

Inspect

CCR Performance Tasks

Math Grade 5: Make Sense of Volume

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Inspect Assessment Content is available through a variety of assessment administration and data analysis platforms.

Inspect assessment content offers these benefits:

Native college- and career-ready and NGSS content prepares students to meet their post-secondary goals. Content re-aligned from legacy standards cannot do this.

Content that addresses your scope and sequence so that your assessments do not waste valuable instruction time



Professional development embedded within content that

- shows the relationship between specific skills and higher-order thinking
- includes authentic, permissioned texts of appropriate complexity
- and documents student progress using DOK and learning progressions

Help for teachers addressing the instructional shifts with content that elicits evidence of learning from each response

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CCR Performance Tasks

Math Grade 5: Make Sense of Volume

Student Test Booklet

Name:

Math Grade 5: Make Sense of Volume

Student Rubric

This problem is meant to test if you can:

- Determine the volume of a rectangular box;
- Construct a box with a given volume;
- Compare measurements using different units.

Your teacher will rate your answer as a level 4, 3, 2, 1, or 0. The descriptions below explain the types of answers expected at each level.

Level 4:

Your answer is correct and complete.

Your answer includes:

- A box you have constructed that has a given volume;
- A correct determination of the volume of your box, with a valid explanation of how you determined the volume;
- A correct explanation for how measurements using different-sized units are different.

Level 3:

Your answer is correct but one or two of your explanations are incomplete.

Your answer includes:

- A box you have constructed that has a given volume;
- A correct determination of the volume of your box, with a possibly incomplete explanation of how you determined the volume;
- A correct but incomplete explanation for how measurements using different-sized units are different.

Level 2:

You have answered parts of the problem correctly but your explanations are missing or weak.

Your answer includes:

- A box you have constructed that has a given volume, although you may have needed help to figure out how to construct a box with the correct volume;
- A correct determination of the volume of your box, with a possibly incomplete explanation of how you determined the volume;
- A vague, missing, or incorrect explanation for how measurements using different-sized units are different.

Level 1:

Your answer is incorrect.

Your answer may include:

- A box you have constructed that does not have the given volume;
- An incorrect determination of the volume of your box;
- A vague, missing, or incorrect explanation for how measurements using different-sized units are different.

Level 0:

Your answer is not related to the question, the teacher cannot understand your answer, or you do not write anything.

Name: _____

Math Grade 5: Make Sense of Volume

Complete all the tasks in the test booklet.

