

Mathematics: The Language of STEM

Area – “Fixer Upper”
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CONTENT AND TASK DECISIONS

Grade Level(s): 3rd

Description of the Task: Your mom just finished tiling a floor in your house and has 400 leftover tiles. You and your friends decided that adding tiles to the walls of your clubhouse would look great. However, your mom said you were only allowed to use the tiles if you first figured out the exact number of tiles you would need. These are the dimensions of your rectangular clubhouse:

- Your clubhouse walls are 7 feet tall.
- Two walls are 8 feet long.
- Two walls are 4 feet long.
- The door is 6 feet tall and 3 feet wide.
- There is one window that is 2 feet tall and 2 feet wide.

Your mom’s tiles are squares, and measure 6 inches X 6 inches.
Does your mom have enough tiles for you?

Indiana Mathematics Content Standards:

3.AT.3: Solve two-step real-world problems using the four operations of addition, subtraction, multiplication and division (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).

Indiana Mathematics Process Standards:

PS.1 Make sense of problems and persevere in solving them
PS.2: Reason abstractly and quantitatively.

Mathematics Content Goals:

Students will use area to determine how many tiles will be needed to cover the four walls of a clubhouse.

Language Objectives:

Working in pairs, students will be able to verbally explain how to determine the number of tiles to cover the four clubhouse walls.

Materials:

- blank sheet of 11x17 paper for each group
- square color tiles math manipulatives

THE LESSON

Before:

- **Activate prior knowledge:**

Ask the students to activate their schema about area. What does area mean? (Amount of space in the middle of an object) What information do you need to know in order to solve the area of rectangle or square? What information will impact how many tiles you will need to cover the walls? How do the length and width relate to each other?

Sentence frames: ____ (length) X ____ (width) = area

Ask students how many inches are in one foot.

Sentence frames: ____ (12) inches = 1 foot

_____ tiles are in ____ square foot.

My mom _____ (does/does not) have enough tiles for our clubhouse because _____.

- **Be sure the problem is understood:**

Begin with a simpler version of the task:

- o Before giving the problem, the teacher will draw a rectangle on the board with a length of 3 inches and the width of 2 inches. Have students solve the area (**sentence frame:** ____ (length) x ____ (width) = area). Ask students how they could use the tile manipulatives to help solve the problem.

- o Ask students how many walls a rectangular room has. What are some things that will be true about the room? (The two walls opposite of each other will have the same area, the height of all four walls will be the same, tiles will not need to cover the area of the door or the window, no tiles will go on the ceiling or floor)

- **Establish clear expectations:**

1. Students will be working with their task partner to figure out the area of each wall in the clubhouse.
2. Students will then figure out how many tiles will be needed to cover each of the four walls.
3. They need to draw all their strategies, struggles, and solutions on graph paper so that they can present to the class during the math congress immediately following the math task.

During:

- **Let go:** Students will work with a partner to determine how to solve the task. They will need to use written communication to record their thinking on the graph paper. While students are working, listen to ensure that both partners understand the concept of area.
- **Listen actively: (Circulate the room and ask questions to ensure that students are understanding how to find the area of the walls, and how to determine the number of tiles needed)**
 - o How are you determining the area of each wall?
 - o How do you find the area?
 - o What are you noticing about the size of the tiles? How big is each tile?
 - o How do the tile manipulatives help you solve the problem?

- What are the tiles being measured in? Why does the unit of measurement matter for this problem?
- What are you struggling with? What might be a solution to your struggle?
- How does the door change the area of the walls?
- How could you change what you just did?
- What seems to be working so far?
- Why is area measured in “square” units? How do the square units relate to this task?
- Have you tried anything different that did **not** seem to work? Explain. What did you change?
- What steps have you taken to work towards your solution?
 - **Sentence frame:** First, we _____. Then we _____.

- **Provide appropriate support:**

- How do you find the area of a rectangle? _____(length) x _____(width) = area
- How many inches are in one foot? _____(12) inches = 1 foot
- What is your next step after you found the area of the wall(s)?
- The area of the walls is being measured in _____(feet), and the area of the tiles is being measured in _____(inches).

- **Provide worthwhile extensions:**

- Challenge early finishers to find the price of the tiles you are using if your mom paid \$0.50 per tile.
- How many more tiles would you need if you added 1 foot to the height of each wall and 1 foot to the length of each wall?

After

- **Promote a mathematical community of learners**

- The teacher will choose some student groups to model their struggles, strategies, and solutions by hanging their 11X17 piece of papers on the board simultaneously. Encourage discussion of different strategies and thinking by evaluating the different examples’ similarities and differences.
- Have students justify their answers to the rest of the class. Challenge students to question other group’s thinking.

- **Listen actively without evaluation**

- How did you work together with your partner to decide how many tiles were needed? Did Mom have enough for you to tile all the walls?
- What was the most challenging part of the task?
- Why do you need to find the area of the walls?
- Why is area measured in “square” units?
- How did you complete the task?
- Which wall did you subtract the area of the door from? Did it make a difference in the overall amount of tiles?

- **Make connections**

- What patterns did you notice?
- What did you notice about the length/height of the walls and the area?
- Can you make a connection between the length and the width of your area and the length/width of the tiles?

- How did knowing the area of the walls help you find the amount of tiles needed?
- Why is area measured in “square” units?
- Why does the unit of measurement matter in solving the task?
- How did the unit of measurement of the tiles/length(height) of the walls need to be converted in order to solve the task?
 - What do you think about what [student/group] is/are saying?
 - Does anyone have the same answer, but a different way to explain it?

- **Summarize main ideas**

We need to be able to find the area of shapes so that we can solve real-world problems like how much paint to buy, how many tiles to cover our floors with, how many seeds we can plant in our garden, etc. When we persevere, we can solve two-step problems based on the information from the first step by putting our operations together.

ASSESSMENT

Observe:

- Look for evidence that students see the connections between length/width of the tiles and the area.
- Look/listen for evidence that supports students’ understanding of why area is measured in square units.
- Look at students’ graph papers. If teacher notices errors, have the task group rework through their steps and explain/justify their reasoning.

Ask:

- How does finding the area connect to multiplication?
- What steps did you take in order to solve the math task?
- How do you find the area of a shape?
- How did finding the area of the problem first help you solve the problem?