### All About Our Unit of Study

**Geometry**

In this unit students will be engaged in using what they have previously learned about drawing geometric figures using rulers and protractor with an emphasis on triangles, students will also write and solve equations involving angle relationships, area, volume, and surface area of fundamental solid figures.

The challenges in this unit include understanding the geometric figures and solving equations involving geometric figures. The students also should be guided to realize how geometry works in real world situations. The Big Ideas that are expressed in this unit are integrated with such routine topics as estimation, mental and basic computation. All of these concepts need to be reviewed throughout the year.

### The Big Ideas of this Unit

Students should walk away from this unit understanding that…

- A polygon is a closed plane figure formed by line segments that are connected at vertices.
- The sum of the angles of a triangle total 180.
- Intersecting lines can form complementary angles (total 90), supplementary angles (total 180) and vertical angles (opposite and equal).
- A scale drawing is a proportional representation of an object.
- A cross-section slice of a solid is a 2 dimensional plane figure.
- Surface area is the total area of the outside surfaces of a 3 dimensional figure. Volume is the amount of space that a solid takes up.
- The Pythagorean Theorem. Identifies the unique relationship between the 3 sides of a right triangle and is used to calculate the missing sides of a right triangle or prove that a triangle is a right triangle.

### Engage with Standards for Mathematical Practice (SMPs)

The Standards for Mathematical Practice (SMP) are practices that we want to develop in students as they engage in mathematics.

**SMP 1. Make sense of problems and persevere in solving them.**
Students make sense of real-world and mathematical problems involving area, volume and surface area and persevere in solving them. They will also make sense and persevere in discovering the derivation of the relationship between circumference and diameter.

**SMP 2. Reason abstractly and quantitatively.**
Students will reason about the use of pi as a symbol representing a repeating decimal and using in a context is appropriate for what is being calculated.

**SMP 3. Construct viable arguments and critique the reasoning of others.**
Students use arguments to justify their reasoning when solving real world and mathematical problems about two-dimensional and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

**SMP 4. Model with mathematics.**
Students create models for the sides of a triangle in order to better understand the properties of two-dimensional shapes and three dimensional solids.
SMP 5. Use appropriate tools strategically.
Students use tools such as graph paper, isometric paper, rulers, protractors, the calculator and any geometric software strategically and appropriately.

SMP 6. Attend to precision.
Students attend to precision when solving problems involving the ratio pi and in the use of geometric vocabulary.

SMP 7. Look for and make use of structure.
Students look for patterns between various circle circumferences and their corresponding diameters when deriving the relationship between them.

SMP 8. Look for and express regularity in repeated reasoning.
Students look for and express repeated reasoning comparing various circle circumferences and their corresponding diameters when deriving the relationship between them. Students also express repeated reasoning when noticing conditions that can form unique triangles.

Ask your child some of the following questions:
- What are the characteristics of angles and sides that will create geometric shapes, especially triangles?
- How can angle and side measures help us to create and classify triangles?
- What is the relationship between circumference and diameter? Diameter and radius?
- What is the relationship between circumference and area? Can we use that relationship to derive a formula of the area of a circle from the circumference of a circle?
- What is the difference between area and surface area? Area and volume?

Key Online Resources for Mathematics Learning


Lessons and games aligned to Common Core http://illuminations.nctm.org

Lessons covering various 7th grade math topics https://www.purplemath.com/modules/index.htm

