Reason with shapes and their attributes (Standards 1–3).

Standard 2.G.1 Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Sizes are compared directly or visually, not compared by measuring. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

Concepts and Skills to Master

- Identify shapes (see Academic Vocabulary below for a list) by the number of angles, sides, or equal faces
- Draw two-dimensional shapes given specified attributes (accuracy of drawings may be limited by a student's fine motor skills), students may explore drawing three-dimensional shapes but are not expected to do so

Teacher Note: Through building, drawing, and analyzing two- and three-dimensional shapes, students will develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades. While students do not measure angles in second grade, they are first exposed to them as defining attributes.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of squares **2.G.3** Partition circles and rectangles into two, three, or four equal shares	**3.G.1** Understand that shapes in different categories may share attributes, and that the shared attributes can define a larger category **4.G.1** Draw points, lines, line segments, rays, angles (right, acute, and obtuse) and perpendicular and parallel lines **4.G.2** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or angles of a specified size

Critical Background Knowledge from Previous Grade Levels

- Identify defining attributes such as: number of sides, number of corners/vertices, etc. (1.G.1)
- Distinguish between defining attributes versus non-defining attributes; build and draw shapes that possess defining attributes (1.G.1)
- Correctly name shapes regardless of their orientations or overall sizes; Analyze, compare, and sort two- and three-dimensional shapes; Model and create shapes (K.G.2, K.G.4, K.G.5)
- Students work with trapezoids, half-circles, quarter-circles, and rectangular prisms in addition to kindergarten shapes in first grade (1.G.2a)
- Students work with squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres in kindergarten (K.G)

Academic Vocabulary

square, quarter-circle, triangle, rectangle, hexagon, cube, flat, solid, two-dimensional, three-dimensional, draw, attribute, defining attribute, non-defining attribute, closed figure, sides, corners/vertices, angles, edges, face, straight, round
Shapes new to second grade: quadrilateral, pentagon

Suggested Models	Suggested Strategies
 Teacher says, "Draw a closed shape that has five sides. What is the name of the shape?" Student says, "I drew a shape with 5 sides. It is a pentagon."  Student A says, "I have 3 sides and 3 angles. What am I?" Student B says, "A triangle. See, 3 sides, 3 angles."	• Identify and sort shapes from collections with various colors, sizes, and orientations • Draw a shape based on a given set of attributes, not the name of the shape • Explore drawing three-dimensional shapes, dot paper or isometric dot paper may be helpful • Construct shapes from various materials such as marshmallows and tooth picks, clay, straws, etc.

Image source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/2.pdf

Reason with shapes and their attributes (Standards 1–3).

Standard 2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of squares.

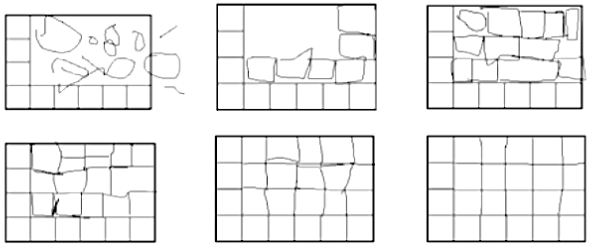
Concepts and Skills to Master

- Understand that a rectangle can be tiled with squares; there should be no overlaps or gaps
- Understand that all squares used to tile the rectangle must be the same size
- Understand that each row contains the same number of squares; repeated addition can be used to find the total number of squares
- Draw rows and columns to partition the rectangle into same-size squares
- Understand that the number of lines used to partition into columns or rows is one less than the number of columns or rows (three lines will partition the rectangle into four rows)

Teacher Note: This standard supports the use of arrays for understanding multiplication in third grade. "This involves more learning than is sometimes assumed. Students need to understand how a rectangle can be tiled with squares lined up in rows and columns. At the lowest level of thinking, students draw or place shapes inside a rectangle but do not cover an entire region. Only at the later levels do all the squares align vertically and horizontally." The number of objects arranged in rectangular arrays is limited to 5 rows and 5 columns (2.OA.4).

Text and image source: http://commoncoretools.me/wp-content/uploads/2014/12/ccss_progression_gk6_2014_12_27.pdf

Levels of thinking in spatial structuring



Levels of thinking portrayed by different students as they attempted to complete a drawing of an array of squares, given one column and row. This was an assessment, not an instructional task.

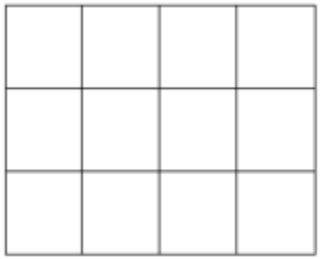
Related Standards: Current Grade Level	Related Standards: Future Grade Level
2.G.3 Partition circles and rectangles into two, three, and four equal shares; describe the shares as halves, thirds, half of, etc. **2.OA.4** Use addition to find the total number of objects arranged in a rectangular array and write an equation to express the total	**3.OA.1** Interpret products of whole numbers (using arrays as visual models) **3.OA.5** Apply properties of operations as strategies to multiply and divide (using arrays as visual models) **3.MD.6** Measure area by counting unit squares **3.G.2** Partition shapes into parts with equal areas and express the area of each part as a unit fraction of the whole

Critical Background Knowledge from Previous Grade Levels

- Notice smaller shapes within a larger existing shape (1.G.2)
- Partition circles and rectangles into two and four equal shares; describe the shares as halves, fourths, and quarters. Understand that decomposing into more equal shares creates smaller shares (1.G.3)
- Compose simple shapes to form larger shapes (K.G.6)
- Multiple shapes in a row equal the total (1.MD.2)