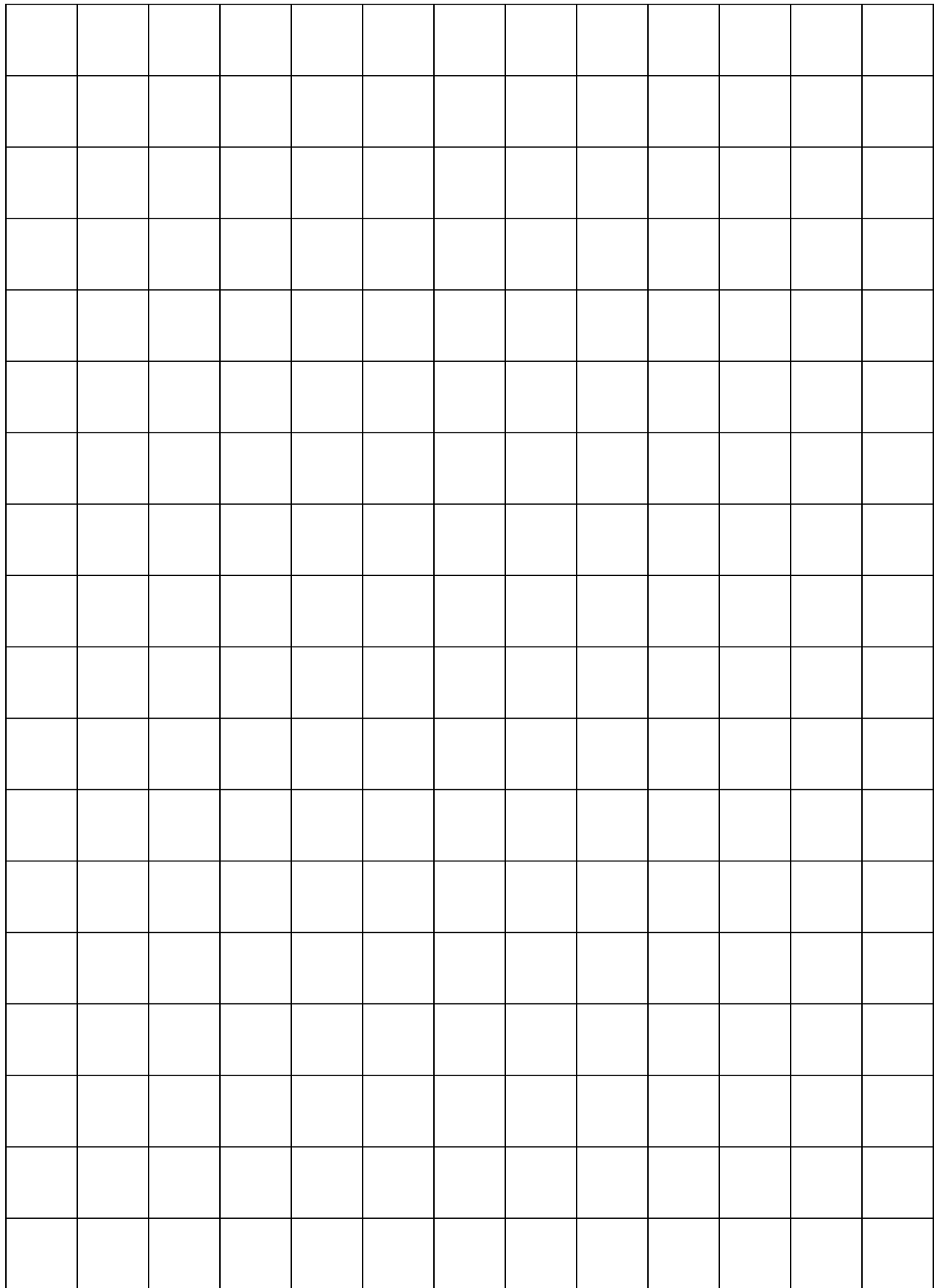
- 1

A. Construct a box that has a volume of 60 cubic units. Use the graph paper provided, scissors, and tape to construct the box.

B. Explain how you know the volume of your box is 60 cubic units.

- C. Suppose you are going to measure the volume of your box using smaller units. How does the measurement of the volume change? Explain your answer.**





CCR Performance Tasks

Math Grade 5: Make Sense of Volume

Teacher Guide

About the Teacher Guide

This document contains support materials for “Math Grade 5: Make Sense of Volume.” This includes:

- (a) The task
- (b) The standards and depth of knowledge level of the task
- (c) The scoring rubric
- (d) Discussion questions
- (e) Extension activities

These specifications have been included to help you connect the task to the Common Core content standards and the standards for mathematical practice. The rubric is designed to help you look for the development of mathematical practices in student work. It is also here to help you look for consistencies in student content errors that can help guide intervention and re-teach strategies.

Test Definition File

Item #	Correct Answer	Practice Standard	Content Standards
1	See Scoring Rubric	Mathematical Practice 1	5.MD.4, 5.MD.5

SBAC Claims	PARCC Sub-Claims
1 and 3	A and D

Special Instructions

Students will need scissors, tape and an inch ruler to complete the task.

