# **Geometry Discussion Guide (for use during or after reading)**

1. Define the following foundational geometric terms: plane, point, line, line segment, angle, and vertex. (Planes, Points, Lines, and Angles, p. 6-11)
   1. A plane is a flat surface that has two dimensions: length and width. A plane goes on forever.
   2. A point is an exact position on a plane. It has no length, width, or height. Points are often named with letters.
   3. A line is a set of points that extends forever at both ends. A line is usually named with two of its endpoints and represented by a line with double arrows.
   4. A line segment is part of a line that exists between two endpoints. Line segments are also named by their endpoints and are represented by a line with no arrows.
   5. An angle forms from two line segments or rays that share a common endpoint. Angles are measured in degrees.
   6. A vertex is the endpoint shared by both line segments or rays in an angle. Angles are often named used their three endpoints, placing the vertex in the center of the name. For example, in the angle ABC, point B is the vertex.
2. What are parallel and perpendicular lines? (Parallel and Perpendicular Lines, p. 12-13)
   1. Parallel lines are lines in the same plane that never intersect, or cross.
   2. Perpendicular lines are lines in the same plane that not only intersect but do so to form right angles.
3. Describe the five types of triangles detailed on pages 14 and 15. (Triangles, p. 14-15)
   1. A right triangle has exactly one right angle.
   2. An obtuse triangle has exactly one obtuse angle that measures between 90 and 180 degrees.
   3. An equilateral triangle has sides and angles that are all the same size. In an equilateral triangle, all the angles have a measure of 60 degrees.
   4. An isosceles triangle is one in which two sides have the same length and their opposite angles have equal measurements.
   5. A scalene triangle is one in which all three sides and all three angles are different.
4. What is a quadrilateral? Choose and describe one type of quadrilateral. (Quadrilaterals, p. 16-17)
   1. A quadrilateral is a two-dimensional figure with four sides and four interior angles. Quadrilaterals are polygons and include such figures as squares, rhombuses, rectangles, parallelograms, and trapezoids.
   2. Students’ descriptions of quadrilaterals will vary depending on what they choose, but they should include a description of what makes that shape unique. For example, a student may describe a square as a parallelogram with four sides of equal length and four right angles.
5. What is a polygon? Provide an example to support your answer. Is a circle considered a polygon? Why or why not? (Polygons, p. 20-23)
   1. A polygon is a two-dimensional figure with three or more straight sides and the same number of angles as sides. Hexagons are six-sided polygons that contain six interior angles. Octagons are eight-sided polygons that contain eight interior angles.
   2. A circle is not considered a polygon because polygons have angles and straight sides, and circles have neither of those attributes.
6. What are three-dimensional figures? Describe an example of a common three-dimensional figure. (Three-Dimensional Figures, p. 24-27)
   1. Three-dimensional figures have length and width like two-dimensional figures, but they also include height. Common three-dimensional figures include cubes, cylinders, rectangular prisms, square pyramids, cones, and spheres.
   2. Students’ descriptions of three-dimensional figures will vary depending on the figure they choose, but they should include a description of what makes that figure unique. For example, a student may describe a square pyramid as a figure with a square base and four triangular faces that join to make a point, or a vertex.
7. According to the text, what can be said about the lines of symmetry for regular polygons, irregular polygons, and circles? (Symmetry, p. 28-29)
   1. According to the text, regular polygons contain the same number of lines of symmetry as their number of sides or angles. Irregular polygons have fewer lines of symmetry than their regular counterparts. Circles, on the other hand, are unique because they have an infinite number of lines of symmetry.
8. Describe what must be true for two figures to be considered congruent. (Congruent Figures, p. 30-33)
   1. For two figures to be considered congruent, they must have the same shape and size. However, congruent figures may be in different positions from one another. For example, you can create a congruent figure by turning, sliding, or flipping it.
9. Describe what must be true for two figures to be considered similar. (Similar Figures, p. 34-35)
   1. For two figures to be considered similar, they must have matching angles as well as side lengths that are proportional to one another. For example, a rectangle with a length of 2 and a width of 4 is similar to a rectangle with a length of 4 and a width of 8 because the angles are the same size and the side lengths have a proportional (doubled) relationship.
10. Explain how ratios relate to the idea of similarity in geometry. (Similar Figures, p. 34-35)
    1. Ratios can be used to determine whether two figures are similar and to generate new, similar figures. We can apply proportional reasoning to determine whether the side lengths of two figures with equivalent angles are related by the same ratio. For example, a triangle with side lengths 3, 4, and 5 can be said to be similar to one with the same angles and side lengths 9, 12, and 15 because the ratio of the side lengths is always 1 to 3.