

Unpacked South Dakota State Mathematics Standards

Purpose: In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

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| Domain: Measurement and Data | | Grade Level: 5 |
| 5.MD.C Cluster: Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. | | |
| The students will understand that volume is an attribute of a solid figure, use unit cubes to determine the volume, understand that volume can be calculated with a formula, and break down two non-overlapping right rectangular prisms in order to determine the volume. The students will also apply this knowledge to real world problems. | | |
| <p>**This is a MAJOR cluster. Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.</p> <p>5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.</p> <ul style="list-style-type: none"> a. 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. b. 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. <p>5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.</p> <p>5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume².</p> <ul style="list-style-type: none"> a. 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. b. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. c. Apply the formulas $V = l \times w \times h$ and $V = B \times h$ (where B is the area of the base) 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. d. 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 problems³ | | |
| Aspects of Rigor for Student Learning: (Conceptual, Procedural, and/or Application) | | |
| Conceptual Understanding | Procedural Fluency | Application |
| Understand that volume is an attribute of solid figures. (5.MD.3) Understand that volume is measured in cubic units. (5.MD.3a) Understand that volume is filling an object without gaps and without | | |

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| overlaps. (5.MD.3b) | | |
| | Measure volume by counting unit cubes. (5.MD.4) | |
| Understand that volume can be found by multiplying dimensions or by multiplying height by the area of the base. (5.MD.5a) Understand that volume of two right rectangular prisms is additive. (5.MD.5d) | Find volume by packing a right rectangular prism with unit cubes. (5.MD.5a) Use dimensions to write and apply the formula for volume for right rectangular prisms. (5.MD.5b,c) Find the volume of solid figures composed of two non-overlapping right rectangular prisms. (5.MD.5d) | Solve real world problems involving volume of rectangular prisms. (5.MD.5c) Apply technique for finding volume of two non-overlapping right rectangular prisms to real world problems. (5.MD.5d) |

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
 - Students will solve real-world and mathematical problems involving volume. ¹
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
 - Students will 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.
5. **Use appropriate tools strategically.**
 - Students will use manipulatives to build cubes and rectangular prisms to discover the formula for the volume of rectangular prisms.
6. **Attend to precision.**
 - Students will use specific vocabulary to describe the dimensions for measurement of volume.
7. **Look for and make use of structure.**
 - Students will use their knowledge of the mathematical structure of area and apply that knowledge to volume.
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

| <i>Previous Learning Connections</i> | <i>Current Learning Connections</i> | <i>Future Learning Connections</i> |
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| Previously, students have created 3-D shapes. (1.G.2b) In 3rd grade, students learned to measure area using unit squares. (3.MD.6) In 4th grade, students applied the formulas to determine area and perimeter of rectangles. (4.MD.3) | Students will continue using their understanding of fluently multiplying multi-digit whole numbers. (5.NBT.5) | Students in 6th grade will find the volume of right rectangular prisms with fractional dimensions in the context of solving real-world and mathematical problems. (6.G.2) |

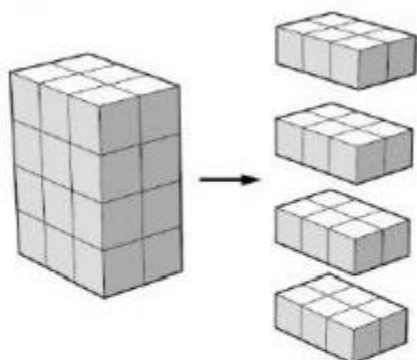
Vocabulary (Key Terms Used by Teachers and Students in this Cluster):

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> • unit cube • cubic unit • cubic inch • cubic foot • cubic centimeter | <ul style="list-style-type: none"> • right rectangular prism • base (B) • length (l) • height (h) • width (w) | <ul style="list-style-type: none"> • volume (V) • formula |
|---|--|---|

Relevance, Explanations, and Examples:

2

Example Stem: The layers of a rectangular prism are shown to the right of the prism.

