Unit 4: Domain: Volume and Measurement

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Marking Period 3**
Length: **5-6 Weeks**
Status: **Published**

Unit Overview

In this unit, the students will understand concepts of volume and relate volume to multiplication and to addition. The students will also convert like measurement units within a given measurement system. The students will represent and interpret data. The students will solve problems with volume in real-world situations. The teacher will use various types of station activities in these areas, and final assess daily in ticket to leaves.

Standards

MA.5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
MA.5.MD.B.2	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.
MA.5.MD.C.3a	A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
MA.5.MD.C.3b	A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.
MA.5.MD.C.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.
MA.5.MD.C.5a	Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
MA.5.MD.C.5b	Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.
MA.5.MD.C.5c	Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.
MA.5.G.A.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Essential Questions

- How does knowing the associative property assist you in understanding volume?
- In what ways do we organize data for the purpose of analysis?
- What strategies can be used when finding volume?
- When can knowledge of volume be utilized in real-world situations?

Application of Knowledge and Skills...

Students will know that...

- a cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
- a solid figure with a volume of n cubic units can be packed without gaps or overlaps with n unit cubes.
- in an ordered pair, the first number indicates how far to travel from the origin in the direction of one axis (x), and the second number indicates how far to travel in the direction of the second axis (y)
- the formulas that can be used to find the volume of rectangular prisms are: volume = length x width x height and volume = base x height.
- the operations of multiplication and addition are related to volume.
- the volume is the same whether the three edge lengths are multiplied or the height is multiplied by the area of the base.
- the volume of adjacent rectangular prisms can be combined to find the total volume of a figure (additive)
- threefold whole-number products are represented as volumes, which can be demonstrated by the associative property of multiplication.
- volume can be recognize as an attribute of solid figures.

Students will be skilled at...

- Applying this technique (adding the volumes of the non-overlapping parts) to solve real-world problems.
- Converting among different-sized measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m)
- Finding the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes
- Finding the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes
- Finding volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts
- Making a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8).
- Measuring volume using cubic units (cm, in, ft, and improvised units).
- Measuring volume using cubic units (cm, in, ft, and improvised units).
- Solving real-world and sample mathematical problems by graphing points in the first quadrant of the

coordinate plane.

- Using the formulas for volume in the context of solving real-world and mathematical problems.

Assessments

- Benchmark Tests
- End of the Year Test
- Other visual assessments During the guided practice part of the lesson, students record responses to problems on individual whiteboards. Teacher will monitor for errors, and assist where needed
- Placement Test: used to test prior knowledge
- Task Cards: used as a reinforcement of a topic
- Topic Math Projects
- Topic Quick Checks: can be given after each section in the topic to check for understanding
- Topic Tests: given after each topic

Activities

Problem of the Day-Present a daily problem that serves as a review from the previous day's lesson.

Station activities- Each section has center activities to reinforce skill (leveled)

- Toss and Talk - Toss a die and complete the problem to that number. Explain and discuss with your partner.
- Display the Digit- Choose a table. Explain how each number in the bottom row is related to the one about it. Find the missing numbers. Display each 0-9 tiles exactly once. Take turns with partner.
- Teamwork - As a team (2-4 students) pick a tile (1-4) and chose from the list of jobs (A-F) to complete. Check each others work.
- Tic Tac Toe - Toss the cubes. The numbers toss are the length and width in inches of a rectangular prism that has a height of 8 inches. Cover the answer and three in the row in the section wins.
- Think Together - Put a tile (1-4) and choose (A-D) box. Complete the problem together, discuss process and if the answer is correct.

STEM - Certain sections have Going Digital integrating technology and the use of calculators

- Mixed Problem Solving: Art - page 293

Projects - There is a math project for each topic (Topic 12-14) - (See Cross-Disciplinary Instruction for projects and page numbers)

Practice work - Communicator practice can be done using Independent work and problem- solving practice problems in each section.

Volume of Playdough Activity - Students will create rectangular and triangular prisms with a given volume of play- dough, discovering the properties and attributes of these solids (number of edges, faces, and vertices

as well as the types of faces), reviewing - (See Link)

Box It Up - In this activity students will be finding the volume of rectangular prisms. (See Link)

Fill 'Em Up - This activity will help students to learn the concept of volume through hands-on activities.

(See Link)

- Volume of Play
- Box It Up
- Fill 'Em Up

Activities to Differentiate Instruction

General strategies for modification of this curriculum for students with special needs, ELL, and gifted learners:

- **General strategies:**
  - preferential seating
  - manipulatives
  - modified workbook pages
  - practice or enrich homework pages
- **Center activities** - There are leveled center activities for each section. There is a separate activity for "Intervention", and then "On-Level" and "Advanced" are in spiral book.
- **Leveled practice pages** - There are three leveled (Reteaching, Practice, and Enrichment) sheets that can be used for practice or homework.
- **Math Concept Readers:** These readers allow the student to read the story at different levels- above level, on level, and below level. (also available on line with audio) Complete the Think and Respond and Write Math questions at the conclusion of each book.
- **Assessment**- Using Quick Check Review can determine differentiated instruction levels using sample answers and using the rubric at the Close/ Assess and Differentiate section in the teacher edition.

