Unit 7: Geometry

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 24**
Length: **6 weeks**
Status: **Published**

Unit Overview

In this unit, students will learn about geometric principles including angle relationships, properties of circles, and volume and surface area of three-dimensional objects. This unit will begin with a simple review of measuring angles using a protractor and classifying them. Next, students will learn about specific angle relationships such as adjacent, complementary, supplementary, and vertical angles. While learning about specific angle relationships, students will learn how to apply the given relationship to create an algebraic equation and solve it in order to find missing angle measures. Then, students will learn about the characteristics of circles. They will learn the basic properties of circles and use this information to calculate the circumference and area of a circle (both exact and approximate answers). Students will then apply given information on circumference and/or area of circles and apply it to creating ratios and solving for one measurement when given the other measurement. Finally, students will learn how to calculate the surface area and volume of three-dimensional solids. Students will begin by reviewing how to classify a solid. Then, they will learn how to identify the two-dimensional shape that is formed when slicing into a three-dimensional figure. This will lead them to calculating the surface area and volume for any type of right prism or pyramid. Many questions from this part of the unit will be asked in the context of a real-world problem.

Standards

MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
MA.7.G.A.2	Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
MA.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.
MA.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.
MA.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.
MA.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.

Essential Questions

- Why must you have a strong foundation in two-dimensional figures in order to be able to solve problems containing three-dimensional figures?
- In what careers would you need to have a strong foundation in geometric principles?
- How does knowing the relationship between different angles allow one to create an equation to calculate a missing value?

Application of Knowledge: Students will know that...

- A right angle measures exactly 90 degrees.
- Adjacent angles are angles that have a common vertex and share a common side. They can not be inside one another.
- An acute angle has a measure less than 90 degrees.
- An obtuse angle has a measure greater than 90 degrees.
- Classifying solids is always done by the figure of the base.
- Complementary angles are angles whose sum is 90 degrees. These angles come together to form a right angle.
- In order to calculate the volume of an irregular solid you add the volume of each separate solid that creates the irregular solid.
- Pyramids have 1/3 the volume of a prism that has the same base and height.
- Supplementary angles are angles whose sum is 180 degrees. These angles come together and form a straight angle.
- The area of a circle is the space inside of the circle.
- The circumference of a circle is the distance around the outside of the circle.
- The diameter of a circle is a line that goes from one side of the circle to the other. The line must go through the center of the circle.
- The radius of a circle is a line drawn from the center to the edge of the circle. The radius is always half of the diameter.
- The surface area of any figure is sum of the area of all the faces of the solid.
- The volume of a solid represents how much substance a solid can hold.
- Using a protractor will give you the specific number of degrees of a given angle.
- Vertical angles are angles that are directly across from each other and share a vertex, but not a side. These angles form a perfect "X" when put together.
- Vertical angles are congruent to one another.

Application of Skills: Students will be able to...

- Apply the idea of surface area and volume to solving real-world problems.
- Calculate missing angle measures by identifying the relationship between different angles.

- Calculate the area of a circle when given the circumference.
- Calculate the circumference and area of a given circle (both exact and approximate answers).
- Calculate the radius/diameter for a given circle (including algebraic examples).
- Calculate the surface area of right prisms and pyramids.
- Calculate the volume and surface of irregular solids.
- Calculate the volume of right prism and pyramids.
- Classify a solid based on given characteristics.
- Classify an angle measure based on the number of degrees.
- Find the measure of an angle by using a protractor.
- Identify the two-dimensional figure that is formed when slicing into a three-dimensional figure.
- Solve real-world problems involving the circumference and area of circles.

Assessments

- Do-Now's: These daily assessments will be used to check for prior knowledge and to determine mastery of particular topics. If needed, remediation will be completed on an as needed basis.
- Exit Tickets: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic.
- Communicator Practice: This will be used as a quick whole-class assessment tool to check for complete comprehension.
- Geometry Poster: They may be used as a formative assessment (see description in activity section).
- Playground Activity: This may be used as a formative or summative assessment (see description in activity section).
- Unit Quiz
- Unit Test
- End of year benchmark assessment: Information from this unit will be included on the end-of-year assessment.

Suggested Activities

- Grade 7 Digits Topics 10 - 13 Launches
- Review games using Communicators.
- Student-centered SMART Board lessons: students will manipulate irregular solids to "pull apart" the different solids that created the irregular solid.
- Three-Dimensional Slice Activity: Students will use Uniflex cubes to create a three-dimensional model and will be asked to draw the top, bottom, and side view of it. Then, they will be asked to draw what a vertical and horizontal cross-section of their model would look like. Students will watch a video about 3-D printers and see the real-world connection between the skill of identifying the polygon created by a cross-section of a solid and today's technology.
- Geometry Poster: Students will work with a partner to calculate the surface area/volume of a right prism and pyramid. Students will neatly show their work and add creativity to the poster. These will then be displayed around the room.
- Playground Construction Activity: Students will develop a playground that must satisfy a given set of geometric conditions. Students will then calculate the area, surface area, or volume for the given

figures.

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
  - Modifications & accommodations as listed in the student's IEP
  - Assign a peer to help keep student on task
  - Modified or reduced assignments
  - Reduce length of assignment for different mode of delivery
  - Increase one-to-one time
  - Working contract between you and student at risk
  - Position student near helping peer or have quick access to teacher
  - Break tests down in smaller increments

- **Content specific modifications may include:**
  - Provide personal handout for integer rules
  - Provide graphic organizer for remembering angle relationships
  - Provide completed examples for practice work and homework.
  - Provide calculator to assist with calculations.
  - Provide students with a formula sheet with one type of problem for each formula worked out for them already.

Differentiation for ELL's:

- General modifications may include:
  - Strategy groups
  - Teacher conferences
  - Graphic organizers
  - Modification plan

- **Content specific vocabulary important for ELL students to understand include:** protractor, degrees, measure, acute angle, right angle, obtuse angle, adjacent, complementary, supplementary, vertical, radius, diameter, center, circumference, area, surface area, volume, prism, pyramid, base, height

Differentiation to extend learning for gifted students may include:

- Provide students pyramids and prisms with bases that are either a pentagon, hexagon, heptagon, octagon, nonagon, or decagon
- Discuss how to find the area of irregular figures that consist of circles or semi-circles
- Discuss how to find the two-dimensional figures formed by a diagonal slice of three-dimensional figure
- Investigate the angle relationships that are formed by two parallel lines and a transversal

Integrated/Cross-Disciplinary Instruction

ELA: Practice formulating complete and grammatically correct responses to open-ended questions.

Technology: Studying how 3-D printers utilize cross-sections of the three-dimensional solid that is made in order to create the figure

Engineering: Have students develop a playground that must contain different geometric shapes. Students will then calculate the area, volume, or surface area for each item in the playground.

Resources

- Digits teacher materials and support: www.pearsonrealize.com
- Digits student access and support: www.mymathuniverse.com
- IXL practice: www.ixl.com
- SMART Exchange: http://exchange.smarttech.com/index.html#tab=0
- 3-D Printer Video (for lesson on identifying two-dimensional shapes formed by slicing into a three-dimensional figure): http://www.pbslearningmedia.org/resource/mgbh.math.g.printing/three-dimensional-printing/
- Uniflex cubes
- SMART Board lessons
- Kuta software generated worksheets

21st Century Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.