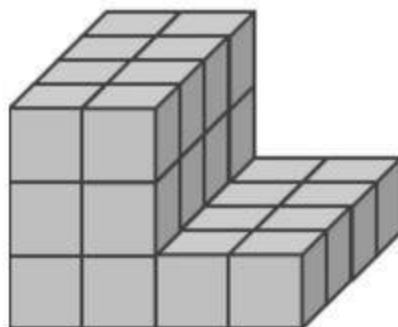


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|  Key represents 1 cubic cm |
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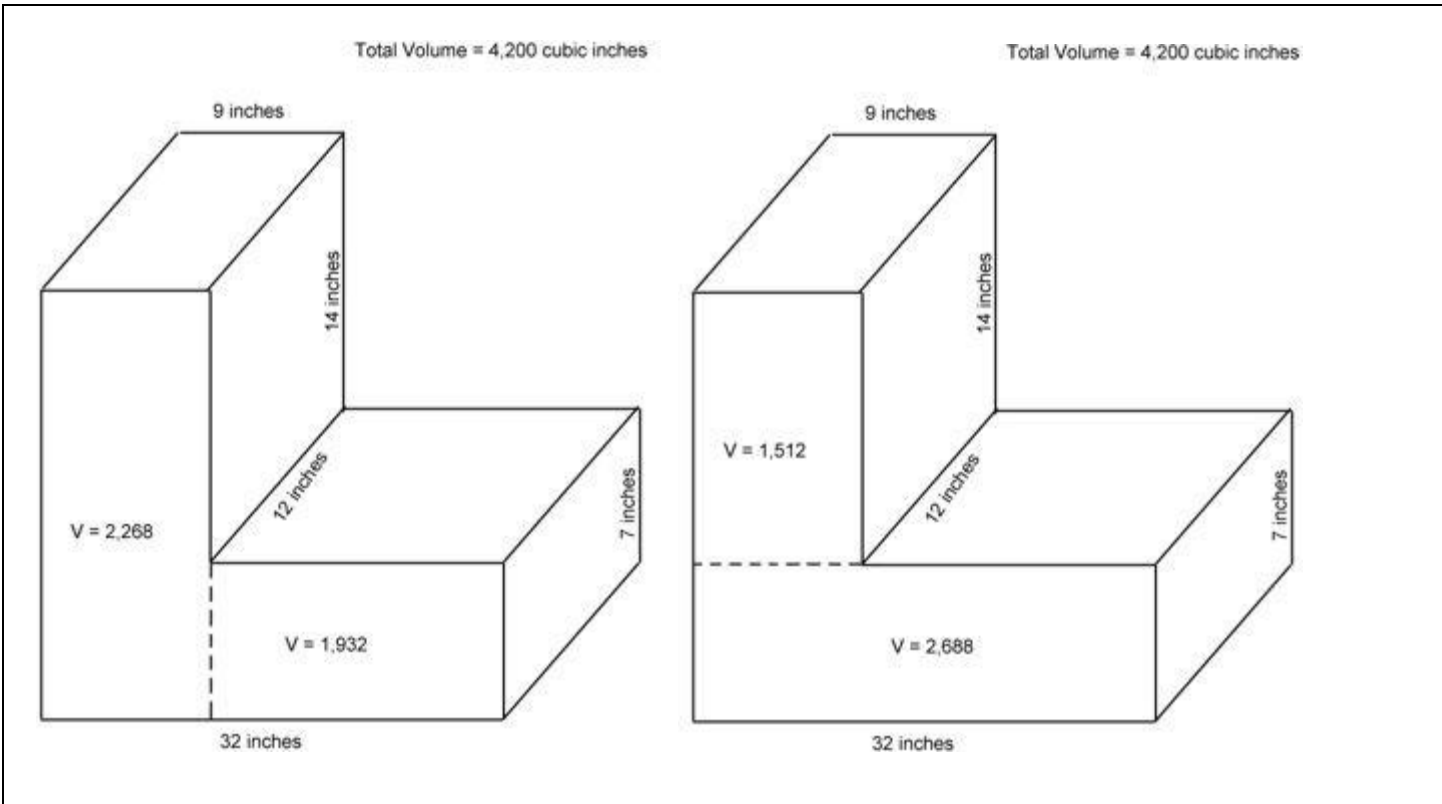
Enter the volume, in cubic centimeters, of the rectangular prism.

[HTTP://WWW.SMARTERBALANCED.ORG/ASSESSMENTS/DEVELOPMENT;](http://www.smarterbalanced.org/assessments/development/)

3



Phillis also broke this solid into two rectangular prisms, but she did it differently than John. She found the volume of the solid below using this expression: $(2 \times 4 \times 3) + (2 \times 4 \times 1)$.



Achievement Level Descriptors

Cluster: Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Concepts and Procedures

Level 1: Students should be able to use unit cubes to find the volume of rectangular prisms with whole number edge lengths.

Level 2: Students should be able to understand the concept that the volume of a rectangular prism packed with unit cubes is related to the edge lengths.

Level 3: Students should be able to use the formulas $V = l \times w \times h$ and $V = B \times h$ to find the volume of rectangular prisms. They should be able to find the volume of two non-overlapping right rectangular prisms.

Level 4: Students should be able to find the volume of a right rectangular prism after doubling the edge length of a side and compare it to the original.