Next Steps and Instructional Moves

The intended purpose of this document is to provide teachers with a tool to determine student understanding and suggest instructional moves that may help guide a student forward in their learning of a concept or standard. This guide is not an exhaustive list of strategies.

<table>
<tr><th colspan="2">Third Grade: Cluster 6
Measurement and Data
Area and Perimeter</th></tr>
<tr><td colspan="2">NC.3.MD.5 Find the area of a rectangle with whole-number side lengths by tiling without gaps or overlaps and counting unit squares.
NC.3.MD.7 Relate area to the operations of multiplication and addition.
● Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
● Multiply side lengths to find area of rectangles with whole-number side lengths in the context of problem solving and represent whole-number products as rectangular areas in mathematical reasoning.
● Use tiles and/or arrays to illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles, and that the area of the larger rectangle is the sum of the two smaller rectangles.
NC.3.MD.8 Solve problems involving perimeters of polygons, including finding the perimeter given the side lengths, and finding an unknown side length.</td></tr>
<tr><td rowspan="2">Not Yet</td><td>Students that are consistently scoring “Not Yet” on area and perimeter tasks could have a variety of errors. Students consistently scoring “Not Yet” on area and perimeter tasks may not be able to demonstrate understanding of the difference between area and perimeter and what they are measurements of. Further, students may demonstrate difficulty in using appropriate strategies to find the area or perimeter of shapes, including identifying and using the related operations of multiplication and addition. In Third Grade, the focus is not on formulas for area and perimeter, but rather the conceptual understanding of what the area and/or perimeter of shapes are measuring.</td></tr>
<tr><td><u>Next Steps:</u>
For students having trouble understanding area is measured in square units:
● Some students may not understand that area covers the surface and may need to look at covering in beans and circular counters first. They should notice there is space not covered to see the need for a square unit so there are no gaps or overlaps when finding area.
● Pose tasks in which students cover rectangles and squares with square color tiles and count the number of tiles needed to cover the shape to determine the area.
● As students gain more experiences tiling, have them draw pictures of their tiling work on grid/graph paper. Students should have ample opportunities tiling with physical objects before moving to only pictorial representations on graph paper.
● Ordering rectangles lesson

For students having difficulty using distinguishing between square inches and square centimeters:
● Provide students with 1-inch square tiles and have them build a rectangle, count the tiles and find the area. Then ask students to draw their rectangle on 1-cm graph paper. Have a discussion on the difference in size of each of the rectangles and why they are different. Students should see the difference in size is due to the difference in size of the square unit used for each.</td></tr>
</table>

Next Steps and Instructional Moves

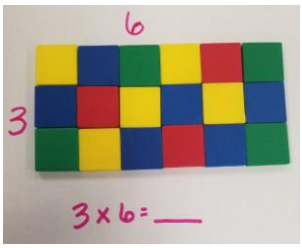
	For students with errors related to using addition to find the perimeter: ● Have students tape off a large rectangle on the floor (preferably a floor is in square units) and then cut a piece of string the size of each side. Measure the lengths of each of the 4 strings and ask how do they find the total perimeter if they only know the measurement of string? (Add them!) Lay them out in a straight line to show how perimeter is a linear measurement so they can see the total perimeter for their large rectangle. Ask, "How far would an ant walk if he walked the perimeter of their rectangle?" ● Present students with real life problems as they relate to perimeter and discuss the difference between strategies used to find the area. ● Review characteristics of polygons and linear measurement from second grade standards. ● Revisit using expanded form and adding in parts with equations or open number lines to support students' addition work. ● Finding and measuring perimeter lesson.

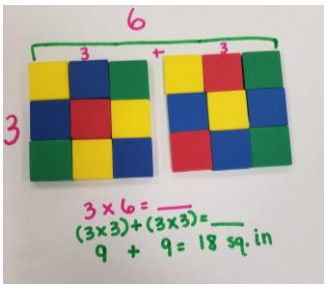
Progressing	Students that are consistently scoring "Progressing" have a strategy to use for finding area and perimeter; however, they have not mastered this strategy or may also still struggle with the difference between area and perimeter. Students also may not be sure how to notate their answers (units/square units). The more comfortable students become with solving a variety of real world area and perimeter problems, the easier it will be for them to distinguish between the two concepts and how to notate their answer.
	Next Steps: **For students having trouble making the connection between area and the operations of multiplication and area:** ● Incorporate strategies from Cluster 4- Making Sense of Multiplication and Division, as it relates to the use of area models and arrays to find the product of two numbers. ● Provide opportunities for students to explore tasks where they find the area of rectangles with similar dimensions and discuss the commutative property. Ex: Rectangle A is 7 inches high and 5 inches wide while Rectangle B is 5 inches high and 7 inches wide. What do you notice about the areas? ● Breaking Apart Areas Lessons: Lesson 1, Lesson 2 ● Pose tasks in which students take a larger rectangle and partition it into smaller rectangles. Ex: The Gonzalez family has a patio that is 9 yards long and 8 yards wide. They put a table on the patio that is 2 yards long and 8 yards wide. Draw a picture of the patio and determine the area of the table and the remainder of the patio not covered by the table. ● While working with pictures of rectangles, start by posing tasks that include the area of partitioned shapes that have rows and columns. As students develop understanding, transition to non-partitioned rectangles in which students have to partition the shapes themselves. ● The focus of third grade is NOT to teach the formula A=L x W, but rather to understand conceptually through multiple experiences ***why*** the number of tiles needed to cover a rectangle is the same as (or equal to) the area when using repeated addition or multiplying the dimensions of the rectangle.

