MA.5.GR.2.1

Overarching Standard: ***MA.5.GR.2*** *Find* the perimeter and area of rectangles with fractional or decimal side lengths.

Benchmark of Focus

MA.5.GR.2.1 Find the perimeter and area of a rectangle with fractional or decimal side lengths using visual models and formulas.

Benchmark Clarifications

Clarification 1: Instruction includes finding the area of a rectangle with fractional side lengths by tiling it with squares having unit fraction side lengths and showing that the area is the same as would be found by multiplying the side lengths.

Clarification 2: Responses include the appropriate units in word form.

Related Benchmark/Horizontal Alignment

- MA.5.NSO.2.3/2.4/2.5
- MA.5.FR.2.1/2.2/2.3
- MA.5.AR1.2
- MA.5.M.1.1

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.3.GR.2.3 MA.4.GR.2.1	MA.6.GR.1.3

Terms from the K-12 Glossary

- Area Model
- Perimeter

Purpose and Instructional Strategies

The purpose of this benchmark is for students to understand how to work with fractional and decimal sums and products when calculating perimeter and area. This benchmark connects to previous work where students found areas and perimeters with whole number side lengths in Grade 4 (MA.4.GR.2.1) and prepares for future work of finding area and perimeter on a coordinate plane in Grade 6 (MA.6.GR.1.3).

- During instruction, teachers should encourage students to use models or drawings to assist them with finding the perimeter and area of a rectangle and have them explain how they used the model or drawing to arrive at the solution getting them to understand that multiplying fractional side lengths to find the area is the same as tiling a rectangle with unit squares of the appropriate unit fraction side lengths (MTR.5.1).
- This benchmark provides a natural real-world context and a visual model for the multiplication of fractions and decimals. When finding the area, teachers can begin with

students modeling multiplication with whole numbers and progress into the fractional and decimal parts, such as area models using rectangles or squares, fraction strips/bars and sets of counters. For example, ask questions such as, "What does 2 × 3 mean?" Then, follow with questions for multiplication with fractions, such as, "What does $\frac{3}{4}$ x $\frac{1}{3}$ mean?" "What does $\frac{3}{4}$ × 7 mean?" (7 sets of $\frac{3}{4}$) and What does 7 × $\frac{3}{4}$ mean?" ($\frac{3}{4}$ of a set of 7) (MTR.2.1, MTR.3.1, MTR.5.1).

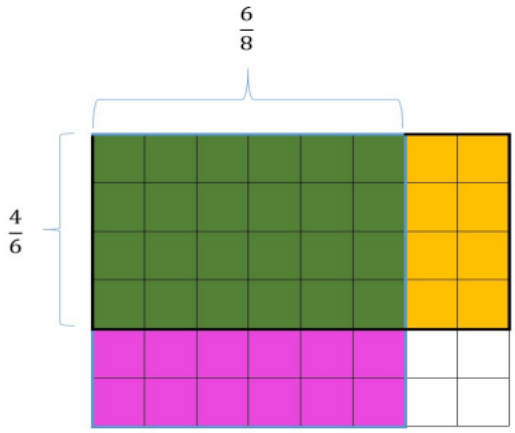
Common Misconceptions or Errors

- Students may believe that multiplication always results in a larger number. Working with area provides them with concrete situations where this is not true. For example, a city block that is $\frac{1}{10}$ mile by $\frac{1}{10}$ mile has an area of $\frac{1}{100}$ of a square mile.
- Students have difficulty connecting visual models to the symbolic representation using equations. Use concrete visuals to represent problems.

Strategies to Support Tiered Instruction

- Instruction provides opportunities to use concrete visuals to represent problems. Instruction includes providing a rectangle to divide into fractional parts. The teacher provides students with fractional dimensions to divide the figure into to find the area of part of the whole figure. Before calculating the area, students explain if the area will be greater or less than one of the dimensions and explain how they know.
    - For example, the teacher provides students with a blank rectangle and has students divide into fractional parts as shown below. The teacher uses prompts like those shown to help guide the students. After dividing the figure, the students use two different colors to shade the fractional parts and label each side with the shaded dimensions ($\frac{6}{8}$ or $\frac{4}{6}$).

Divide the figure vertically into eights.
Divide the figure horizontally into sixths.
Shade $\frac{6}{8}$ vertically and $\frac{4}{6}$ horizontally. The area of $\frac{6}{8} \times \frac{4}{6}$ is where the 2 shaded sections overlap.
Is the shaded area greater or less than $\frac{6}{8}$?
How do you know?



- Instruction includes providing fractional area models printed on transparency sheets. Models include equal size wholes divided into thirds, fourths, fifths, sixths, eighths, tenths, and twelfths. Students use two transparencies to show the area of given dimensions.
    - For example, the teacher asks students to find the area of a figure with side
    - lengths of $\frac{3}{4}$ inch and $\frac{4}{10}$ inch. Students model $\frac{3}{4}$ × $\frac{4}{10}$ by shading $\frac{3}{4}$ of one fraction and $\frac{4}{10}$ of another fraction model. The teacher has students explain if the area will be greater or less than $\frac{3}{4}$ and how they know. The students then overlap the two figures and determine the fractional parts that overlap as being the area.

