Unit 6 - Geometry

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 27**
Length: **5 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.NS.C.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
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

- How are algebra and geometry related?
- How are shapes related to each other? How can you deconstruct them to find the formula for other shapes?
- How can unit cubes be used to find volume of three-dimensional figures?
- How is 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?
- In what jobs will you use the concepts of geometry, and how will you use them?

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.
- a parallelogram is a quadrilateral with opposite sides parallel and opposites sides the same length.
- area and surface area are measured in square units and volume is measured in cubic units.
- 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 parallelogram is A = bh, where "b" is the base and "h" is the height.
- the formula to calculate the area of a trapezoid is A = 1/2 h(b1 + b2), where "h" is the height, b1 and b2 are the two bases.
- 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 amount of space inside a three-dimensional figure.

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

- calculate the area of parallelograms.
- calculate the area of regular polygons and composite figures.
- calculate the area of trapezoids.
- calculate the area of triangles.
- calculate the surface area of prisms and pyramids.
- calculate the volume of a 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 Now: These daily assessments will include a few questions to check for prior knowledge and to determine mastery of particular topics. Remediation can also be done through this activity on an as needed basis.
- Exit Tickets and Quick Checks: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic or if there were any common misconceptions amongst the students.
- Communicator Practice: During guided practice, this will be used as a quick whole-class assessment tool to check for complete comprehension.
- IXL Practice: This online tool will be used to formatively assess students during independent practice. This will provide students with practice and immediate self-check.
- Homework and Classwork: These will be used to formatively assess students. Some examples of activities that can be used in class as assessments are listed in suggested activities (Area Gallery Walk, Tangram Activity, Picture Activity, Volume of Prisms Activity, Net Activity, Surface Area and Volume Scavenger Hunt)
- Marzano learning goals self-assessment: Students will complete tiered questions to determine their own proficiency in the topic on a scale of 0 to 4.
- Informal Observations: Walking around the room, listening to productive conversations, and checking in on students will help to formatively assess their learning.
- Mid-Chapter Quiz: This will be used to formatively assess students halfway through the chapter.
- Chapter Test: This will be used to summatively assess students at the end of the chapter.
- Information from this unit will be included on a locally developed, mid-year or end of year benchmark assessment that may take the form of a test, performance based project, or other summative assessment.

Suggested Activities

- Grade 6 Digits Topic 13 and 14 Launches
- Inquiry labs using unit squares and unit cubes to discover the formula of 2D and 3D shapes
- Student centered Smart Board lessons using drawing tools to show how to decompose composite figures and interactive coordinate plane for drawing polygons on graphs
- Review games using communicators
- Marzano learning goals self-assessment: Students will complete tiered questions to determine their own proficiency in the topic on a scale of 0 to 4
- Discover Area of Triangles Activity: Students will use unit squares to first explore the relationship between parallelograms and triangles. After listing out their findings in a table, they will try to discover the formula for finding the area of triangles.
- 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.

- Tangram Activity: Students will be given a set of shapes. As a group, they will create a composite figure with those shapes. They will find the composite area and create an answer key. Afterwards, the figures will be rotated through the different groups. Each group will try to organize the shapes to match the original figure and then find the composite area.
- 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.
- Surface Area and Volume Scavenger Hunt: Students will work in pairs to answer surface area and volume problems around the room. Their answer will lead to another problem. Students will follow a specific order, which can be easily checked for accuracy.

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:
    - Use unit squares and unit cubes to find area and volume of figures as a visual and hands-on method to learning about the figures
    - Create graphic organizer and visual web to show classification of 2D and 3D figures
    - Provide numbered and labeled coordinate planes
    - Provide students with a formula sheet of all the 2D and 3D figures

- Provide guided notes and step-by-step instructions
- Provide worked out problems on the classwork and homework for students to use as a guide

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:
  - Base, height, composite figure, parallelogram, rectangle, square, rhombus, right triangle, trapezoid, polygon, volume, three-dimensional figure, prism, pyramid, surface area, face, edge, vertex, cubic units

Differentiation to extend learning for gifted students may include:

- Have students find the missing dimension of a 2D or 3D figure by solving an equation. This will require solving multi-step equations.
- Explore finding the volume of other prisms by using the volume of rectangular prisms.
- Have students find the surface area of prisms and pyramids that have bases with more than 4 sides.

Technology Integration

- iPads or Chromebooks as appropriate to the activity.
- Online learning components including use of the Digits digital textbook, Buzzmath, KhanAcademy, and other resources.
- Teacher integration of the SMART board to facilitate active student engagement throughout the course of the lesson.
- Software or online programs that teachers may use to create students materials or generate problems such as Kuta software.
- Additional practice provided through the use of IXL

Integrated/Cross-Disciplinary Instruction

- **ELA:** Practice formulating complete and grammatically correct responses to open-ended questions.
- **Geography:** Estimate and find the area of continents by using composite figures
- **Art:** Build a figure or structure out of multiple different shapes and find the total area or volume
- **Architecture:** Explore the volume of different buildings

Resources

- Digits student access and support: www.MyMathUniverse.com
- Digits teacher materials and support: www.pearsonrealize.com
- IXL: www.ixl.com
- SMART Exchange: www.exchange.smartteach.com
- SMART Board Lessons
- Pizzazz worksheets (self-correcting)
- Kuta software generated worksheets
- Khanacademy: www.khanacademy.org
- Buzzmath: www.buzzmath.com
- NCTM Illuminations: www.illuminations.nctm.org
- New Jersey Center for Teaching and Learning: www.njctl.org

21st Century 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.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.