Unit 08: Geometry

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 22**
Length: **3 weeks**
Status: **Published**

Unit Overview

In this unit, students utilize their previous knowledge in order to understand and develop formulas for area, volume, and surface area. Students will begin the unit by learning how to calculate the area of two-dimensional figures. They will use decomposition to determine the area of triangles, quadrilaterals, and other polygons, including regular polygons. Then, students will use their previous knowledge in order to draw polygons on coordinate planes. They will be able to find distances between points on a coordinate plane and will use this skill in order to determine distance, perimeter, and area of the polygons. Then, students will begin working with three-dimensional figures by learning how to classify them and identifying their bases, edges, and faces. They will learn how to calculate the volume of right rectangular prisms and use it to solve real-life applications. They will apply volume formulas and use their previous experience with solving equations in order to find missing volumes and missing dimensions. The final topic includes deconstructing the faces of solid figures in order to determine surface area. Students will be able to draw nets of three-dimensional figures and utilize them in order to find the surface area. They will apply the concept of surface area to real-life situations and will be able to distinguish between the need to find surface area or volume when problem-solving.

Standards

MA.6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
MA.6.G.A.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
MA.6.G.A.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
MA.6.G.A.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Essential Questions

- In what jobs will you use the concepts of geometry, and how will you use them?
- How does knowledge of calculating the area of two-dimensional figures necessary for calculating the volume and surface area of three-dimensional figures?

- In what practical ways is it important to know the volume and surface area of a solid?

Application of Knowledge: Students will know that...

- a net is a two-dimensional pattern of a three-dimensional figure that can be folded to form the figure.
- area and surface area area measured in square units and volume is measured in cubic units.
- area is the space contained within a two-dimensional figure.
- surface area is the area of the faces of a three-dimensional figure.
- the area of a composite figure can be found by dividing the figure into polygons and finding the sum of their areas.
- the area of two-dimensional polygons can be found by either utilizing a formula or decomposing the figure into triangles and finding the sum of their areas.
- the formula to calculate the area of a triangle is A = 1/2 bh, where "b" is the base and "h" is the height.
- the length of a horizontal or vertical line on a coordinate plane can be found by counting.
- the volume of a right rectangular prism can be found by the formulas V = Bh or V = lwh, where "B" is the area of the base, "h" is the height, "l" is the length, and "w" is the width.
- volume is the space contained within a three-dimensional figure.

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

- calculate the area of quadrilaterals.
- calculate the area of regular polygons and composite figures.
- calculate the area of triangles.
- calculate the surface area of prisms and pyramids.
- calculate the volume of right rectangular prisms, including those that have dimensions containing fractional units.
- classify three-dimensional solids.
- draw polygons on a coordinate plane and calculate their perimeters and areas.
- draw the nets of three-dimensional solids.
- solve problems with real-world applications involving area, volume, or surface area.

Assessments

- Do-Nows: 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.
- Communicator practice: This will be used as a quick whole-class assessment tool to check for complete comprehension.
- Exit Tickets: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic.
- Area Gallery Walk: An activity that can be used as a formative assessment (see description in activity

section).
- Picture Activity: An activity that can be used as a formative assessment (see description in activity section).
- Net Activity: An activity that can be used as a formative assessment (see description in activity section).
- Practice using IXL
- Mid-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 6 Digits Topics 13 and 14 Launches
- Investigations: Students will use examples of the topic being studied as well as a protractor and ruler in order to discover properties of geometric figures. For example, students could be given a parallelogram in which they would have to draw a height from a vertex, cut along that height so that they are left with a triangle, and then they will line up the triangle with one of the non-parallel sides so that a rectangle is formed. From this investigation, students can derive the formula of A = bh.
- Student-centered SMART Board lessons: including interactive protractor and ruler for measuring angles and sides, drawing tools to show how to decompose composite figures, and interactive coordinate plane for drawing polygons on graphs
- Review games using Communicators
- Area Gallery Walk: Students will work in partners to complete a gallery walk containing problems that will ask for the area of two-dimensional polygons, including triangles, quadrilaterals, regular polygons, and irregular figures. Each problem will be posted around the room. Students will rotate around the room and complete each problem. The answer to each poster will lead students to the next poster. This will create a sequence that students will complete in a specific order. This can be used as a formative assessment.
- Picture Activity: Students will draw a picture on a coordinate plane using only vertical and horizontal lines. Then, they will find the length of each side of their figure. Finally, they will calculate the total perimeter and area of their picture. This can be used as a formative assessment.
- Volume of Prisms Activity: Students will calculate the volume of real-world examples of right rectangular prisms. Examples of prisms can be brought in by the students or can be examples found within the classroom or school (if students bring in a box this activity can be repeated for surface area by breaking down the box into its net). Students will measure the dimensions of the box in inches and calculate its volume. An extension can be to give students a known volume of a small object that could fit inside each of the prisms, such as a jellybean. Then, students could be asked how many of that item can fit inside the prims.
- Net Activity: Each student will be assigned a specific prism or pyramid. Each student will have a copy of their figure's net that they will use to discover the number of faces, edges, and vertices for their figures. Then, they will use a ruler and their net to calculate the surface area of their figure. Students can write their findings on one of the faces of their figure. Finally, they will cut out and tape the figure together. Students who have been assigned the same figure can compare their results and then share their findings with their classmates.

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
  - Prioritize tasks
  - Think in concrete terms and provide hands-on-tasks
  - Position student near helping peer or have quick access to teacher
  - Anticipate where needs will be
  - Break tests down in smaller increments

- Content specific modifications may include:
  - Provide graphic organizer for classifying two-dimensional and three-dimensional figures
  - Provide coordinate planes in which the x and y-axis go from -5 to 5 rather than -10 to 10 for transformations
  - Provide students with a formula sheet with one type of problem for each formula worked out for them already.
  - Provide completed problems for practice work and homework

Differentiation for ELL's:

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

- Content specific vocabulary important for ELL students to understand include: area, triangle, rectangle, square, parallelogram, rhombus, trapezoid, right triangle, acute triangle, obtuse triangle, height, base, polygon, three-dimensional solid, prism, pyramid, volume, surface area, base, face, edge, vertex

Differentiation to extend learning for gifted students may include:

- For area, give two different polygons with the same area but one dimension is missing for one of the figures. Students will need to write and solve an equation in order to find the missing dimension.
- For volume, introduce how to calculate the volume of other types of prisms other than only right rectangular prisms.
- For surface area, include prisms and pyramids that have bases with more than six sides.

Integrated/Cross-Disciplinary Instruction

- **ELA:** Practice formulating complete and grammatically correct responses to open-ended questions.
- **Art:** Students will utilize methods from art to create three-dimensional figures on a two-dimensional surface.
- **Architecture:** Students will utilize skills and concepts learned about area, surface area, and volume and apply it to construction and architecture.

Resources

- Digits student access and support: www.MyMathUniverse.com
- Digits teacher materials and support: www.pearsonrealize.com
- IXL: www.ixl.com
- SMART Exchange: http://exchange.smarttech.com/index.html#tab=0
- SMART Board lessons
- Coordinate graph worksheets
- Website containing printable nets of prisms and pyramids: http://www.senteacher.org/worksheet/12/NetsPolyhedra.html
- Hands-on solids and net shapes
- Punchline/Pizzazz worksheets (self-correcting)
- 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.