MA.3.GR.2.2

Overarching Standard: ***MA.3.GR.2*** *Solve problems involving the perimeter and area of rectangles.*

Benchmark of Focus

MA.3.GR.2.2: Find the area of a rectangle with whole-number side lengths using a visual model and a multiplication formula.

Benchmark Clarifications

Clarification 1: Instruction includes covering the figure with unit squares, a rectangular array or applying a formula.

Clarification 2: Two-dimensional figures cannot exceed 12 units by 12 units and responses include the appropriate units in word form.

Related Benchmark/Horizontal Alignment

- MA.3.NSO.2.2/2.3/2.4

Vertical Alignment

Previous Benchmarks	**Next Benchmarks**
MA.2.AR.3.2	MA.4.GR.2.1/2.2
MA.2.GR.2.2	

Terms from the K-12 Glossary

- Rectangular Array

Purpose and Instructional Strategies

The purpose of this benchmark is for students to calculate the area of rectangles presented visually as arrays or by using a multiplication formula (MTR.5.1).

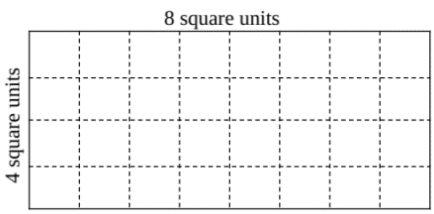
- The benchmark MA.3.GR.2.1 expects students to calculate the area of rectangles by counting unit squares that covered them with no gaps or overlaps. As students count, they will likely connect their calculations to rectangular arrays and connect understanding that multiplication is a more efficient strategy for calculating than counting or adding unit squares.
- Instruction should encourage students to discover a multiplication formula based on patterns they have observed through practice and classroom discussions. This will make a multiplication formula more meaningful for students conceptually (MTR.5.1). Teachers can help students formalize the formula into an equation, like $A = l \times w$. In this benchmark, memorization of a multiplication formula is the goal (MTR.3.1).

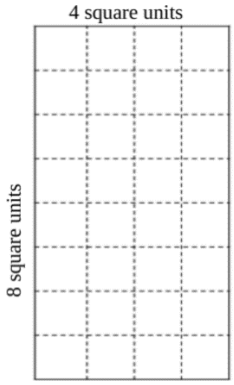
Common Misconceptions or Errors

- When using a formula, students may be confused about which dimension to label the length and width in a rectangle. During instruction, teachers should make connections to the commutative property of multiplication to emphasize that the order in which dimensions are multiplied will not change the rectangle's area, and therefore the length and width can be labeled flexibly.

Strategies to Support Tiered Instruction

- Instruction includes the teacher modeling how to draw in rows and columns to cover a figure based on the side lengths given. Students then count the total number of square units that make up the figure and write a multiplication equation to represent it. Teachers help students make the connection to the Commutative Property of Multiplication by having them create and compare figures with the same factors for their rows and columns, just switched. Emphasize that the order in which dimensions are multiplied will not change the rectangle's area, and therefore the length and width can be labeled flexibly.
    - For example, when provided with a figure with the dimensions of 4 × 8, students draw in the rows and columns as shown by the dotted lines. The teacher then asks students to do the same for an image with the dimensions 8 × 4 and has them compare the area of the two figures.





- Teacher provides dimensions for a given rectangle and students use square tiles to build the figure in two ways. Students then count the number of tiles in each row and in each column and creates a multiplication expression. Next, the students count the total number of tiles used to make the figure and recognize that as the area of the figure.
    - For example, the teacher asks students to create a rectangle with a length of 5 and a width of 7. Students use the square tiles to create two rectangles applying the Commutative Property of Multiplication and writing multiplication equations to match. Then, students count the total number of tiles to check that the area they found for their equation is correct.