Next Steps and Instructional Moves

For students with errors related to decomposing large rectangles into smaller rectangles to make finding the area easier:

- Exploring 24 Tile Rectangles- Provide students with 24 tiles and graph paper. Have students make as many different rectangles as possible using all 24 tiles. They should draw the rectangles and record the dimensions on paper. (24 tiles: 24x1, 12x2, 8x3, 6x4)
- Decomposing Rectangles Activity: Provide students with square tiles to make a large rectangle and label the length and width. Then have students split the rectangle into two smaller rectangles, either by rows or columns, by sliding the tiles apart. The two new rectangles, should be easily distinguished and the "split" side length should be re-labeled, allowing students to see the two smaller rectangles in relation to the original rectangle and side length.





- Provide opportunities for students to examine and discuss tasks related to the meaning of properties from Cluster 4, specifically the distributive property, as it relates to decomposing a factor into two addends.

For students struggling to distinguish between area and perimeter:

- Ensure that students have ample opportunities to solve real world problems involving area and perimeter separately before requiring them to distinguish between situations that could be focused on area or perimeter.
- Is it Perimeter or Area? Activity: Have students sort different area and perimeter situations with the emphasis on identifying the type of problem, not necessarily solving to find a solution. Then have students compare the differences in the types of problems.
    - Examples of area situations- painting a wall, covering a floor with carpet or tile, building a patio, planting a garden, an area rug…
    - Examples of perimeter situations- amount of fencing needed for a garden, or making an animal enclosure, border on a wall, poster or bulletin board, picture frame, walking distance around a football/soccer field, or lake…
    - Perimeter examples can include any polygon, not just rectangles. In Grade 3, area situations are limited to rectangles, which include squares.

For students having difficulty finding an unknown side length when given the area or perimeter and one other side length:

- Re-visit Cluster 5, discussing the attributes of quadrilaterals. Provide more opportunities for students to discover and discuss that opposite sides of rectangles are equal and that all sides of a regular polygon are equal.
- Re-visit Cluster 4 and the idea about how to find the missing factor in a multiplication problem, using a variable to represent the unknown as it relates to finding the area of a rectangle.

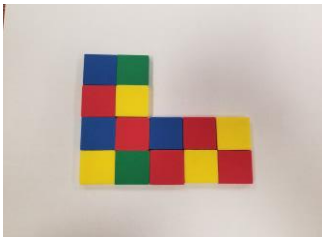
Next Steps and Instructional Moves

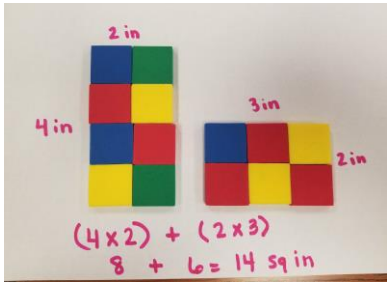
Meets Expectation	Students that are consistently scoring "Meets Expectation" on area and perimeter tasks should have a good command of solving a variety of area and perimeter tasks accurately and be able to justify or prove their answer. Students meet the expectation for this standard when they demonstrate flexibility in the strategies they use, understand and can explain these strategies, and produce accurate answers efficiently.

Next Steps:

NOTE: The goal is to have third grade students use and understand a variety of strategies for finding area and perimeter. Be sure students that consistently score meets expectation on area and perimeter tasks can use and explain a variety of appropriate strategies before exploring fourth grade concepts. The ideas below are merely listed as a means to get students exploring and discussing these concepts, not to learn or be taught the fourth grade standards.

- In fourth grade students will investigate, in depth, that shapes with the same area can have different perimeters and vice versa. Exploring this concept in third grade will deepen students' understanding of area and perimeter concepts and help them understand that while the two concepts are related and may impact each other, there are not directly correlated to one another. Ex: You have 16 yards of fencing. How many different sized rectangular areas can you make for your dog to play in? Which dimensions give your dog the most area?
- Allow students to explore tasks where the perimeters of several rectangles have the same area, and vice versa.
  - Example- a rectangle with side lengths of 4 cm and 5 cm has an area of 20 square cm and a perimeter of 18 cm, while a rectangle with side lengths of 10 cm and 2 cm also has an area of 20 square cm, it has a perimeter of 24 cm.
  - Example- a rectangle with side lengths of 3 cm and 7 cm has a perimeter of 20 cm and an area of 21 square cm, while a rectangle with side lengths 6 cm and 4 cm has a perimeter of 20 cm, but an area of 24 square cm.
- Enrichment- Students that meet the expectation for finding the area of large rectangles by breaking them into smaller rectangles and adding the two areas together may try finding the area of rectilinear figures, a concept that is taught in fourth grade. Students will break the rectilinear figure into two rectangles, find the area of each and add the two areas for the total area. Students in third grade should use square tiles and/or graph paper to model these problems.





  - If students are successful in splitting the rectilinear figure and accurately finding the area, see if they can split it a different way.
  - On a computer students should load the website: http://www.shodor.org/interactivate/activities/AreaExplorer/ Students select the perimeter and click the box "Draw only rectangular shapes." Students record their work and solutions in their math journal or notebook.