

MATHEMATICS COMMON CORE CURRICULUM UNIT

North Smithfield School Department

UNIT 4: Geometric Measures: Understanding Concepts of Volume as Multiplication and Addition COURSE OR GRADE: **5**

DATE PRESENTED: _____ DATE DUE: _____ LENGTH OF TIME: Several Weeks

OVERVIEW OF UNIT:

In this unit, students will convert like measurement units within a given measurement system as well as understand the concepts of volume and relate volume to multiplication and addition.

ESSENTIAL QUESTION, PROMPT, PROBLEM/UNIT

Why does "what" we measure influence "how" we measure? Why display data differently? How is volume measured? How is volume related to multiplication?

STANDARDS: Common Core Math Standards – Grade level domains K-5

Counting and Cardinality CC	Operations and Algebraic Thinking OA	Number and Operations in Base Ten NBT	Number and Operations – Fractions NF	Measurement and Data MD	Geometry G
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> MD. 1-5	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>				
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STANDARDS: Mathematical Practices grades K-12

- | | | | | |
|---|--|--|---------------------------------------|--|
| 1. Make sense of problems and persevere in solving them | 3. Construct viable arguments and critique the reasoning of others | 5. Use appropriate tools strategically | 7. Look for and make use of structure | 8. Look for and express regularity in repeated reasoning |
| 2. Reason abstractly and quantitatively | 4. Model with mathematics ★ | 6. Attend to precision | | |

FOCUS MATHEMATICS STANDARDS: see curriculum for specific standards, e.g.

- Convert like measurements within a given system 5.MD.1
- Represent and interpret data 5.MD.2
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. 5. MD. 3, 4, 5

Applied Learning Standards:

problem solving communication critical thinking research reflection/ evaluation

ENDURING UNDERSTANDING:

Measurement can be converted into different sized standard unit measurements within a measurement system. These conversions can be used to solve real-world problems. Data can be collected and represented in many ways, including graphs and line plots. Volume is equivalent to *length x width x height*. The volume of a rectangular prism is determined by multiplying its three dimensions; *length x width x height* or the *base x the height*.

PRIOR KNOWLEDGE: (from grade 4 CCSS)

- Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.
- Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
- Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
- Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

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STUDENT OBJECTIVES, SKILLS and/or NEW KNOWLEDGE:

- MD.1: Students apply their understanding of place value and decimals when using several strategies to convert measurements.
- MD.2: Data can be interpreted, analyzed, and compared using graphs or line plots.
- MD. 3: Volume is an attribute of 3 dimensions; length, width and height. *Volume is measured by the quantity of same size unit times of volume that completely fill the space.*
- MD. 4: $1 \times 1 \times 1$ unit cube is standard unit of measurement for volume; either customary or metric measurement can be used.
- MD.5: Given multiple opportunities, students derive the volume formula

SUGGESTED PROBLEMS:

ASSESSMENT PROBLEMS

5.MD.1 Advanced

- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/878/original/illustrative_mathematics_878.pdf?1363534387
- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/293/original/illustrative_mathematics_293.pdf?1343856883
- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/031/original/illustrative_mathematics_1031.pdf?1363534303

5.MD.2 Advanced

- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaZDU4ZTEwNWItMmZkOC00MDliLWFmMWItZGYyMmQ5ODA4Njcy/edit?pli=1>
- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaZWnkY2ZkOGUtMzQyNC00NmI4LWlxYtEtYjhhMGM4YmUyZjNk/edit?pli=1>

5.MD.3 Basic

- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaN2RjMGM0ZTQtMTc1Yi00YWUzLTlhYTUzMTRIZTc3NjNhYjkz/edit?pli=1>
- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaZGQ4NWEzYzEtNTVhZC00YzM1LWE3YjAtYzJlMGU3Mjc2/edit?pli=1>
- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaMjQzOTkzNTctOGE4OS00MzhiLTgxNzEtN2E5ZDg2NDUwZTMx/edit?pli=1>

5.MD.4 Basic

- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaa0tzdG52d2ITLVMwZEJKZWZftkZMQQ/edit?pli=1>