Academic Vocabulary

rectangle, row, column, same-size, partition, square

Suggested Models	Suggested Strategies
 4 + 4 + 4 = 12 Mathematical convention states that this model is thought of as three rows or groups of four and should be written as three addends of four (4 + 4 + 4 = 12). Students may also be exposed to this model as four columns or groups of three which would be written as four addends of three (3 + 3 + 3 + 3 = 12). This will prepare students for the commutative property of multiplication (3.OA.5).	• Use square tiles to fill a given rectangle, then identify how many tiles are contained within each row and each column • Use context to partition rectangles into rows and columns (garden boxes, patio tiles, classroom tables, etc.) • Partition rectangles using pipe cleaners or popsicle sticks to create the rows and columns • Given a rectangle, draw a given number of rows/columns and count to find the total number of squares created

Reason with shapes and their attributes (Standards 1–3).

Standard 2.G.3 Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves, thirds, half of, a third of,* etc.; and describe the whole as two halves, three thirds, or four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Concepts and Skills to Master

- Recognize when shares are and are not equal
- Partition circles and rectangles into two, three, or four equal shares
- Describe the whole as two halves, three thirds, or four fourths
- Understand that the word halves is used to describe two equal shares that compose the whole (meaning that there are two parts and those two parts must be equal in size)
- Understand that the word thirds is used to describe three equal shares that compose the whole (meaning that there are three parts and those three parts must be equal in size)
- Understand that the words fourths and quarters are used to describe four equal shares that compose the whole (meaning that there are four parts and those four parts must be equal in size)
- Reason that as the number of equal shares in the whole increases, the size of the share decreases (thirds are smaller than halves because the whole has been partitioned into more equal parts)
- Recognize that equal shares of identical wholes need not have the same shape (see Suggested Models below)

Teacher Note: Students need only explore fraction concepts using rectangles and circles. Students extend first grade understanding to include thirds in second grade. Students verbally use the words partition, halves, thirds, fourths, and quarters and the phrases half of, quarter of and third of to describe their thinking. Second grade students are not expected to use or recognize fraction notation (½, ⅓, ¼). Fractional notation begins in third grade. Emphasis should be placed upon the relationship between the shares and the whole. Students should be given extensive opportunities to partition circles and rectangles rather than just identifying shares of pre-partitioned shapes.

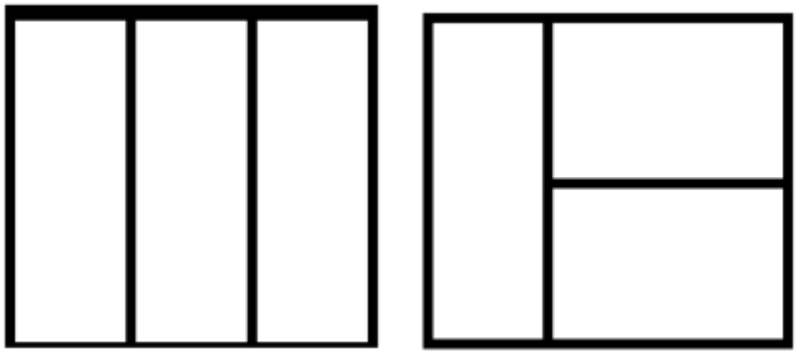
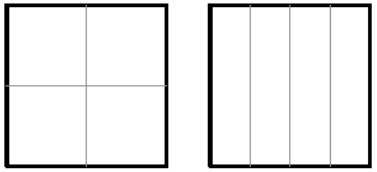
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of squares **2.OA.4** Use addition to find the total number of objects arranged in a rectangular array and write an equation to express the total	**3.NF.1** Understand unit fractions **3.NF.2** Understand a fraction as a number on the number line **3.NF.3** Explain equivalence of fractions and compare fractions by reasoning about their size **3.G.2** Partition shapes into parts with equal areas and express the area of each part as a unit fraction of the whole **4.NF.1** Explain why fractions are equivalent using area models

Critical Background Knowledge from Previous Grade Levels

- Notice smaller shapes within a larger existing shape (see how two triangles make a square) (1.G.2)
- Partition circles and rectangles into two and four equal shares; describe the shares as halves, fourths, and quarters. Understand that decomposing into more equal shares creates smaller shares (1.G.3)
- Compose simple shapes to form larger shapes (K.G.6)

Academic Vocabulary

circle, rectangle, partition, decompose, equal shares, halves, thirds, fourths, quarters, half of, third of, fourth of, quarter of, whole

Suggested Models	Suggested Strategies
 **Squares partitioned into fourths**  These different partitions of a square afford the opportunity for students to identify correspondences between the differently-shaped fourths (MP.1), and to explain how one of the fourths on the left can be transformed into one of the fourths on the right (MP.7).	• Partition regions into equal shares using a context (for example: cookies, pies, pizza, brownies, crackers, grass area, etc.) • Sort shapes that are partitioned into equal shares and shares that are not equal • Partition shapes using manipulatives such as geoboards, paper rectangles and circles, food, etc. • Use context to compare the relative size of halves, thirds, and fourths (Would you rather have a third of this candy bar or a fourth of the same candy bar?) • Use context to compare the size of equal shares that differ in shape (Would you rather have the fourth of this brownie that is cut into a triangle or the fourth of the same brownie that is cut into a square? Which piece is more brownie?) • Find many, varied, and unusual ways to partition circles and rectangles into halves, thirds, and fourths