Geometry Information

Fluency Recommendations

G-SRT.5 Fluency with the triangle congruence and similarity criteria will help students throughout their investigations of triangles, quadrilaterals, circles, parallelism and trigonometric ratios. These criteria are necessary tools in many geometric modeling tasks.

G-GPE.4, 5, 7 Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.

G-CO.12 Fluency with the use of construction tools, physical and computational, helps students
draft a model of a geometric phenomenon and can lead to conjectures and proofs.

Mathematical Practice Standards for Geometry

Discussion of Mathematical Practices in Relation to Geometry Course Content

• Reason abstractly and quantitatively (MP.2). Abstraction is used in geometry when, for example, students use a diagram of a specific isosceles triangle as an aid to reason about all isosceles triangles (G-CO.9). Quantitative reasoning in geometry involves the real numbers in an essential way: Irrational numbers show up in work with the Pythagorean theorem (G-SRT.8), area formulas often depend (subtly and informally) on passing to the limit and real numbers are an essential part of the definition of dilation (G-SRT.1). The proper use of units can help students understand the effect of dilation on area and perimeter (N-Q.1).

• Construct viable arguments and critique the reasoning of others (MP.3). While all of high school mathematics should work to help students see the importance and usefulness of deductive arguments, geometry is an ideal arena for developing the skill of creating and presenting proofs (G-CO.9.10). One reason is that conjectures about geometric phenomena are often about infinitely many cases at once — for example, every angle inscribed in a semicircle is a right angle — so that such results cannot be established by checking every case (G-C.2).

• Use appropriate tools strategically (MP.5). Dynamic geometry environments can help students look for invariants in a whole class of geometric constructions, and the constructions in such environments can sometimes lead to an idea behind a proof of a conjecture.

• Attend to precision (MP.6). Teachers might use the activity of creating definitions as a way to help students see the value of precision. While this is possible in every course, the activity has a particularly visual appeal in geometry. For example, a class can build the definition of quadrilateral by starting with a rough idea ("four sides"), gradually refining the idea so that it rules out figures that do not fit the intuitive idea. Another place in geometry where precision is necessary and useful is in the refinement of conjectures so that initial conjectures that are not correct can be salvaged — two angle measures and a side length do not determine a triangle, but a certain configuration of these parts leads to the angle-side-angle theorem (G-CO.8).

• Look for and make use of structure (MP.7). Seeing structure in geometric configurations can lead to insights and proofs. This often involves the creation of auxiliary lines not originally part of a given figure. Two classic examples are the construction of a line through a vertex of a triangle parallel to the opposite side as a way to see that the angle measures of a triangle add to 180 degrees and the introduction of a symmetry line in an isosceles triangle to see that the base angles are congruent (G-CO.9.10). Another kind of hidden structure makes use of area as a device to establish results about proportions, such as the important theorem (and its converse) that a line parallel to one side of a triangle divides the other two sides proportionally (G-SRT.4).

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