3 GRADE

Mathematics Curriculum

Topic C
Arithmetic Properties Using Area Models

3.MD.5, 3.MD.7

Focus Standards:	3.MD.5	Recognize area as an attribute of plane figures and understand concepts of area measurement.
		a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
		b. A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.
	3.MD.7	Relate area to the operations of multiplication and addition.
		a. 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.
		b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
		c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
		d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.
Instructional Days:	3	
Coherence -Links from:	G2–M2	Addition and Subtraction of Length Units
	G3–M1	Properties of Multiplication and Division and Solving Problems with Units of 2–5 and 10
	G3–M3	Multiplication and Division with Units of 0, 1, 6–9, and Multiples of 10
-Links to:	G4–M3	Multi-Digit Multiplication and Division
	G4–M7	Exploring Multiplication

Topic C begins with a concrete study of arithmetic properties. Students cut apart rectangular grids and rearrange the parts to create new rectangles with the same area. Lesson 9 lays the foundation for the work to come in Lessons 10 and 11.

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In Lesson 10, students apply knowledge of the distributive property from Modules 1 and 3 to find area. In previous modules, they learned to decompose an array of discrete items into two parts, determine the number of units in each part, and then find the sum of the parts. Now, students connect this experience to using the distributive property to determine the unknown side length of an array that may, for example, have an area of 72 square units. They might decompose the area into an 8 by 5 rectangle and an 8 by 4 rectangle. The sum of the side lengths, 5 + 4, gives the length of the unknown side.

In Lesson 11, students use a given number of square units to determine all possible whole number side lengths of rectangles with that area. Students engage in MP.3 as they justify that they have found all possible solutions for each given area using the associative property. Areas of 24, 36, 48, and 72 are chosen to reinforce multiplication facts that are often more difficult. Students realize that different factors give the same product. For example, they find that 4 by 12, 6 by 8, 1 by 48, and 2 by 24 arrays all have an area of 48 square units. They use understanding of the commutative property to recognize that area models can be rotated similar to the arrays in Modules 1 and 3.

A Teaching Sequence Toward Mastery of Arithmetic Properties Using Area Models
Objective 1: **Analyze different rectangles and reason about their area.** **(Lesson 9)**
Objective 2: **Apply the distributive property as a strategy to find the total area of a larger rectangle by adding two products.** **(Lesson 10)**
Objective 3: **Demonstrate the possible whole number side lengths of rectangles with areas of 24, 36, 48, or 72 square units using the associative property.** **(Lesson 11)**