Just in Time Quick Check

Standard of Learning 4.MG.3

Strand: Measurement and Geometry

Standard of Learning 4.MG.3

The student will use multiple representations to develop and use formulas to solve problems, including those in context, involving area and perimeter limited to rectangles and squares (in both U.S. Customary and metric units).

Students will demonstrate the following Knowledge and Skills:

a) Use concrete materials and pictorial models to develop a formula for the area and perimeter of a rectangle (including a square).

b) Determine the area and perimeter of a rectangle when given the measure of two adjacent sides (in whole number units), with and without models.

c) Determine the area and perimeter of a square when given the measure of one side (in whole number units), with and without models.

d) Use concrete materials and pictorial models to explore the relationship between area and perimeter of rectangles.

e) Identify and represent rectangles with the same perimeter and different areas or with the same area and different perimeters.

f) Solve contextual problems involving area and perimeter of rectangles and squares.

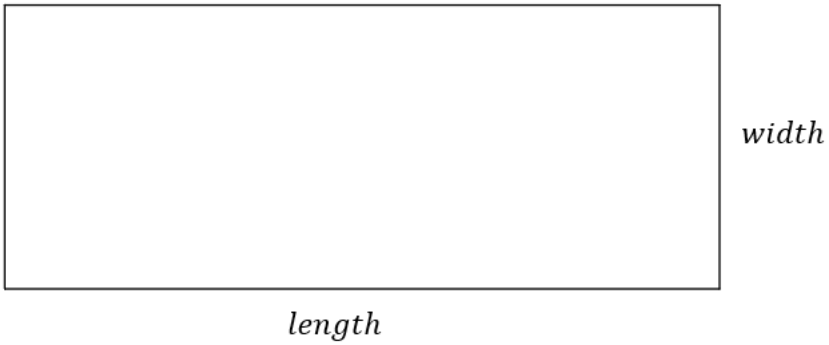
Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: 4.CE.2, 4.MG.5, 3.MG.2

Just in Time Quick Check 4.MG.3

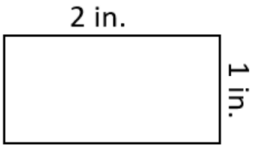
1. Marcus and Kelly were trying to find the area of the rectangle shown below.



- Marcus said the area could be determined using the formula $length \times width$.
- Kelly said that the area could be determined using the formula $(2 \times length) + (2 \times width)$.

Who is correct? Justify your reasoning.

2. Determine the perimeter and area of the rectangle.



Perimeter: _____

Area: _____

3. Determine the perimeter and area of a square with a side that measures 6 ft.

Perimeter: _____

Area: _____

4. The dimensions of six different rectangles are shown in the table below. Which rectangles have the same perimeter but different areas?

Rectangle 1 Length: 6 inches Width: 6 inches	**Rectangle 2** Length: 12 inches Width: 5 inches	**Rectangle 3** Length: 6 inches Width: 4 inches
Rectangle 4 Length: 8 inches Width: 3 inches	**Rectangle 5** Length: 10 inches Width: 2 inches	**Rectangle 6** Length: 8 inches Width: 4 inches

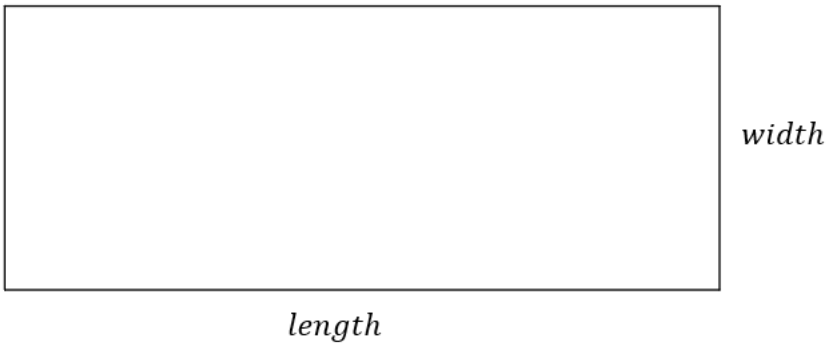
5. Sandra buys a rectangular rug for her bedroom. The rug has a width of 12 ft. and length of 10 ft. What is the area of the rug?

6. Mario wants to put a fence around a rectangular garden. He wants the area of the garden to be 48 square feet. Create two rectangles that could represent the dimensions of the garden. Draw the figure and label the dimensions.

4.MG.3 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. Marcus and Kelly were trying to find the area of the rectangle shown below.

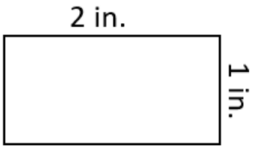


- Marcus said the area could be determined using the formula $length \times width$.
- Kelly said that the area could be determined using the formula $(2 \times length) + (2 \times width)$.

Who is correct? Justify your reasoning.

A common error is for students to state that Kelly is correct. This may indicate that students confused the formulas for area and perimeter. It may be helpful to have students work with concrete or pictorial rectangles with given lengths. For example, if given a rectangle with a length of 5 units and a width of 3 units, students could draw the rectangle on grid paper. From there, they could trace around the edges to determine the perimeter, noting that the perimeter is 5 + 3 + 5 + 3 or (2 × 5) + (2 × 3). Similarly, students could see that the rectangle is portioned into a 5 × 3 array, noting that the area is 5 × 3. Repeating this process with many rectangles of different sizes will help students see the patterns and generalize the formulas for perimeter and area of rectangles.

