Lesson 3: Count the Squares

Standards Alignments

Addressing 3.MD.C.5.b, 3.MD.C.6

Teacher-facing Learning Goals

- Explain that rectangles that can be covered by the same number of unit squares without gaps or overlaps have the same area.
- Find the area of rectangles by counting unit squares (areas within 24 square units).

Student-facing Learning Goals

- Let's count square tiles.

Lesson Purpose

The purpose of this lesson is for students to count square tiles to measure area and create rectangles with a given area.

In previous lessons, students learned that counting square tiles that cover a shape gives the area of a shape in square units. In this lesson, students further explore tiling rectangles. They avoid gaps and overlaps as they use square tiles to find the area of partially tiled rectangles. Students also create rectangles of a specific area to demonstrate they understand that rectangles covered by the same number of square tiles without gaps or overlaps have the same area.
Students should have access to square tiles throughout the lesson and also be encouraged to draw the partitioned rectangles they create with the tiles.

Students with Disabilities (SwD)

- Representation (Activity 2)

English Learners (EL)

- MLR1 (Activity 1)
- MLR8 (Activity 2)

Instructional Routines

Card Sort (Activity 2), MLR1 Stronger and Clearer Each Time (Activity 1), Which One Doesn't Belong? (Warm-up)

Materials to Gather

- Square tiles: Activity 1, Activity 2

Materials to Copy

- Rectangles to Tile (groups of 2): Activity 2

- Rectangular Area Cards (groups of 2): Activity 2

Required Preparation

For Time to Tile and Card Sort: Rectangles: 24 square tiles per group of 2

Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

Teacher Reflection Question

Reflect on students' counting strategies. What strategies are they comfortable using as they find area? What strategies could use more practice?

Cool-down (to be completed at the end of the lesson)

5 min

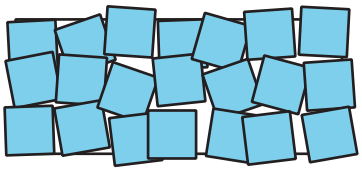
Tile a Rectangle

Standards Alignments

Addressing 3.MD.C.6

Student-facing Task Statement

Andre says this rectangle has an area of 21 square units because he covered it with 21 square tiles.



Do you agree with Andre? Explain your reasoning.

Student Responses

Sample responses:

- No, even though it is 21 tiles, we don't know that completely fills the rectangle because you can see some of the rectangle and some of the squares are overlapping.
- No, even though it is 21 tiles, you can see that some of the space in the bottom row isn't covered.

Begin Lesson

Warm-up

10 min

Which One Doesn't Belong: Tiling

Standards Alignments

Addressing 3.MD.C.6

The purpose of this warm-up is for students to compare four images. It gives students a reason to use language precisely (MP6). It gives the teacher an opportunity to hear how students use terminology and talk about characteristics of the items in comparison to one another. During the synthesis, ask students to explain the meaning of any terminology they use, such as rows, columns, area, gaps, overlap, and tiling.

Instructional Routines

Which One Doesn't Belong?

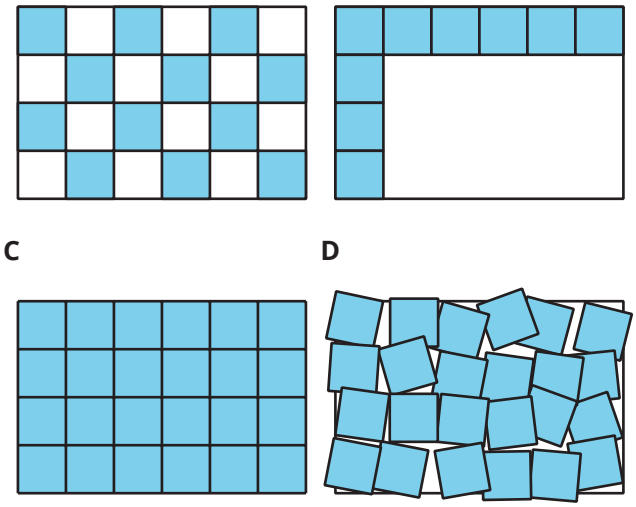
Student-facing Task Statement

Which one doesn't belong?

A **B**

Launch

- Groups of 2
- Display the image.
- "Pick one that doesn't belong. Be ready to share why it doesn't belong."
- 1 minute: quiet think time



Student Responses

Sample responses:
A doesn't belong because:

- It's the only one where the grey squares are not all touching.

