Unit 5: Geometry

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 4**
Length: **7 weeks**
Status: **Published**

Brief Summary of Unit

Introduction: The "Geometry" unit is designed to provide 7th-grade students with a comprehensive understanding of geometry concepts. Over the course of 20 days, students will explore geometric shapes, angles, surface areas, and volumes of various three-dimensional figures. They will analyze circles, calculate circumference and area, study perimeters and areas of composite figures, construct polygons, and find unknown angle measures using different angle relationships. Additionally, students will investigate surface areas of prisms, cylinders, and pyramids, as well as volumes of prisms and pyramids, and learn about cross sections of three-dimensional figures. The unit emphasizes hands-on activities, problem-solving strategies, and real-world applications to help students develop a strong understanding of geometric concepts.

Revision Date: 5/31/24

Standards

Students will analyze geometric designs which connects to various cultures. Embracing the diversity within society incorporates the following:

Amistad Commission

This unit also reflects the goals of the Department of Education and the Amistad Commission including the infusion of the history of Africans and African-Americans into the curriculum in order to provide an accurate, complete, and inclusive history regarding the importance of of African-Americans to the growth and development of American society in a global context.

Asian American and Pacific Islander History Law

This unit includes instructional materials that highlight the history and contributions of Asian Americans and Pacific Islanders in accordance with the New Jersey Student Learning Standards in Social Studies.

New Jersey Diversity and Inclusion Law

In accordance with New Jersey’s Chapter 32 Diversity and Inclusion Law, this unit includes instructional

materials that highlight and promote diversity, including:

economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance.

Commission on Holocaust Education

This unit further reflects the goals of the Holocaut Education mandate where students are able to identify and analyze applicable theories concerning human nature and behavior; understand that genocide is a consequence of prejudice and discrimination; understand that issues of moral dilemma and conscience have a profound impact on life; and understand the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
ELA.L.VL.7.3	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, including technical meanings, choosing flexibly from a range of strategies.
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	Look for and express regularity in repeated reasoning
ELA.L.VI.7.4	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
MATH.7.EE.B.4.a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms with accuracy and efficiency. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
MATH.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.
MATH.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.
MATH.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.

MATH.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.
MATH.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.
MATH.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.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.K-12.P.4	Demonstrate creativity and innovation.

Essential Questions

- How do the concepts of volume and cross sections help us understand the capacity and internal structure of three-dimensional objects, and how can we analyze and interpret cross sections in real-world contexts?
- How do the properties of circles, including circumference and area, influence real-world applications and construction projects?
- How do the properties of polygons and angle relationships help us construct and analyze geometric figures, and how can we apply these concepts to solve unknown angle measures?
- How do the surface area and volume of three-dimensional figures impact real-world applications such as construction, packaging, and design?
- What strategies can we use to analyze and calculate perimeters and areas of composite figures, and how do these concepts apply to real-world situations?
- What strategies can we use to calculate the surface area of prisms, cylinders, and pyramids, and how do these calculations differ based on the shape of the figure?

Enduring Understandings

- Area, perimeter, and volume are related to each other, although not precisely by formula.
- As shapes of a region change, but maintain the same area, there is a predictable effect on perimeter.
- As shapes of a region change, but maintain their volume, there is a predictable effect on the surface area.
- Basic geometric figures can be combined to create many other geometric figures.
- One may classify geometric figures by appearance only when a problem asks so; one cannot assume any information about a diagram by appearance only.
- Special relationships exist between some angles and are useful in solving everyday problems.
- The ratio of every circle's circumference to its diameter is the same, which is pi.
- The volume of a pyramid or cone is one-third the volume of the prism or cylinder with the same base and height.
- Transversals that intersect two parallel lines create congruent angles.

Students Will Know

- Different angle relationships, such as vertical, supplementary, complementary, and adjacent angles, and how to apply them to find unknown angle measures.
- How to analyze composite figures by breaking them down into simpler shapes and calculate their perimeters and areas.
- The concept of cross sections and their relationship to the internal structure of three-dimensional objects.
- The definitions and components of surface area and volume for various three-dimensional figures, including prisms, cylinders, and pyramids.
- The formulas and methods used to calculate surface area and volume for different types of three-dimensional figures.
- The properties of circles, including radius, diameter, circumference, and area, and how to calculate them using appropriate formulas.
- The properties of polygons, including sides and angles, and how to construct polygons given certain criteria.

Students Will Be Skilled At

- Analyzing and interpreting cross sections of three-dimensional figures to understand their internal structure and characteristics.
- Analyzing composite figures to determine their perimeters and areas by combining the perimeters and areas of their component shapes.
- Applying angle relationships to find unknown angle measures in geometric figures, using strategies such as identifying corresponding angles or applying angle sum properties.
- Calculating the circumference and area of circles using the appropriate formulas and units.
- Calculating the surface area of prisms, cylinders, and pyramids using appropriate formulas and units.
- Calculating the volume of prisms and pyramids using appropriate formulas and units.
- Constructing polygons given specific criteria, such as side lengths or angle measures, using rulers, compasses, and protractors.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, iReady MyPath, Big Ideas Math online platform problems, and NJSLA test bank problems
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Big Ideas Math unit assessments
- Benchmark: iReady diagnostic assessments and district placement assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and adaptive learning tasks in iReady, Khan Academy, and Big

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Complete Grade 7 Unit 5 Model Curriculum Assessment
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

Week 1-2: Circles and Composite Figures

Day 1-2: Circles and Circumference

- Introduction to Circles: Define circles and their components, including radius, diameter, and circumference.
- Calculating Circumference: Practice calculating the circumference of circles using the formulas $C = \pi d$ or $C = 2\pi r$.
- Guided Practice: Step-by-step exercises on calculating circumference.
- Real-World Applications: Apply circumference calculations to scenarios like measuring around circular objects or constructing circular paths.