2. Determine the perimeter and area of the rectangle.



Perimeter: _____

Area: _____

A common error is for students to state that the perimeter is 3 inches. This may indicate that students do not understand the characteristics of a rectangle. Students may not recall that opposite sides of a rectangle are congruent. It may be helpful for students to label all four sides of the rectangle with the appropriate measurements.

Another common error is for students to state that the perimeter is 2 inches. This may indicate that students have not conceptualized the difference between perimeter and area. The underlying concept that perimeter is a measurement of length and area is a measurement of space can sometimes create confusion. Teachers may wish to have students count the number of squares within a figure (as they did in grade 3) to reinforce the connection between square units and area. More experiences with practical problems involving area and perimeter may be beneficial.

3. Determine the perimeter and area of a square with a side that measures 6 ft.

Perimeter: _____

Area: _____

Some students may struggle to determine the area and perimeter of the square because a labeled diagram is not provided. This may indicate that students do not understand the characteristics of a square, including that all sides of a square are congruent. It may be helpful to have students draw the square and label each side of the square with the appropriate measurements to reinforce this characteristic.

When solving for the area of the square, some students may incorrectly multiply 6 ft. by 4 instead of 6 ft. by 6 ft. It may be helpful for students to use grid paper to create the square, which would allow them to count the number of squares needed to cover the space inside the square. This would support conceptual understanding of area and the attributes of the unit of measure.

When solving for the perimeter of the square, some students may state that it is 6 ft. because they did not add all the sides of the square (or multiply the length of one side by 4). Students may also confuse the measurements for perimeter and area, stating that the area is 24 square ft. and the perimeter is 36 ft. Another common error is for students to use square ft. for the perimeter and ft. for the area. Drawing the square on grid paper, then tracing around the square to determine the perimeter may help reinforce the concept that perimeter is a measurement of length. Similarly, drawing the square on grid paper, then counting and labeling each smaller square within the square may help reinforce the concept that area is a measurement of space.

4. The dimensions of six different rectangles are shown in the table below. Which rectangles have the same perimeter but different areas?

Rectangle 1 Length: 6 inches Width: 6 inches	**Rectangle 2** Length: 12 inches Width: 5 inches	**Rectangle 3** Length: 6 inches Width: 4 inches
Rectangle 4 Length: 8 inches Width: 3 inches	**Rectangle 5** Length: 10 inches Width: 2 inches	**Rectangle 6** Length: 8 inches Width: 4 inches

Students may have difficulty determining rectangles that have the same perimeter of different areas (or the same area and different perimeters). For example, students may choose Rectangles 1, 3, 4, 5, and 6 because they all have a measurement that is 24 (Rectangles 1, 5, and 6 have a perimeter of 24 inches and Rectangles 3 and 4 have an area of 24 square inches). Another common error is to state that Rectangles 3 and 4 have the same perimeter but different areas. This may indicate that students found the rectangles that have the same area, rather than the same perimeter. It is important to question students to determine whether the mistake was the result of misreading the question (i.e., believing the question asked for rectangles with the same area and different perimeters) or the result of a misunderstanding of the concepts of area and perimeter.

Students may also struggle with this problem because the images of the rectangles are not provided. They may try to do mental math and keep track of the areas and perimeters of each rectangle. It may be helpful for students to draw each of the rectangles using grid paper, label each side, and write the area and perimeter next to each rectangle. Creating a visual of the different rectangles may help students see which rectangles have the same perimeter but different areas.

5. Sandra buys a rectangular rug for her bedroom. The rug has a width of 12 ft. and length of 10 ft. What is the area of the rug?

Students who confuse perimeter and area may find the perimeter of the rug, rather than the area, resulting in an incorrect answer of 44 ft. Teachers may wish to encourage students to draw and label the dimensions of the rectangular rug before solving the problem to assist the students in visualizing what is being asked. Additionally, engaging students in discussions about real life applications of perimeter and area will assist students in understanding the difference between area and perimeter.

6. Mario wants to put a fence around a rectangular garden. He wants the area of the garden to be 48 square feet. Create two rectangles that could represent the dimensions of the garden. Draw the figures and label the dimensions.

   This question requires students to work backwards from knowing the area to finding the dimensions of a specified area. Students may not recognize that they need to use factor pairs of a number (i.e., factor pairs of 48 in the given problem) to find the dimensions of the area. Some students may also struggle with finding an answer when there are multiple solutions. It may be helpful for students to create rectangles using grid paper or concrete manipulatives (e.g., inch squares) to assist them with finding a solution. It may also be beneficial for students to engage in class discussions about their strategies to find multiple rectangles that have an area of 48 square feet.

   Alternatively, teachers may also encourage students to investigate situations in which students must find the length and width for a given perimeter. For example, this scenario could be tweaked such that Mario is putting a fence around the rectangular garden and he wants to use 48 feet of fencing. Students could then determine the dimensions of rectangles that would produce a perimeter of 48 feet.