B doesn't belong because:

- It's the only one that isn't filled with grey or white squares.

C doesn't belong because:

- It's the only one where there's no white showing.

D doesn't belong because:

- It's the only one where the squares are not arranged neatly.

Activity

- "Discuss your thinking with your partner."
- 2–3 minutes: partner discussion
- Share and record responses.

Synthesis

- "How could you use the tiling in each of these rectangles to find the area of each rectangle?" (In C, I can just count the tiles. In B, I could finish tiling the rectangle and count the tiles. In D I would need to straighten out the tiles to know how many there are. In A I could count the tiles and double the number since half the squares are tiled and half are not.)
- Consider saying:
  - "Let's find at least one reason why each one doesn't belong."

Activity 1

15 min

Time to Tile

Standards Alignments

Addressing 3.MD.C.5.b, 3.MD.C.6

The purpose of this activity is for students to use square tiles to find the area of rectangles. Students use their knowledge of tiling from a previous lesson to complete the tiling that is started in each rectangle in this activity. Students may use physical tiles or work directly from the images. The synthesis focuses on solidifying the idea that rectangles must be tiled completely without gaps or overlaps in order for the number of tiles to measure the area of the rectangle.

This activity uses *MLR1 Stronger and Clearer Each Time.* Advances: reading, writing

Instructional Routines

MLR1 Stronger and Clearer Each Time

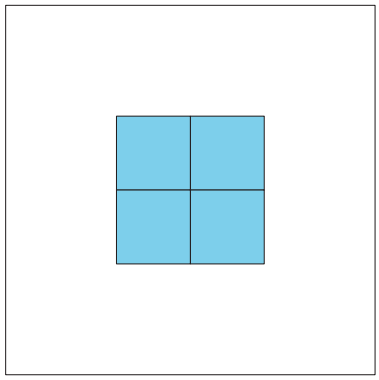
Materials to Gather

Square tiles

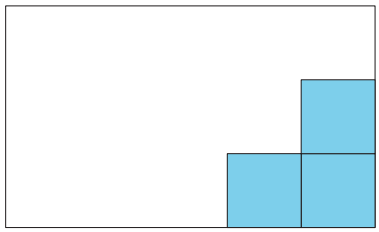
Student-facing Task Statement

1. Describe how to use square tiles to finish measuring the area of each rectangle. You can move the square tiles already placed if needed.

a.



b.



Launch

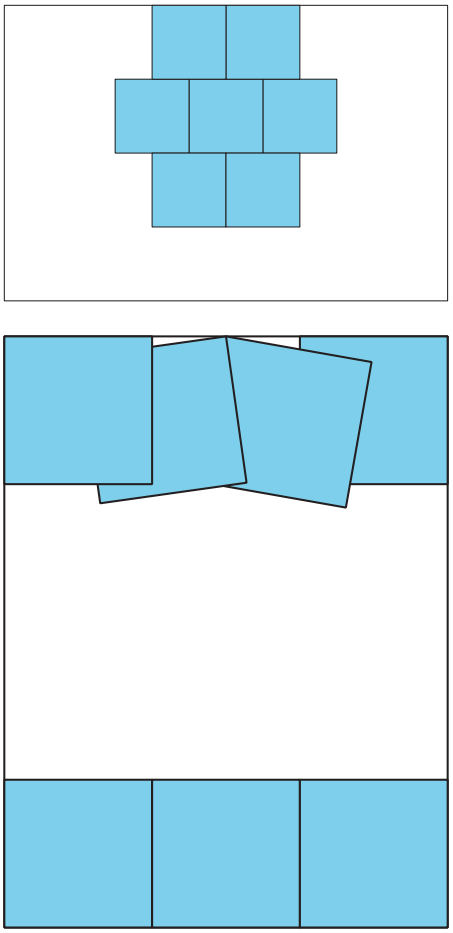
- Groups of 2
- Give each student 1 copy of the blackline master.
- Give students access to square tiles.
- "Take a minute to think about how you would finish measuring the area of these rectangles that are partially tiled."
- 1 minute: quiet think time

Activity

- "Work with your partner to finish measuring the area of each rectangle. You can use the square tiles and a copy of the rectangles to finish measuring the area and move the square tiles if you need to."
- 3–5 minutes: partner work time

Synthesis

- "Why did the square tiles in a, c, and d need to be adjusted before we could finish finding the area of the rectangle?" (The square tiles had to be moved over because

d. 