Content specific modification for students with special needs, ELL, and gifted learners:

- **Topic 12**
  - **Below level students:**
    - If students have a hard time finding volume using the volume formula, allow them to use cubes to model rectangular prisms. Or encourage students having difficulty to break the formula into parts by finding the area of the prism's base and then multiplying by the number of layers, which corresponds to the height.
    - Encourage students to always sketch the prisms describe in word problems and to label them with the dimensions given. Sketching and labeling go a long way toward avoiding errors and confusion.
  - **Students with special needs:**

- For students who have difficulty drawing the representations of three-dimensional shape,s prepare worksheets that already have on them any three-dimensional shapes necessary for solving the problems.
- Plastic tracing templates are also available at art and office supply stores for drawing triangles, ellipses, parallelograms, and even three-dimensional shapes.

- **ELL**
  - Hold up a reference cube when talking about a specific unit of volume. Have students frequently repeat the names of the various units and ask them to search for examples of items at home that are close to each unit of volume.
  - **Emerging:** Explain the terms face, edge, and vertex while holding up different examples of solids. Have students repeat the names as you point to them.
  - **Expanding:** Students may be familiar with the use of the word net as a shorthand for the word Internet. Remind students that the term net is used for the plan figures that fold into solids because the interconnected lines resemble a fishing net.
  - **Bridging:** Students may have difficulty recognizing that the word vertices is the plural of the word vertex. Explain that it is done this way because the mathematical term comes from Latin.

- **Advanced/Gifted:**
  - Have students with strong number sense determine how many prisms with different dimensions can be made with 36 cubes. (8)
  - Have students explore what happens to the volume of a rectangular prism if all of the dimensions are doubled. (The volume is multiplied by 8.) What happens if all of the dimensions are triple? (The volume is multiplied by 27).

- **Topic 13**
  - **Below level students:**
    - To help students see the relationship between the various units of customary capacity, bring in a liquid measuring cup (8 and/or 16 oz), a quart container, and a gallon container. Then have students count how many times it takes one container to fill a larger container. Then repeat for metric measures of capacity.
  - **Students with special needs:**
    - Students with special needs will benefit greatly from hands-on experiences with measuring weight and mass. Bring in a variety of containers and items and allow students to pour water, sane, rice, or other materials into the containers and weigh items on a balance scale. This will help them get a better sense of the relative size of each unit of measure.
    - Remind students of the difference between weight and mass. The terms cannot be used interchangeably.
    - Create an environmental learning space that can accommodate wheelchairs and students using other assistive devices to navigate around the classroom.

  - **ELL**
    - English Language Learners are unlikely to have had experiences with the customary units of weight. They may have difficulty with the vocabulary as well as difficulty developing benchmarks for ounces, pounds, and tons.
    - **Emerging:** Have students hold an object that weighs about one ounce in one hand and 16 of the same object in the other. Have them imitate a balance, holding the lighter object up and the heavier object down. Have them repeat for each hand, "This weighs about one ounce." "This weighs about one pound."
    - **Expanding:** Have students find objects in magazines that might weigh about one ounce

and paste them onto index cards. Then have them complete sentences such as "16___weigh about one pound"
        - **Bridging:** Have students find or draw pictures of real-world objects that might weigh one ounce, one pound, and one ton.

    - **Advanced/Gifted:**
        - If students show proficiency in converting between units of measure, have them convert into fractional units of measure. For example, 1 quart is 1/4 of a gallon, 1 inch is 1/36 of a yard and 1 ounce is 1/16 of a point.
        - Bring in a cereal box that shows both ounces and grams. Have students determine the approximate number of grams in an ounce. (28).

- **Topic 14**
    - **Below level students:**
        - Discuss with students why surveys are important. Have students think of real-world examples when surveys may be taken.
        - Have students brainstorm different types of survey questions they could ask their classmates.
    - **Students with special needs:**
        - Discuss line plots with students. Have students give examples of information that could be shown on a line plot.
        - Create a simple categorical line plot using the number of days in the past two weeks that were sunny, cloudy, rainy, or snowy.

    - **ELL**
        - Students may have difficulty understanding parts of a line plot.
        - **Emerging:** Choose one line plot from the lesson. Have students point to each part of the line plot and say what it represents.
        - **Expanding:** Choose one line plot from the lesson. Hive students a piece of the line plot and have students describe it.
        - **Bridging:** Draw various line plots that are missing one or more sections. Have students identify the section and fill in the missing information.

    - **Advanced/Gifted:**
        - Students who understand how to make and analyze line plots may benefit from creating these graphs on the computer. Have them choose one graph from a lesson and reproduce it using an appropriate program.
        - Advanced students will benefit from drawing graphs that are appropriately misleading. Ask groups of students to draw the same graph, each using a different scale. Have groups discuss how each graph is misleading.

Integrated/Cross-Disciplinary Instruction

Topic 12- Geodesic Dome - Have students research geodesic domes and have them draw pictures and identify their locations. Then have students make their 3D version of it with toothpicks, pipe cleaners, and clay.

Topic 13 - Fishing - Have students use the Internet to find Florida fishing records. Have them choose three records and for each one draw a picture of the fish and state its weight. Then they should convert the weight to ounces.

Topic 14 - Tornado - Have students research five tornadoes safety tips. Then have them survey 25 people and record which tips people did not know about. Students should display their data in a tally chart.

Resources

Topic 12: Volume of Solids

Topic 13: Unit of Measure

Topic 14: Data

On line Resources available at www.pearsonrealize.com

- Teacher Edition (TE) Textbook
- Student Edition (SE) Textbook
- Tests on line
- Concepts videos
- Math Tools

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of

problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.