Lesson Plan

Tiling a Rectangle to Determine Area

Age group: Grade 4, Grade 3
Virginia - Mathematics Standards of Learning (2009): 3.10a, 3.9d
Fairfax County Public Schools Program of Studies: 3.10.a.1, 3.9.d.1, 3.9.d.2
Online resources: Square it Up!

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Math Objectives

- **Experience** covering a rectangle with tiles
- **Practice** finding area of a rectangle
- **Learn** strategies to find area when the tiles do not cover the entire rectangle
- **Develop** the connection between tiling a rectangle and multiplication

Opening | 5 min
• Distribute graph paper.

• Ask the students to draw as many rectangles as possible that contain 24 boxes.

• When the students have finished drawing, ask a student to share one of the rectangles she drew.

• Continue asking different students to share other possible rectangles containing 24 boxes.

  ○ *Four rectangles exist. Other rectangles are just rotations of these:*

• **Say:** If each of the small squares on the graph paper is a unit square, then each of the rectangles you have drawn has an area of 24 square units.

• Write on the board:

  **Area** – the number of square units inside a flat object

• **Ask:** What are the dimensions of the 4 rectangles we drew that each have area 24?

  ○ *One rectangle is 1 unit by 24 units, the second is 2 by 12 units, the third is 3 by 8 units, and the fourth is 4 by 6 units.*
Teacher presents Math game: Square it Up! - Measure Area | 12 min

- Using Preset Mode, present Matific's episode Square it Up! - Measure Area to the class, using the projector.

The goal of the episode is to calculate area of a rectangle by placing unit tiles within the rectangle. The number of unit tiles provided is insufficient to cover the rectangle entirely.

- Say: Please read the question.

  - The question asks, “What is the area of the large rectangle?”

- Ask: How can we determine the area of the rectangle?
- *We can move the tiles into the rectangle until the rectangle is covered.*

- Move the tiles into the rectangle until all of the tiles have been used.

- **Say:** We are out of tiles, but we can still determine the area of the rectangle. What is its area?

- Click on the [ ] to enter the students’ answer.

If the answer is correct, the episode will proceed to the next problem.

If the answer is incorrect, the question will wiggle.

- **Say:** Now we want to find area of a larger rectangle. Let’s place the tiles in this rectangle.

- Place 6 tiles across to form the top row of the rectangle. Then place 4 tiles in a row directly underneath like so:

- **Say:** I cannot determine the area of this rectangle because there are not enough tiles. What can I do to figure it out?

- Elicit suggestions from different students for how to determine the rectangle’s area.
• Follow the students’ instructions for how to move the tiles within the rectangle.

• The episode will present a total of three questions. The third situation, like the second, will provide far fewer tiles than required. Encourage the students to use different strategies for finding area by placing the tiles in different locations within the rectangle.

Students practice Math game: Square it Up! - Measure Area | 10 min

• Have the students play Square it Up! - Measure Area on their personal devices. Circulate, answering questions as necessary.

Class discussion | 10 min

• Run the episode and display a problem. For example:
• **Place four tiles in the rectangle, like so:**

• **Say:** Even though we have not tiled the entire rectangle, we can determine the rectangle’s area. How?

  - *We can see that 4 tiles can fit across the rectangle. We can fit 3 rows, each with 4 tiles. If there are 3 rows of 4 tiles each, then there are 12 total tiles.*

• Enter 12 by clicking on the [ ] to proceed to the next question.

  • Place the tiles like so:

• **Say:** Suppose we tile the next rectangle like this. How can we determine its area?

  - *We can see that 6 tiles fit in a column. We can also see that we*
can fit 6 columns across the rectangle. If there are 6 columns of 6 tiles each, then there are a total of 36 total tiles.

- Enter 36 by clicking on the [ ] to proceed to the next question. Place the tiles like so:

- **Say**: Suppose we tile the next rectangle like this. How can we determine its area?

  - Even though there is no complete row or column here, we can tell that it would take 7 tiles to fill a row. We can also see that we would need 4 of these rows to fill the rectangle. If there are 4 rows of 7 tiles each, then there are a total of 28 tiles.

- Enter 28 by clicking on the [ ] to proceed to the next question. Place the tiles like so:

- **Say**: Suppose we tile the next rectangle like this. How can we determine its area?
We can see that it would take 6 tiles to fill a row. We can also see that we need 3 of those rows to fill the rectangle. If there are 3 rows of 6 tiles each, then there are a total of 18 tiles.

- Enter 18 by clicking on the [ ] to proceed to the next question.

Place the tiles like so:

- **Say:** Suppose we tile the next rectangle like this. How can we determine its area?

  - We can see that we would need 8 tiles to make a row. We can also see that 4 rows are necessary to fill the rectangle. If there are 4 rows of 8 tiles each, then there are a total of 32 tiles.

- **Say:** We have found some ways to find the area of a rectangle without covering the entire rectangle with tiles. What strategies have you used to find the area without counting every tile?

  - Responses will vary. Some students may state that they are multiplying the length of the rectangle by its width. Others may have other strategies.
Distribute a square sticky note to each student.

Ask the students to write the number 1 on the sticky note.

**Say:** We will use this sticky note as our unit square.

Ask the students to determine the area of various objects in the room -- tables, posters, bulletin boards, etc. -- with the sticky notes by counting how many sticky notes it takes to cover the object. Some objects will not be able to be measured exactly. In that case, students can approximate the object’s area or they can give a range of two numbers that contains the actual area.

**Closing | 4 min**

Ask a student to come to the board to create an area problem similar to the ones in the episode. The student should draw a rectangle and place some unit squares strategically within the rectangle.

Ask the rest of the class if the first student provided enough information to determine the rectangle’s area and if so, what the area is.

Repeat, as time allows. Invite different students to the board to create new area problems.