: Elementary skills- counting, drawing, tracking their steps.

Lab objective: To teach students the importance of being precise, rounding in

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

Mathematics K–12 Learning Standards:

- HSN-Q.A.3- Reason quantitatively and use units to solve problems: choose a level of accuracy appropriate to limitations on measurement when reporting quantities

Standards for Mathematical Practice:

- Reason abstractly and quantitatively
- Modeling with mathematics
- Attend to precision

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

- W.11-12.2- Write informative/explanatory texts to examine and convey ideas, concepts, and information clearly accurately through the effective selection, organization, and analysis of content.



K-12 Science Standards

- N/A

Technology

- 3.b. Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources.

Engineering

- HS-ETS1-1-Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (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 | |

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

LEARNING AND INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Others
- Implement Innovations

Critical Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgments and Decisions
- Solve Problems

Communication and Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change

- Be Flexible

Initiative and Self-Direction

- Manage Goals and Time

- Work Independently

- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Others

- Work Effectively in Diverse Teams

Productivity and

Accountability

- Manage Projects

- Produce Results

Leadership and

Responsibility

- Guide and Lead Others

- Be Responsible to Others

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

Materials

- Patty Paper- for island drawing
- Various area sheets (inch, $\frac{3}{4}$ inch, $\frac{1}{2}$ inch, $\frac{1}{4}$ inch, $\frac{1}{8}$ inch)
- Writing utensils and coloring utensils
- Worksheet/reflection write-up explanation

Set-Up Required:

- Students are assigned groups
- For each student:
 - 1 patty paper
 - a quarter of *each* area sheet type
- Each group gets one of each area sheet type to remain blank
- Each student is handed a worksheet/reflection write-up explanation

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Manage Projects
- Produce Results
- Guide and Lead Others
- Be Responsible to Others
- Adapt to Change
- Use and manage information
- Work Creatively with others
- Use systems thinking
- Communicate Clearly
- Collaborate with Others

Cooperative Learning:

- Each group needs to work together to identify the various areas of their respective islands
- Each group collaborates to evaluate of the level of accuracy of each level of area

Expectations:

- Students are expected to finish with a generalized area of their island for all five area levels
- Students are expected to work collaboratively with their group to identify generalized areas
- Students will communicate findings verbally and in their write ups

Timeline:

- Students are first instructed to create an island (squiggly edge) comparing their island to their peers
- Students then proceed to identify the rounded area of their island compared to
 1. The inch grid paper
 - a. Then color out the squared version of their island on the smaller, personal inch grid paper
 2. The $\frac{3}{4}$ inch grid paper
 - a. Then color out the squared version of their island on the smaller, personal $\frac{3}{4}$ inch grid paper
 3. The $\frac{1}{2}$ inch grid paper

- a. Then color out the squared version of their island on the smaller, personal $\frac{1}{2}$ inch grid paper
 4. The $\frac{1}{4}$ inch grid paper
 - a. Then color out the squared version of their island on the smaller, personal $\frac{1}{4}$ inch grid paper
 5. The $\frac{1}{8}$ inch grid paper
 - a. Then color out the squared version of their island on the smaller, personal $\frac{1}{8}$ inch grid paper
- All of this (previous work) is done hand-in-hand with tracking their observations on their worksheet
 - After students have all their island areas, student go over reflection questions with their group

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Using the correct units and rounding in any situation (cooking, banking, taxes, construction, math class, etc!)

Career Applications

- This is a lab that is applicable to any career that deals with measurements and the importance of using the right unit of measurement to be as precise as possible

Optional or Extension Activities

- Decimal placement understanding
- Expanding on rounding timing within a problem
- Creating pancake-batter using different units of measurement
- Coordinate plain understanding

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Name: _____

Group Name: _____

Date: _____

Area Island Lab

Work with your classmates to calculate the rounded area of your individual islands and reflect on your findings

Getting started: Make sure you have...

- 1 sheet of patty paper for each student
- 1 whole sheet of 1 inch, $\frac{3}{4}$ inch, $\frac{1}{2}$ inch, $\frac{1}{4}$ inch *and* $\frac{1}{8}$ inch per group
- 1 quarter sheet of 1 inch, $\frac{3}{4}$ inch, $\frac{1}{2}$ inch, $\frac{1}{4}$ inch *and* $\frac{1}{8}$ inch per student
- 1 per student - 11x14 sheet of paper to attach your square-island sheets to at the end
- 1 set of coloring utensils per group (you can grab other colors from other groups if you need to)
- You can borrow tape from Ms. McCallum to attach your square-islands to the 11x14 toward the end

Reminder! Keep track of your steps on these sheets, keep track of your square-islands (each should be a different color), work together to reflect on your findings, and if you have any questions—ask your team!
If your whole team is stuck, THEN ask Ms. McCallum :)

Directions:

