# Unit 4
## Geometry

## Acceleration to Algebra
(Grade 7 & 8 LSSM Standards)

## Unit Description:

Building upon geometry concepts from prior grade-levels, students will solve real-world problems involving triangles, angles, scale drawings, area of composed figures, circles, volume, surface area, and plane sections of solid figures. Additionally, students will explore the conditions for drawing triangles.

This unit will introduce new geometry concepts of transformations, congruence, similarity, parallel lines, angle relationships created from parallel lines cut by a transversal, and the Pythagorean Theorem. Students will add to their understanding of 3-D objects to include volume of cylinders, cones, and spheres.

**Standards for Mathematical Practice**

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.

**Louisiana Student Standards for Mathematics (LSSM)**

| G: Geometry | |
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| 7.G.A.2 | Draw (freehand, with ruler and protractor, or with technology) geometric shapes with given conditions. (Focus is on triangles from three measures of angles or sides, noticing when the conditions determine one and only one triangle, more than one triangle, or no triangle.) |
| 7.G.A.3 | Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. |

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| 7.G.B.4 | Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. |
| 7.G.B.5 | Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. |
| 7.G.B.6 | Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (Pyramids limited to surface area only.) |
| 8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations: (Rotations are only about the origin and reflections are only over the y-axis and x-axis in Grade 8)<br>**a.** Lines are taken to lines, and line segments to line segments of the same length.<br>**b.** Angles are taken to angles of the same measure.<br>**c.** Parallel lines are taken to parallel lines. |
| 8.G.A.2 | Explain that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. (Rotations are only about the origin and reflections are only over the y-axis and x-axis in Grade 8) |
| 8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (Rotations are only about the origin and reflections are only over the y-axis and x-axis in Grade 8) |
| 8.G.A.4 | Explain that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Dilations only use the origin as the center of dilation, rotations are only about the origin and reflections are only over the y-axis and x-axis in Grade 8) |
| 8.G.A.5 | Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the |

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| | angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. |
| 8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse using the area of squares. |
| 8.G.B.7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Some parts of tasks require students to use the converse of the Pythagorean Theorem.) |
| 8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. |
| 8.G.C.9 | Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems |

## Enduring Understandings:

*Mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms can be solved by breaking the figure into its various parts.
*Triangles have limits to the length of the sides as well as the sum of interior angles.
*Congruent figures have the same size and shape.
*When parallel lines are cut by a transversal, corresponding angles, alternate interior angles, alternate exterior angles, and vertical angles are congruent.
*The Pythagorean Theorem can be used both algebraically and geometrically to solve problems involving right triangles
*There is a relationship between the Pythagorean Theorem and the distance formula and both can be used to find missing side lengths in a coordinate plane and real-world situation.
*Two shapes are similar if the lengths of all the corresponding sides are proportional and all the corresponding angles are congruent.

## Essential Questions:

*What is the total number of degrees in supplementary and complementary angles?
*What is the relationship between vertical and adjacent angles?
*How do geometric models describe spatial relationships?
*How are geometric shapes and objects classified?
*How is the third side of a triangle determined?
*What two-dimensional figures result from slicing prisms, pyramids, cubes, cylinders, and cones?
*What are transformations and what effect do they have on a two-dimensional figure?
*How can you use coordinates to describe the result of a translation, reflection, or rotation?
*What properties of a two-dimensional figure are preserved under a translation, reflection, or rotation?
*Why does the Pythagorean Theorem apply only to right triangles?
*Where is the origin on a coordinate grid?
*What does the scale factor of a dilation convey?
*Can two figures be both congruent and similar?

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| *Two similar figures are related by a scale factor, which is the ratio of the lengths of corresponding sides. | |
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