**Thematic Unit: Perimeter, Area, and Volume**

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# Design Document

## Goals and Objectives

The goal in this unit is to address the standards listed below in math, language arts, science, and social studies and to include assessments that will show students mastery of the standards. Specific objectives are listed in the lesson table.

### Mathematics Standards

The Common Core State Standards for 6th grade in geometry require students to solve real-world mathematical problems involving area, surface area, and volume.

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.
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 by 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.
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.
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.

### Language Arts Standards for Reading Informational Texts

1. Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

4. Determine the meaning of words and phrases as they are used in a text.

### Language Arts Standards for Writing

Writing Standard 2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

1. Introduce a topic: organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect.
2. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
3. Use appropriate transitions to clarify the relationships among ideas and concepts.
4. Use precise language and domain-specific vocabulary to inform about or explain the topic.

### Speaking and Listening Standards

Comprehension and Collaboration

1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.
   1. Come to discussions prepared, having read or studied required material; explicitly draw on the preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
   2. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.
   3. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.
   4. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.
2. Interpret information presented in diverse media and formats (e.g. visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
3. Delineate a speaker’s argument and specific claims, distinguishing claims that are supported yb reasons and evidence from claims that are not.
4. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

### Science Standards

Standard 3: Students will understand the relationship and attributes of objects in the solar system.

Objective 1: Describe and compare the components of the solar system.

1. Identify the planets in the solar system by name and relative location from the sun.
2. Using references, compare the physical properties of the planets (e.g., size, solid or gaseous).
3. Use models and graphs that accurately depict scale to compare the size and distance between objects in the solar system.

### Social Studies Standards

Standard 1: Students will understand how ancient civilizations developed and how they contributed to the current state of the world.

Objective 4: Analyze how the earliest civilizations created technologies and systems to meet community and personal needs.

## Learner Prerequisites

Learners need to have the following skills prior to this unit:

1. Be able to identify and use the following vocabulary:
   1. Polygons: circle, parallelogram, polygon, rectangle, rhombus, square, trapezoid, and triangle.
   2. Geometry: base, height, and width. These terms will also be defined as encountered.
   3. Measurement: centimeters, cube, feet, inches, linear, square. These terms will also be defined as encountered.
2. Ability to read on a fourth grade level or Lexile level of 600 and above.
3. Ability to work in cooperative groups.

## Learner Characteristics

* 88% of the students attend school regularly. 1 student is regularly absent with psychological issues and the other two have non-illness related attendance issues.
* 93% of the students report enjoying school. The class is split pretty evenly with a slight majority preferring math and sciences to the language arts. 96% of the students prefer working in groups or pairs rather than working alone.
* On the Praxis scale of engagement, 1 student is considered a reluctant learner, 2 are invisible learners, 5 are engaged, and 19 are fully engaged in their learning process.
* 24 of the students regularly complete homework and consistently complete in-class assignments. Of the three remaining students, one is self-contained resource and classified as invisible, one is a reluctant learner, and the other is engaged in class, but does not complete work at home

Design plan for geometry**: 3-dimensional figures**

Overarching goal**:** Students will be able to compute perimeter, area, volume, and surface area; differentiate between the three, and apply them to real-life situations.