2. Describe how to use square tiles to find the area of any rectangle.

Student Responses

1.
   a. Students tile the rectangle with 5 rows and each row has 5 square tiles.
   b. Students tile the rectangle with 3 rows and each row has 5 square tiles.
   c. Students tile the rectangle with 4 rows and each row has 6 square tiles.
   d. Students tile the rectangle with 4 rows and each row has 3 square tiles.
2. Tile the rectangle with square tiles, making sure there are no gaps or overlaps. The number of tiles used is the area of the rectangle in square units.

they weren't going to fill the whole rectangle if we left the 4 squares in the center. The square tiles were crooked which made them overlap each other. The second row needed to be lined up with the first row so there would be the same number of squares in each row.)

- "If someone told you 4 squares would fit across the top of the rectangle, but only 3 squares would fit across the bottom of the rectangle, how would you know this didn't make sense?" (The same number should fit across the top and the bottom of the rectangle. The top and bottom have the same length so they should fit the same amount of squares.)

MLR1 Stronger and Clearer Each Time

- "Share your response to problem 2 with your partner. Take turns being the speaker and the listener. If you are the speaker, share your ideas and writing so far. If you are the listener, ask questions and give feedback to help your partner improve their work."
- 3–5 minutes: structured partner discussion.
- Repeat with 2–3 different partners.
- "Revise your initial draft based on the feedback you got from your partners."
- 2–3 minutes: independent work time

Activity 2

20 min

Card Sort: Rectangles

Standards Alignments

Addressing 3.MD.C.6

The purpose of this activity is for students to continue to recognize that different shapes can have the same area. Students sort the cards any way that makes sense to them and then by area. After the cards are sorted by area, students create another rectangle that would fit into that category (a rectangle with the same area). A sorting task gives students opportunities to analyze representations, statements, and structures closely and make connections (MP2, MP7).

Students may start to notice that the organization of the squares in rectangles makes it efficient to count by grouping square tiles by row, column, or in other ways. As students sort and create rectangles with certain areas, monitor for counting strategies that leverage the strengths of the rectangular organization to share in the synthesis.

English Learners (EL)

In this activity, the gridded rectangles are not the same size as the square tiles, but students could still use tiles as a support. Provide students access to square tiles if they would like to use them, but encourage them to draw what they create on the grid provided.
MLR8 Discussion Supports. Students should take turns finding a match and explaining their reasoning to their partner. Display the following sentence frames for all to see: "I noticed _____ , so I matched . . . ." Encourage students to challenge each other when they disagree.
Advances: Conversing

Students with Disabilities (SwD)

Representation: Internalize Comprehension.
Synthesis: On chart paper, record students' rectangles with justifications in each category. Record students' efficient ways for counting to find the area of rectangles.
Supports accessibility for: Memory.

Instructional Routines

Card Sort

Materials to Gather

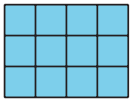
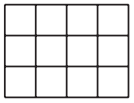
Square tiles

Materials to Copy

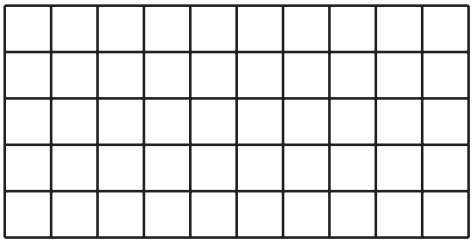
Rectangles to Tile (groups of 2), Rectangular Area Cards (groups of 2)

Student-facing Task Statement

Launch
What do you notice? What do you wonder?

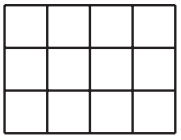
Draw a rectangle with an area of 8 square units on the grid.



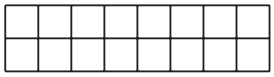
Activity

1. Your teacher will give you a set of cards that show rectangles. Sort the cards into categories of your choosing. Be prepared to explain the meaning of your categories.