5.MD.4 Advanced

- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amack5OWXBBTmRRNktuUDRmY2VCTmxaQQ/edit?pli=1>

5.MD.5 Basic

- <http://www.p12.nysed.gov/assessment/common-core-sample-questions/math-grade-5.pdf> (#6)
- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaMTdmZDRjMmUtZDZjMi00ZWZjLWE2ZmEtYjhhNzI4NmRIYjVh/edit?pli=1>
- <https://docs.google.com/a/bryantschools.org/file/d/0By53YArZ6amaYzJlNzMwMmItNDU1Yy00OWNhLTk4OTktZGU2MmM0NTEzZmZy/edit?pli=1>

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ACTIVITIES, PRODUCTS, PERFORMANCE, and ASSESSMENTS:

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|---------------------------------------|----------------------------|--|---|
| 1. Application to real world problems | 6. Graphic organizers | 14. Problem/Performance based/common tasks | 18. Technology |
| 2. Creating charts/collecting data | 7. Graphing | 15. Real-life applications involving graphing | 19. Summarizing and note-taking |
| 3. Collaboration - interpersonal | 8. Interviews | 16. Represent numbers | 20. Tests and quizzes |
| 4. Conferencing | 9. Journals | 17. Rubrics/checklists (mathematical practice, modeling) | 21. Writing genres Arguments/ opinion Informative |
| 5. Exhibits | 10. KWL charts | | |
| | 11. Mathematical Practices | | |
| | 12. Modeling ★ | | |
| | 13. Oral presentations | | |

- MD.1:** Students build on their prior knowledge of related measurement units to determine equivalent measurements. Prior to making actual conversions, they examine the units to be converted, determine if the converted amount will be more or less units than the original unit, and explain their reasoning. They use several strategies to convert measurements. When converting metric measurement, students apply their understanding of place value and decimals.
- MD.2:** The foundation of a line plot is a number line. An "x" is made above the corresponding value using whole and mixed number units on the line for every corresponding piece of data. Line plots are used to interpret, analyzed, and compare data.
- MD.3:** As students develop their understanding of volume they understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. This cube has a length of 1 unit, a width of 1 unit and a height of 1 unit and is called a cubic unit. This cubic unit is written with an exponent of 3 (e.g., in³, m³). Students connect this notation to their understanding of powers of 10 in our place value system.
- MD.4:** Students understand that same sized cubic units are used to measure volume. They select appropriate units to measure volume. For example, they make a distinction between which units are more appropriate for measuring the volume of a gym and the volume of a box of books. They can also improvise a cubic unit using any unit as a length (e.g., the length of their pencil). Students can apply these ideas by filling containers with cubic units (wooden cubes) to find the volume. They may also use drawings or interactive computer software to simulate the same filling process.
- MD.5:** Students derive the volume formula (volume equals the area of the base times the height) and explore how this idea would apply to other prisms. When given 24 cubes, students make as many rectangular prisms as possible with a volume of 24 cubic units. Students build the prisms and record possible dimensions.

HIGHER ORDER THINKING SKILLS: Web's Depth of Knowledge 2 – 4 or Bloom's Taxonomy

Web's Depth of Knowledge

- skill/conceptual understanding
- strategic reasoning
- extended reasoning

Bloom's Taxonomy

- apply
- analyze
- synthesize/create
- evaluate

ADDITIONAL RESOURCES: see curriculum for specifics

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VOCABULARY

MD

- Area
- Base
- Capacity
- Convert
- Cubic unit
- Cubic unit
- Height
- Length
- Line plot
- Metric measurement
- Rectangular prism
- Standard measurement
- Volume
- Weight
- Width

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LESSON PLAN for UNIT _____

LESSONS

- Lesson # 1 Summary:**

 - Lesson #2 Summary:**

 - Lesson #3 Summary:**
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OBJECTIVES for LESSON # _____

- Materials/Resources:**

- Procedures:**
 - **Lead –in**

 - **Step by step**

 - **Closure**

- Instructional strategies:** see curriculum introduction

- Assessments:** see curriculum introduction
 - **Formative**

 - **Summative**

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