1. Draw your island onto your patty paper
2. Begin comparing your island to each whole area sheet, working your way from 1 inch to $\frac{3}{4}$ inch to $\frac{1}{2}$ inch to $\frac{1}{4}$ inch till eventually the $\frac{1}{8}$ inch
 - a. If your island overlaps with more than (or exactly) half of a square, then it is added to the area as 1
 - b. If your island overlaps with less than half of a square, then you do NOT add to your area
3. After you calculate your area (ex: 14 squares) then you would color in 14 united squares on your respective quarter-sheet with the same base (ex: if you measured 14 squares from the inch grid, then you would take the inch quarter-sheet and color in 14 squares)
4. After coloring in your square-island on your quarter sheet, answer the questions for the respective sections (ex: once you finished creating your square-island for your inch grid, you would then answer the questions for the inch-grid section of this packet)
5. After you have found your squared island for each grid and have answers the questions for each section, create a wrap up reflection with your group (directions at the end), get ready to present.

Patty Patter Island:


Island Name:

How big do you imagine your island?

(The size of your bedroom? a football field? Hawaii? Texas?!?)

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Square Inch Grid:

With a ruler, draw a line that is an inch long here! 


How many squares did your island take up on the square-inch grid?

Have a member of your group initial this box after double checking that you colored in the correct number of boxes in your square-inch quarter sheet:

How do you think this area compares (in inches) to the true size of your patty paper island? Bigger? Smaller?

What errors/challenges did you run into while calculating the area of your island in square inches?

Square $\frac{3}{4}$ inch Grid:

With a ruler, draw a line that is $\frac{3}{4}$ inch long here! 

How many squares did your island take up on the square $\frac{3}{4}$ -inch grid?


Have a member of your group initial this box after double checking that you colored in the correct number of boxes in your square $\frac{3}{4}$ inch quarter sheet:

How do you think this area compares (in $\frac{3}{4}$ inches) to the true size of your patty paper island? Bigger? Smaller?

What errors/challenges did you run into while calculating the area of your island in square $\frac{3}{4}$ inches?

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Square $\frac{1}{2}$ inch Grid:

With a ruler, draw a line that is $\frac{1}{2}$ inch long here! 

How many squares did your island take up on the square $\frac{1}{2}$ -inch grid?


Have a member of your group initial this box after double checking that you colored in the correct number of boxes in your square $\frac{1}{2}$ inch quarter sheet:

How do you think this area compares (in $\frac{1}{2}$ inches) to the true size of your patty paper island? Bigger? Smaller?

What errors/challenges did you run into while calculating the area of your island in square $\frac{1}{2}$ inches?

How does the area of you $\frac{1}{2}$ inch island compare to your $\frac{3}{4}$ and 1 inch?

Square $\frac{1}{4}$ inch Grid:

With a ruler, draw a line that is $\frac{1}{4}$ inch long here! 

How many squares did your island take up on the square $\frac{1}{4}$ -inch grid?

Have a member of your group initial this box after double checking that you colored in the correct number of boxes in your square $\frac{1}{4}$ inch quarter sheet:

How do you think this area compares (in $\frac{1}{4}$ inches) to the true size of your patty paper island? Bigger? Smaller?

What errors/challenges did you run into while calculating the area of your island in square $\frac{1}{4}$ inches?

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Square $\frac{1}{8}$ inch Grid:

With a ruler, draw a line that is $\frac{1}{8}$ inch long here!



How many squares did your island take up on the square $\frac{1}{8}$ inch grid?

Have a member of your group initial this box after double checking that you colored in the correct number of boxes in your square $\frac{1}{8}$ inch quarter sheet:

How do you think this area compares (in $\frac{1}{8}$ inches) to the true size of your patty paper island? Bigger? Smaller?

What errors/challenges did you run into while calculating the area of your island in square $\frac{1}{8}$ inches?

How does the area of you $\frac{1}{8}$ inch island compare to your $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 inch?

Now that you've successfully calculated your various island areas...

Create a write-up with your group. Once written, prepare your presentation to share with the class

The write-up should include answers to the following questions:

- Describe each of your team-mate's islands: the names and the imagined size of their island in real life
- If your islands were all together like Hawaii, how much total space would it need on the earth?
 - how much space would you want between islands? Verbally paint the picture for your classmates
- What grid gave you the most accurate area measurements of your islands?
 - Why do you think that grid gave you the most accurate measurement?
- How was your experience with rounding? (rounding: more than half of the square is added to your area as 1, less than half of the square is NOT added to your area at all)
 - Does this process make sense? (why or why not)
 - In what way does the rounding effect your final answers?
- In what way does your team think you all could take THE MOST accurate measurements of your islands?
- What errors/challenges did your team/team-mates run into during the lab?
- How would this lab compare to taking measurements outside of the classroom?
- What do each of you believe is the most valuable lessons of this lab?

If all of your team-mate's answers don't match, record each answer and explain why
Suggestion: Use the answers recorded in this packet to help formulate write-up content