# Unit 7: Perimeter, Area, and Volume

Content Area: **Mathematics**
Course(s):
Time Period: **Trimester 3**
Length: **25 Days**
Status: **Published**

## Brief Summary of Unit

In this math unit, sixth graders will dive into the world of geometry. They'll start by exploring perimeter, learning how to calculate the distance around various polygons by finding the distance between vertices, and using coordinate planes.

Moving to area, students will master the skill of finding the space inside two-dimensional shapes utilizing formulas and composite area. Surface area will then be introduced using nets to determine the total area of a three-dimensional object's outer surface. Finally, they'll delve into volume, discovering how to measure the space inside three-dimensional figures like cubes and rectangular prisms.

**Revision Date:** June 2024

## Standards

When analyzing designs from various cultures and backgrounds involving area, perimeter, and volume, the following are being addressed:

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.

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.

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.

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| 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 |
| ELA.L.KL.6.2 | Use knowledge of language and its conventions when writing, speaking, reading, or listening. |
| MATH.K-12.5 | Use appropriate tools strategically |
| ELA.L.KL.6.2.A | Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases. |
| MATH.K-12.6 | Attend to precision |
| MATH.K-12.7 | Look for and make use of structure |
| ELA.L.VL.6.3 | Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, including technical meanings, choosing flexibly from a range of strategies. |
| MATH.K-12.8 | Look for and express regularity in repeated reasoning |
| MATH.6.G.A | Solve real-world and mathematical problems involving area, surface area, and volume |
| MATH.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. |
| MATH.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. |
| MATH.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. |
| MATH.6.G.A.4 | Represent three-dimensional figures (e.g., pyramid, triangular prism, rectangular prism) 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. |
| ELA.SL | Speaking and Listening |
| 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.8 | Use technology to enhance productivity increase collaboration and communicate effectively. |
| TECH.K-12.P.9 | Work productively in teams while using cultural/global competence. |

## Essential Questions

- How do we measure volume, and why is it a crucial concept in understanding the space occupied by

three-dimensional figures?

- How is perimeter used in real-world applications?
- What is surface area, and how does it differ from area? How can we calculate the surface area of three-dimensional objects?
- What strategies can we use to find the area of different shapes, and how does understanding area help us solve problems in everyday life?

## Enduring Understandings

- Geometric Relationships: Students will understand the relationships between perimeter and area, as well as surface area and volume, and how changes in dimensions affect these measures.
- Measurement Skills: Students will develop and refine their measurement skills, including using appropriate units of measurement and understanding the precision required for accurate calculations.
- Problem-Solving Strategies: Students will learn and apply various problem-solving strategies, such as breaking down complex shapes into simpler ones or using formulas to calculate geometric measures efficiently.
- Real-World Applications: Students will recognize and apply these geometric concepts to solve real-world problems, such as calculating fencing costs based on perimeter or determining the amount of paint needed for a surface area.
- Visualization: Students will improve their ability to visualize and manipulate two-dimensional and three-dimensional shapes mentally, aiding in their understanding of spatial relationships and geometric properties.

## Students Will Know

- Students will know how to apply their understanding of perimeter, area, surface area, and volume to solve real-world problems, such as calculating material quantities for construction projects or designing packaging for products.
- Students will know the appropriate units of measurement for perimeter, area, surface area, and volume, and how to use them correctly in calculations and problem-solving situations.
- Students will know the formula for calculating the volume of a rectangular prism and that finding volume of a rectangular prism is  the same as finding the area of the base and multiplying it by the height of the prism.
- Students will know the formulas for calculating perimeter and area of common geometric shapes and how to apply these formulas in solving problems.

## Students Will Be Skilled At

- Students will be skilled at calculating the perimeter of various polygons, including rectangles, squares, triangles, and irregular shapes, using distance between vertices on the coordinate plane
- Students will be skilled at calculating the volume of three-dimensional objects, such as cubes, rectangular prisms, and pyramids, using the appropriate volume formulas and understanding how to apply them in different contexts.
- Students will be skilled at determining the surface area of three-dimensional objects, including rectangular prisms, cylinders, pyramids, and cones, by calculating the areas of their individual surfaces and adding them together, utilizing nets when necessary

- Students will be skilled at finding the area of two-dimensional shapes, such as rectangles, squares, triangles and parallelograms, using the correct formulas and understanding how to apply those formulas to find composite area of more complex shapes

## Learning Plan

Day 1: Explore perimeter of polygons

- Perimeter of ectangles, squares, triangles.
- Guided practice and word problems, including problems from the coordinate grid

Day 2: Review perimeter concepts and introduce area as the space inside a shape.

Days 3-4: Review area formula for rectangles and squares

- Practice area of rectangles/squares
- Include shaded region problems
- Include rectangles made up of smaller equivalent squares problem (for example, a rectangle is made up of 8 smaller squares. If the square has an edge length of 1.5 cm, what is the area of the entire rectangle?)

Day 5: Mixed Review of Perimeter and Area of Rectangles and Squares.

Day 6: Quiz on Perimeter and Area of rectangles and squares.

Day 7: Introduction to area formula for a parallelogram.

- Practice area of parallelogram.
- Include problems on coordinate grid system
- Include problems given area, find missing dimension.

Day 8-9: Area of Triangles.

- Introduction to area of triangle formula.
- Include problems on coordinate grid system
- Include problems given area, find missing dimension.

Day 10-11: Introduction to areas of composite figures

- Guided and individual practice problems

Day 12: Mixed review area of parallelograms, triangles and composite figures.

Day 13: Quiz on area of parallelograms, triangles, composite figures and shapes on coordinate grid.

Day 14: Introduction to 3-D figures, including vocabulary (edge, face, vertice).

- Define parts of a 3-D figure.
- Use manipulatives to help students visualize/name 3-D figure

Day 15-16: Surface Area

- Guided practice finding surface area of cubes, rectangular and triangular prisms and pyramids.
- Use real world  surface area application problems.

Day 17 Quiz on 3-D shapes and Surface Area.

Day 18-19: Volume Introduction

- Introduce formulas for volume of a cube and rectangular prism
- Practice finding volume, including dimensions with decimals and fractions.
- Given volume, find a missing dimension

Days 20-21: Students explore volume more by packing a rectangular prism with fractional edge cubes.

Day 22: Quiz on Volume

Days 23-24: Review all concepts (perimeter, area, surface area, volume) with practice problems.

Day 25: Unit test covering all topics (perimeter, area, surface area, volume); end with a reflection on learning progress.

Total number of days - 25

## 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 Ideas Math

## Materials

Core: Core Book List including Big Ideas Math Modeling Real Life, Big Ideas Student Journal Workbook

Supplemental: Khan Academy,  I Ready, IXL (for intervention)

## Suggested Strategies for Modifications

Suggested Strategies for Modifications for Grade 6