Day 3: Areas of Circles

- Calculating Area: Learn to calculate the area of circles using the formula $A = \pi r^2$.
- Guided Practice: Step-by-step exercises on calculating area.
- Real-World Applications: Apply area calculations to scenarios like painting circular surfaces or determining material requirements for circular projects.

Day 4-5: Perimeters and Areas of Composite Figures

- Understanding Composite Figures: Define composite figures and identify their component shapes.
- Calculating Perimeter: Practice calculating the perimeter of composite figures by adding the perimeters of their component shapes.
- Calculating Area: Practice calculating the area of composite figures by combining the areas of their

component shapes.

- Guided Practice: Step-by-step exercises on calculating perimeter and area of composite figures.
- Real-World Applications: Apply perimeter and area calculations to scenarios like fencing irregular-shaped yards or determining material requirements for composite structures.

Week 3: Polygons and Angle Relationships

Day 6-7: Constructing Polygons

- Understanding Polygons: Define polygons and their properties, including sides and angles.
- Constructing Polygons: Learn how to construct polygons using given criteria, such as side lengths or angle measures.
- Guided Practice: Step-by-step exercises on constructing polygons.
- Real-World Applications: Apply polygon construction skills to scenarios like designing floor plans or creating geometric art.

Day 8-9: Finding Unknown Angle Measures

- Identifying Angle Relationships: Define and identify vertical, supplementary, complementary, and adjacent angles.
- Applying Angle Relationships: Practice using angle relationships to find unknown angle measures in geometric figures.
- Guided Practice: Step-by-step exercises on finding unknown angle measures.
- Real-World Applications: Apply angle relationship skills to scenarios like determining the angles of intersecting roads or analyzing architectural designs.

Week 4: Surface Area of Prisms, Cylinders, and Pyramids

Day 10-11: Surface Area of Prisms

- Introduction to Prisms: Define prisms and identify their components.
- Calculating Surface Area: Learn to calculate the surface area of prisms using the appropriate formula.
- Guided Practice: Step-by-step exercises on calculating surface area of prisms.
- Real-World Applications: Apply surface area calculations to scenarios like wrapping gifts or painting rectangular objects.

Day 12: Surface Area of Cylinders

- Introduction to Cylinders: Define cylinders and identify their components.
- Calculating Surface Area: Learn to calculate the surface area of cylinders using the appropriate

formula.

- Guided Practice: Step-by-step exercises on calculating surface area of cylinders.
- Real-World Applications: Apply surface area calculations to scenarios like painting cans or wrapping cylindrical objects.

Day 13-14: Surface Area of Pyramids

- Introduction to Pyramids: Define pyramids and identify their components.
- Calculating Surface Area: Learn to calculate the surface area of pyramids using the appropriate formula.
- Guided Practice: Step-by-step exercises on calculating surface area of pyramids.
- Real-World Applications: Apply surface area calculations to scenarios like constructing roofs or designing pyramidal structures.

Week 5-6: Volumes of Prisms and Pyramids, Cross Sections

Day 15-16: Volumes of Prisms

- Calculating Volume: Learn to calculate the volume of prisms using the appropriate formula.
- Guided Practice: Step-by-step exercises on calculating volume of prisms.
- Real-World Applications: Apply volume calculations to scenarios like filling containers or calculating capacity.

Day 17-18: Volumes of Pyramids

- Calculating Volume: Learn to calculate the volume of pyramids using the appropriate formula.
- Guided Practice: Step-by-step exercises on calculating volume of pyramids.
- Real-World Applications: Apply volume calculations to scenarios like constructing buildings or determining material requirements for pyramidal structures.

Day 19-20: Cross Sections of Three-Dimensional Figures

- Understanding Cross Sections: Define cross sections and understand their relationship to three-dimensional figures.
- Identifying Cross Sections: Learn to identify and analyze different types of cross sections of three-dimensional figures.
- Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
- Guided Practice: Step-by-step exercises on identifying and analyzing cross sections.
- Real-World Applications: Apply cross section analysis to scenarios like cutting objects or analyzing

geological formations.

*Advanced Math 7 students will participate in a rigorous “House Project” that challenges their knowledge of the concepts and skills learned in this unit.

Materials

Core instructional materials: Core Book List including Big Ideas Math textbook and online platform for all levels of grade 6, 7, 8, and Algebra 1

Supplemental materials: Khan Academy, Edia, Delta Math, & iReady.

Additional Materials: Rulers, protractors, and calculators for hands-on activities.

- Calculators/Math Tools
- District approved textbook
- Manipulatives
- Teacher created activiites
- Teacher created notes
- Websites, such as Khan Academy

Suggested Strategies for Modifications

Possible accommodations/modifications for Grade 7