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| **Lesson** | **Objectives and Activities** | Feedback, Evaluations, Assessment |
| **1** | Review 2-dimensional figures**:** polygon classifications with an emphasis on triangles and quadrilaterals. |  |
| **Objective 1:** Establish vocabulary for the unit.  **Vocab:** Polygon, triangle, square, rectangle, parallelogram, trapezoid, rhombus, base, height.  **Lesson Type:** Simple Knowledge. |  |
| **General Procedure:**   * Present vocab with definition and visual. * Use choral responses to identify 2-D shapes. * Students use white boards to identify samples.   **Supplies:**   * Individual white boards, markers, erasers. * Visuals of 2-D shapes. | Choral responses  Individual white boards  Formative assessment |
| 3-dimensional figure features**.** |  |
| **Objective 1:** Establish vocabulary for the unit.  **Vocab:** Face, edge, vertices, classifications of prisms, pyramids, cylinders.  **Lesson Type:** Simple Knowledge. |  |
| **Objective 2:** Students Will Be Able To (SWBAT) identify features in three-dimensional figures with 80% accuracy.  **Identifiable Features:** Face, edge, vertices, classification.  **Lesson Type:** Simple Knowledge. |
| **General Procedure:**   1. Present vocab with definition and visual. 2. Link *social studies connection* with Greek root of “poly” and “hedra”.    1. (<http://www.math.com/school/subject3/lessons/S3U4L1DP.html>)    2. (<http://www.historyforkids.org/learn/greeks/science/math/euclid.htm>) 3. Use choral responses to identify 3-D shape features. 4. Students complete chart on 3-D shape features working with different sized shapes in teams. 5. Assign homework from text.   **Supplies:**   * 3-D shape identification chart. * 3-D shapes for identification. * Textbook for homework assignment. | Choral responses  Formative assessment of chart  Formative assessment of HW |
| **2** | **Perimeter, area, and volume.** |  |
| **Perimeter** |  |
| **Objective 1:** SWBAT understand perimeter using examples and non-examples.  **Lesson Type:** Construct A Concept. |  |
| **Objective 2:** SWBAT compute perimeter with 80% accuracy.  **Lesson Type:** Algorithmic Skill. |
| **General Procedure:**   1. Learn and recite the “Perimeter and Area” drill. 2. Discuss difference between perimeter (example) and area (non-example) with pictures. 3. Build rectangular shapes and compute perimeter. 4. Practice computing perimeter from pictures. 5. Assign homework from text.   **Supplies:**   * Drill book. * Blocks for shape building. * Scratch paper for practice. * Textbook for homework assignment. | Formative assessment of figures and computation  Formative assessment of HW |
| **3** | **Area** |  |
| **Objective 3:** SWBAT understand area of 2-D figures and surface area of 3-D figures, limited to parallelograms and triangles using examples and non-examples.  **Lesson Type:** Construct a Concept. |  |
| **Objective 4:** SW discover-a-relationship between perimeter and area/surface area.  **Lesson Type:** Discover a relationship. \* |
| **General Procedure:**   * Divide students into task groups with 4-6 students per group. * Use a task sheet to find area and perimeter of 2-D shapes by counting squares. * Students will discuss in groups the relationship between perimeter and area and try to create a formula for area of rectangles, triangles, rhombus, and trapezoid. * Each group will present their findings to the class. * The class will devise an area formula by consensus using correct terms. * Assign Homework from text.   **Supplies:**   * Task sheet for area and perimeter. * Scratch paper for practice. * Textbook for homework assignment. | Formative assessment of task sheet  Cooperative group dependence  Class participation  Formative assessment of HW |
| **4** | **Objective 5:** SWBAT compute area of 2-D figures and surface area of 3-D figures with 80% accuracy.  **Lesson Type:** Algorithmic Skill. |  |
| **General Procedure:**   * *Language Arts Connection*: Read Sir Cumference and the Isle of Immeter as a review of perimeter and area. *Social Studies Connection*: Reference to study of knights during the middle ages. * Divide students into task groups with 4-6 students per group. * Use a task sheet to find surface area for 2-D and 3-D shapes. * Students need to use estimation to verify results. * Groups will attempt to develop a formula for surface area. * Each group will present their findings to the class. * The class will devise a surface area formula by consensus using correct terms. * Assign Homework from text.   **Supplies:**   * Task sheet for area and surface area. * Scratch paper for practice. * Textbook for homework assignment. | Formative assessment of task sheet  Cooperative group dependence  Class participation  Formative assessment of HW |
| **5** | **Objective 5:** SWBAT compute area of 2-D figures and surface area of 3-D figures with 80% accuracy.  **Lesson Type:** Algorithmic Skill (Practice and reinforce skills) |  |
| **General Procedure:**   * Students will team up in groups of 2-3. * Students will fill out a task sheet and find area/surface area for polygons provided by the teacher. * The groups will take 2 shapes each and calculate area/surface area for each figure. * As students complete calculations for their figures, they will check their answers for correctness with the instructor. * Students will attempt to complete the calculations for all the figures.   **Supplies:**   * Task sheet for area and surface area. * Polygon figures made out of centimeter graph paper. * Calculation key. | Formative assessment of task sheet  Cooperative group dependence  Class participation |
| **6** | **Volume** |  |
| **Objective 6:** SWBAT understand volume of 3-D prisms using examples and non-examples.  **Lesson Type:** Construct a Concept. |  |
| **Objective 7:** SW discover-a-relationship between area and volume of 3-D prisms.  **Lesson Type:** Discover-a-relationship. |
| **Objective 8:** SWBAT compute volume of 3-D figures with 80% accuracy.  **Lesson Type:** Algorithmic Skill. |
| **General Procedure:**   * Divide students into task groups with 4-6 students per group. * Use a task sheet to find volume of 3-D shapes. * Students need to use estimation to verify results. * Groups will attempt to develop a formula for volume of rectangular prisms. * Each group will present their findings to the class. * The class will devise a volume formula by consensus using correct terms. * Assign Homework from text. * *Science Connection*: Students will establish a volume relationship between the Sun and the planets in our solar system.   **Supplies:**   * Task sheet for volume. * Scratch paper for practice. * Textbook for homework assignment. | Formative assessment of task sheet  Cooperative group dependence  Class participation  Formative assessment of HW |
| **7** | **Objective 8:** SWBAT compute volume of 3-D figures with 80% accuracy.  **Lesson Type:** Algorithmic Skill (Practice and reinforce skills) |  |
| **General Procedure:**   * Students will team up in groups of 2-3. * Students will fill out a task sheet and find volume for nets provided by the teacher. * The groups will take 2 shapes each and calculate volume for each figure. * As students complete calculations for their figures, they will check their answers for correctness with the instructor. * Students will attempt to complete the calculations for all the figures.   **Supplies:**   * Task sheet for volume. * Polygon figures made out of centimeter graph paper. * Calculation key. | Formative assessment of task sheet  Cooperative group dependence  Class participation |
| **8** | **Differentiate between perimeter, area, and volume** |  |
| **Objective 9:** SWBAT differentiate between perimeter, area, and volume and accurately communicate the difference. Students will be divided into 6 task groups. Students will complete their own task sheet in their groups.  **Lesson Type:** Comprehend and Communicate. |  |
| **General Procedure:**   * Divide students into task groups with 4-6 students per group. * Groups will use a task sheet to devise definition, illustration, example of use, non-example of use. One sheet per group will cover: perimeter, area, surface area, and volume. * Each group will present their findings to the class. * After each group presents, the class will discuss the presentation and correctness of the group effort.   **Supplies:**   * Task sheet for perimeter, area, surface area, and volume. * Scratch paper for practice. | Formative assessment of task sheet  Cooperative group dependence  Class participation |
|  | **Objective 10:** SWBAT apply perimeter, area, and volume to real-life problems.  **Lesson Type:** Application |  |
| **General Procedure:**   * Students are given individual assessment. * Student’s mini-experiment assessment will be graded according to the rubric.   **Supplies:**   * Mini-experiment assessment. * Rubric | Summative assessment based on the rubric |