

# K–6, Geometry

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## Grade 2

Students learn to name and describe the defining attributes of categories of two-dimensional shapes, including circles, triangles, squares, rectangles, rhombuses, trapezoids, and the general category of quadrilateral. They describe pentagons, hexagons, septagons, octagons, and other polygons by the number of sides, for example, describing a septagon as either a “seven-gon” or simply “seven-sided shape” (MP2).<sup>2.G.1</sup> Because they have developed both verbal descriptions of these categories and their defining attributes and a rich store of associated mental images, they are able to draw shapes with specified attributes, such as a shape with five sides or a shape with six angles.<sup>2.G.1</sup> They can represent these shapes’ attributes accurately (within the constraints of fine motor skills). They use length to identify the properties of shapes (e.g., a specific figure is a rhombus because all four of its sides have equal length). They recognize right angles, and can explain the distinction between a rectangle and a parallelogram without right angles and with sides of different lengths (sometimes called a “rhomboid”).

Students learn to combine their composition and decomposition competencies to build and operate on composite units (units of units), intentionally substituting arrangements or composites of smaller shapes or substituting several larger shapes for many smaller shapes, using geometric knowledge and spatial reasoning to develop foundations for area, fraction, and proportion. For example, they build the same shape from different parts, e.g., making with pattern blocks, a regular hexagon from two trapezoids, three rhombuses, or six equilateral triangles. They recognize that the hexagonal faces of these constructions have equal area, that each trapezoid has half of that area, and each rhombus has a third of that area.<sup>2.G.3</sup>

This example emphasizes the fraction concepts that are developed; students can build and recognize more difficult composite shapes and solve puzzles with numerous pieces. For example, a tangram is a special set of 7 shapes which compose an isosceles right triangle. The tangram pieces can be used to make many different configurations and tangram puzzles are often posed by showing pictures of these configurations as silhouettes or outlines. These pictures often are made more difficult by orienting the shapes so that the sides of right angles are not parallel to the edges of the page on which they are displayed. Such pictures often do not show a grid that shows the composing shapes and are generally not preceded by analysis of the composing shapes.

Students also explore decompositions of shapes into regions that are congruent or have equal area.<sup>2.G.3</sup> For example, two squares can be partitioned into fourths in different ways. Any of these fourths represents an equal share of the shape (e.g., “the same amount of cake”) even though they have different shapes.

Another type of composition and decomposition is essential to students’ mathematical development—*spatial structuring*. Students

**2.G.1** Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.<sup>3</sup> Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

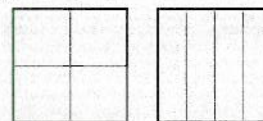
**2.G.1** Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.<sup>4</sup> Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

**Different pattern blocks compose a regular hexagon**



**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, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

**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).

**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, four fourths. Recognize that equal shares of identical wholes need not have the same shape.