A

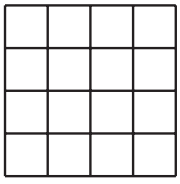


D



B

E

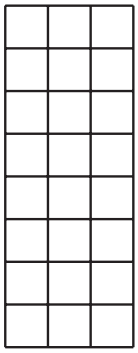


Launch

- Groups of 2
- Display the image.
- "What do you notice? What do you wonder?" (Students may notice: There are 3 rectangles. One of the rectangles is made up of square tiles. One of the rectangles is shaded and the other rectangle isn't. They all have 12 squares. They all have an area of 12 square units. Students may wonder: Why are there 3 rectangles? Why is one rectangle shaded and the other one isn't? Do the grey squares show tiles?)
- 1 minute: quiet think time
- 1 minute: partner discussion
- Record responses.
- "These are ways that we can represent a rectangle with 12 square units. When the squares are shaded in the image they look like square tiles, but we can also make a rectangle on a grid and say that it has an area of 12 square units, because it contains 12 squares."
- "Draw a rectangle with an area of 8 square units on the grid."
- 30 seconds: independent work time
- Share responses.
- Distribute one set of pre-cut cards to each group of students.
- Make square tiles available to students.

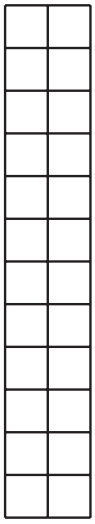
Activity

- "In this activity, you will sort some cards into categories of your choosing. When you



C

F



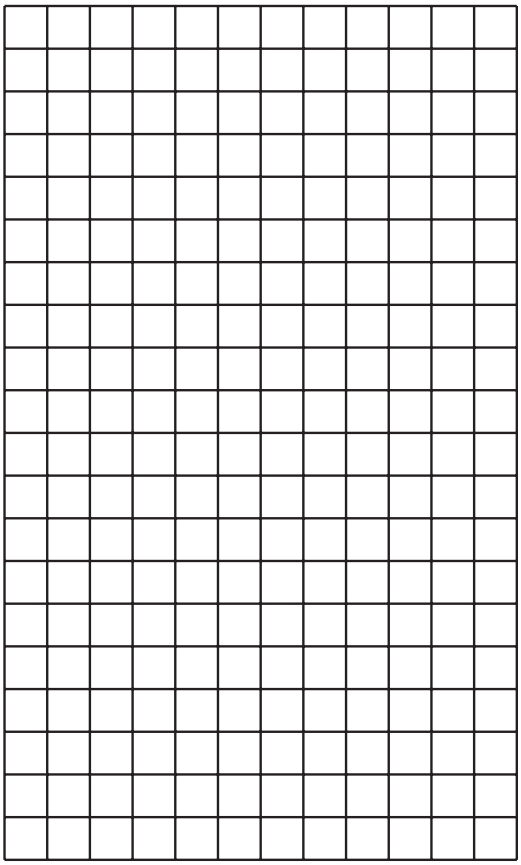
2. Create a rectangle that would fit in each group.

sort the rectangles, you should work with your partner to come up with categories."

- 5 minutes: partner work time
- Select groups to share their categories and how they sorted their cards.
- "Now work with your partner to sort your cards by the area of the rectangle on the card."
- 3–5 minutes: partner work time
- Have students share the groups they made and how they know those cards go together.
- "Take a minute to think about what other rectangles might fit into these categories."
- 1 minute: quiet think time
- "Now, work with your partner to create at least one different rectangle that would fit into each of the categories. Be prepared to share how you know the rectangles you make would fit into that category."
- 5 minutes: partner work time
- Monitor for counting strategies students use to find the area of rectangles.

Synthesis

- Share the rectangles (with justifications) that students created for each category.
- Share some of the efficient ways that students counted to find the area of rectangles.
- Consider asking: "How did you know that the rectangle you created had the same area as the other rectangles in that category?"



Student Responses

1. Students may sort by: length, height, or width.
    - Rectangles with the same area:
    - Area 12 square units: 3 by 4 (A), 12 by 1 (C)
    - Area 16 square units: 2 by 8 (D), 4 by 4 (E)
    - Area 24 square units: 8 by 3 (B), 2 by 12 (F)
2. Sample responses:
    - Area 12 square units: 2 by 6
    - Area 16 square units: 1 by 16
    - Area 24 square units: 4 by 6

Lesson Synthesis

10 min

"Today we learned we can draw squares in rectangles to represent tiling. We can count the squares to find the area of a rectangle just like we would count tiles."

"What helpful features do rectangles have that help us find their area?" (I can think about equal groups in rows or columns, I can just count one row or column and then skip count to find the area, I can think about how much bigger or smaller one rectangle is than another I saw earlier.)