Questions to ask students:

- **When finding area of a rectangle, what would be *more* efficient than counting one by one all the squares that cover the rectangle?**
    - Sample answer that indicates understanding: *If you know the number of rows and the number of squares in each row, you can multiply to find the area. For example, if there are 5 rows with 6 squares in each row, that's the same as 5 rows of 6 or 5x6. The area would be 30 square units.*

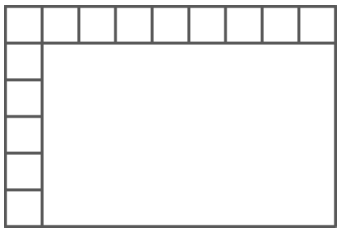
- **How could you find the area of a square that has side lengths of 6ft?**
    - Sample answer that indicates understanding: *I know a square has 4 equal sides so the length and width would each be 6ft. The array would be 6 rows of 6 in each row, so I can multiply 6x6 to find the square has an area of 36 square units.*

- **Reference a rectangle with side lengths identified, ask: what are some equations/expressions you could use to find the area of the rectangle?**
    - Sample answer that indicates understanding: *The length of the rectangle is 4in. and the width is 8in. You can multiply 4x8 or 8x4 or use repeated addition and do 8+8+8+8. The area of the rectangle is 32 square inches.*

Instructional Tasks

Instructional Task 1

Kendra used unit squares with 1-centimeter side lengths to find the area of the rectangle below. She started, but then stopped for a lunch break.

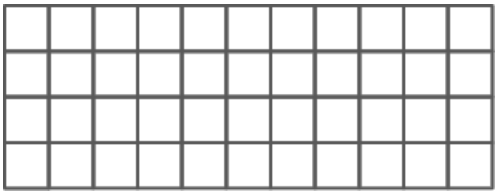


Part A: Write two equations that can be used to find the area of Kendra's rectangle.
Part B: What is the area of Kendra's rectangle?
Part C: Which has a greater area, the rectangle above or a square with side lengths of 8 centimeters? Explain.

Instructional Items

Instructional Item 1

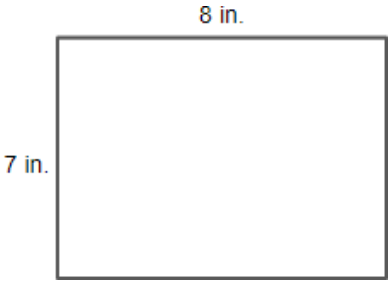
The rectangle below is composed of unit squares. Which equations can be used to find the area of the rectangle?



a. $A = 4 \times 10$
b. $A = 10 \times 4$
c. $A = 4 + 11$
d. $A = 4 \times 11$
e. $A = 11 + 11 + 11 + 11$
f. $A = 11 \times 4$

Instructional Item 2

What is the area of the rectangle below?



Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.3.GR.2.2 Find the area of a rectangle with whole-number side lengths using a visual model and a multiplication formula. Clarification 1: Instruction includes covering the figure with unit squares, a rectangular array or applying a formula. Clarification 2: Two-dimensional figures cannot exceed 12 units by 12 units and responses must include the appropriate units in word form.	Mathematical	Items will not include the formula for area.

ALD 2	ALD 3	ALD 4	ALD 5
finds the area of a rectangle by counting outlines using a visual model with square units tiled along the perimeter.	finds the area of a rectangle labelled with whole number side lengths by using a visual model.	finds the area of a rectangle with whole number side lengths using a visual model and a multiplication formula.	N/A

Additional Resources:
CPALMS Resources

Blog Post: Top 5 Things to Know About Using Arrays to Model Multiplication and Division (focus on multiplication)

Resources/Tasks to Support Your Child at Home:

Look for examples of square units covering the area of items in the real-world, for example: square tiles on a floor or ceiling. Ask your child how they could find the number of squares without counting them all. *How could you find the total number of squares? How could multiplication help you find the number of squares?*

Present your child with drawings of rectangles on graph paper and ask them to identify and record the length and width of each rectangle. Ask them to describe the array (*how many rows and how many*

squares in each row?) Have them explain how they can use the array and multiplication equations to find the areas of each rectangle.

Khan Academy Video: Transitioning from Unit Squares to Area Formula

Khan Academy Practice: Transitioning from Unit Square to Area Formula