Video Lessons https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry

## Key Terms to Know

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<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td><strong>Triangle Inequality Theorem</strong></td>
<td>The sum of the lengths of any two sides of a triangle is greater than the length of the third side.</td>
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<td><strong>Adjacent angles</strong></td>
<td>Two angles that share a common vertex and a common side.</td>
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<td><strong>Congruent Figures</strong></td>
<td>Figures having the same size and shape</td>
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<td><strong>Cross-Section</strong></td>
<td>The shape made when a solid is cut through parallel to the base.</td>
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<td><strong>Area</strong></td>
<td>Number of square units needed to cover a surface.</td>
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<td><strong>Circumference</strong></td>
<td>Distance around the outside of a circle</td>
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<td><strong>Cube</strong></td>
<td>A right prism where the base and vertical sides are squares.</td>
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<tr>
<td><strong>Formulas</strong></td>
<td>A mathematical relationship or rule expressed in symbols.</td>
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<tr>
<td><strong>Polygon</strong></td>
<td>A many-sided, closed, simple figure whose sides are line segments.</td>
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<td><strong>Quadrilateral</strong></td>
<td>A polygon with four sides.</td>
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<td><strong>Irregular Polygon</strong></td>
<td>A polygon in which all angles are not congruent and all side lengths are not congruent.</td>
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<tr>
<td><strong>Regular Polygon</strong></td>
<td>A polygon in which all angles are congruent and all side lengths are congruent.</td>
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<td><strong>Supplementary Angles</strong></td>
<td>Two angles whose sum is 180 degrees.</td>
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<td><strong>Vertical Angles</strong></td>
<td>Non-adjacent angles with equal measure located across a common vertex.</td>
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<td><strong>Right Prism</strong></td>
<td>A geometric solid that has a polygon as a base and vertical sides perpendicular to the base.</td>
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<td><strong>Surface Area</strong></td>
<td>Total area of the exterior faces of a three-dimensional figure.</td>
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<td><strong>Three-Dimensional</strong></td>
<td>Having or appearing to having length, width and height.</td>
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<td><strong>Triangles</strong></td>
<td>A polygon with three sides.</td>
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<td><strong>Volume</strong></td>
<td>The amount of space contained in a solid; measured in cubic units.</td>
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<td><strong>Derivation</strong></td>
<td>A derivation is a sequence of steps, logical or computational, from one result to another.</td>
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## Support Learning at Home

1. Ask your child to use spaghetti sticks or straws to model how they know whether three sides can construct a triangle.

![Image of child using spaghetti sticks](image1.jpg)

2. Provide your child with opportunities to use a ruler and protractor to model the construction of various geometric shapes,

3. Have your child create a scale drawing of your home. Require them to explain their drawing and their scale.
4. Ask your child to predict the two-dimensional cross section that will result when you slice an orange. This is a great activity as you prepare a salad in the kitchen (Starfruit are particularly fun for this activity).

Sample Problems

Example: Planar Cuts
Using a clay model of a rectangular prism, describe the shapes that are created when planar cuts are made diagonally, perpendicularly, and parallel to the base.

Solution: If a rectangular prism is sliced diagonally to the base then a rectangle or square may result. When you slice perpendicular to the base it will result in a rectangle or square. When you slice parallel to the base it will result in a rectangle or square. If a corner is sliced off then a triangular cross section will be produced.

Example: Understanding the area of a circle
A second visual for understanding the formula for the area of a circle can be modeled by cutting up a paper plate into sectors along radii and reshaping the pieces into a parallelogram. Students use the formula of $b \times h$ for the area of a parallelogram to justify the formula for the area of a circle.
Example: Volume

Find the total volume for the house if the base of the house is 20 ft. X 50 ft. with side walls that are 10 ft. high and the peak of the house is 15 ft. from the ground.

Solution: To find the volume of the house, we are going to consider the house as a rectangular prism and the roof as a triangular prism. The volume of the house is 20ft x 50ft x 10ft = 10,000ft³. To find the volume of the roof, we need to find the area of base (or triangular section of the roof) and multiply by the length of the house. If the wall is 10ft high and the peak of the roof is at 15ft, then the height of the roof section is 5ft. The volume of this section is ($\frac{1}{2} \times 5 \times 20$) x 50 = 2,500ft³. The total of the home (10,000ft³) and the roof (2,500ft³) is 12,500ft³.