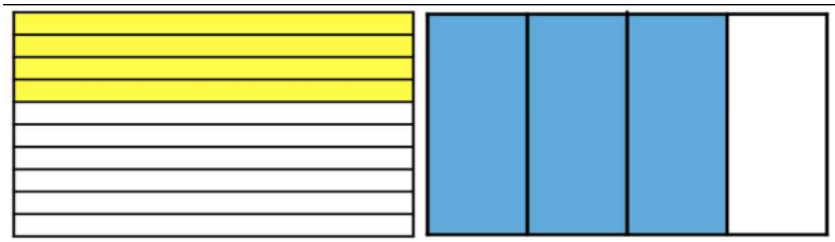
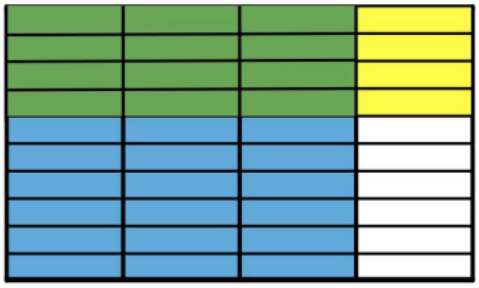
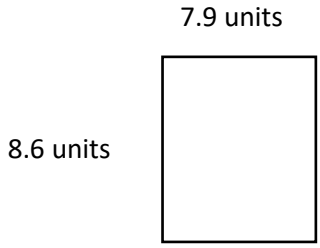


Image showing $\frac{4}{10}$ overlapping $\frac{3}{4}$, $\frac{12}{40}$ is overlapping.



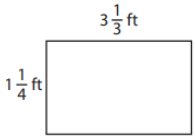
Questions to ask students:

- **What is the area of the rectangle below?**



- Sample answer that indicates understanding: Students will correctly multiply the length x width and use the correct units (7.9 units x 8.6 units = 67.94 square units), to determine the area of the rectangle.
- Sample answer that indicates an incomplete understanding or a misconception: Students may add the four sides to find the perimeter instead of the area. Students may place the decimal incorrectly in their product.

- **Explain how to calculate the perimeter of the rectangle shown below.**



- Sample answer that indicates understanding: Students may explain that they can add all 4 side lengths: ($l + l + w + w$) or students may use the formula: $p = 2(l) + 2(w)$ to find the perimeter. The lowest common denominator for the fractions is 12. The perimeter is 9 $\frac{2}{12}$feet.
- Sample answer that indicates an incomplete understanding or a misconception: Students may add the whole numbers and the fractions and respond with 8 $\frac{4}{14}$ feet or may only add 2 sides and respond with
$4\frac{2}{7}$ feet.

Instructional Tasks

Instructional Task 1

Margaret draws a rectangle with a length of 5.2 inches. The width of her rectangle is one-half its length.

Part A. Draw Margaret's rectangle and show its dimensions.

Part B. What is the perimeter of her rectangle in inches?

Part C. What is the area of her rectangle in square inches?

Instructional Items

Instructional Item 1

What is the area of the square below?

Benchmark	Context	Assessment Limits
MA.5.GR.2.1 Find the perimeter and area of a rectangle with fractional or decimal side lengths using visual models and formulas Clarification 1: Instruction includes finding the area of a rectangle with fractional side lengths by tiling it with squares having unit fraction side lengths and showing that the area is the same as would be found by multiplying the side lengths. Clarification 2: Responses must include the appropriate units in word form.	Both	Items will require the students to find the perimeter, the area, or both. Items including decimals will not include fractions. Items including fractions will not include decimals. Measuring units will not have exponents (cm2, etc.)

ALD 2	ALD 3	ALD 4	ALD 5
Given a visual model, finds the perimeter and area of a rectangle with no more than one fractional side length	Finds the perimeter and area of a rectangle with fractional or decimal side lengths using models.	Finds the perimeter and area of a rectangle with fractional or decimal side lengths using visual models and formulas.	Finds the perimeter and area of a rectangle with missing fractional or decimal side lengths using formulas.

Additional Resources:
CPALMS Resources: https://www.cpalms.org/PreviewStandard/Preview/15408

Khan Academy: https://www.khanacademy.org/math/cc-fifth-grade-math/5th-multiply-fractions/area-of-rectangles-with-fraction-side-lengths/v/example-finding-area-with-fractional-sides

Khan Academy: https://www.khanacademy.org/math/cc-fifth-grade-math/5th-multiply-fractions/area-of-rectangles-with-fraction-side-lengths/v/intuition-for-area-with-fractional-side-lengths

YouTube: https://youtu.be/ajVOkMLjwek

Resources/Tasks to Support Your Child at Home:

Khan Academy: https://www.khanacademy.org/math/cc-fifth-grade-math/5th-multiply-fractions/area-of-rectangles-with-fraction-side-lengths/e/area-of-rectangles-with-fractional-side-lengths

LearnZillion: https://learnzillion.com/lesson_plans/5693-find-the-area-of-a-rectangle-with-fractional-side-lengths-by-tiling