Performance Task

- A. Construct a box that has a volume of 60 cubic units. Use the graph paper provided, scissors, and tape to construct the box.**
- B. Explain how you know the volume of your box is 60 cubic units.**
- C. Suppose you are going to measure the volume of your box using smaller units. How does the measurement of the volume change? Explain your answer.**

Standards Alignment

Practice Standards

MP1 > DOK 3

Make sense of problems and persevere in solving them. -- Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Content Standards

5.MD.4

Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5.MD.5

Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.

SBAC Claims

Mathematics Claim #1:

Concepts and Procedures. Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.

Mathematics Claim #3:

Communicating Reasoning. Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

PARCC Sub-Claims

Sub Claim A:

Major Content with Connections to Practices. The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Sub Claim D:

Highlighted Practice MP.4 with Connections to Content: modeling/application. The student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or, for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them (MP.1), reasoning abstractly and quantitatively (MP.2), using appropriate tools strategically (MP.5), looking for and making use of structure (MP.7), and/or looking for and expressing regularity in repeated reasoning (MP.8).

Scoring Rubric

4 Point Response:

The student response demonstrates:

- The ability to construct a box with a given volume;
- The ability to explain how to determine the volume of a box;
- A strong understanding of how the size of the unit used relates to the size of the measurement.

The response demonstrates a high level of understanding. A level 4 response is characterized by:

- A box constructed to have a volume of 60 cubic units;
- A correct and complete determination of the volume of the box either by using the formula or by using the concept of filling the box with unit cubes;
- Correct answers and a correct and complete explanation as to why using a smaller cube results in a greater number.

For part A, boxes with many different dimensions are possible. Look for a box with dimensions that result in a volume of 60 cubic units, such as $4 \times 3 \times 5$, $6 \times 5 \times 2$, or $3 \times 2 \times 10$.

Sample response for part B: "I know the box has a volume of 60 cubic units because if I filled it with cubes that match the grid paper there are 5 layers with 12 cubes in each layer and that adds up to 60."

Sample response for part C: "If I use $\frac{1}{2}$ -inch cubes, the volume is 60 because the $\frac{1}{2}$ -inch cubes match the graph paper. If I use smaller cubes, the volume is the same but the number of cubes is bigger because there are more cubes in the bottom layer and more layers. When I use a smaller unit cube, the number for the volume is greater because it takes more of the smaller cubes to fill the same amount of space."

3 Point Response:

The response demonstrates a strong understanding, but the work contains minor errors. A level 3 response is characterized by:

- The ability to construct a box with a given volume;
- The ability to explain how to determine the volume of a box;
- A strong understanding of how the size of the unit used relates to the size of the measurement but the explanation may be incomplete or the calculations may contain errors.

2 Point Response:

The response demonstrates a basic but incomplete understanding. A level 2 response is characterized by:

- A basic ability to construct a box with a given volume, but the student may need support from the teacher or peers to determine how to get started and may require several attempts to make a box of the correct volume;
- The ability to explain how to determine the volume of a box;
- A weak understanding of how the size of the unit used relates to the size of the measurement. The answers may be incorrect and the explanation may be missing or contain errors.

1 Point Response:

The response demonstrates minimal understanding. A level 1 response is characterized by:

- A weak ability to construct a box with a given volume;
- A weak ability to explain how to determine the volume of a box;
- A weak understanding of how the size of the unit used relates to the size of the measurement.

0 Point Response:

There is no response, or the response is off topic.

Discussion Questions

1. What does the word “volume” mean?

Possible Response: *Volume is the amount of space within a three-dimensional container. It can be measured by determining the amount of material that can fit within the container. We measure volume in cubic units, meaning the number of unit cubes that can fit in the container.*

2. Which has greater volume: the sink in your kitchen or your bathtub?

Possible Response: *Bathtub. Volume is a measure of how much material a container can hold; since my bathtub can hold a lot more water than my kitchen sink, my bathtub has greater volume.*

3. How can you determine the volume of a (rectangular) box?

Possible Response: *Figure out the number of unit cubes that can be placed within the box. This can be done by actually filling the box with unit cubes, but a simpler method is to multiply the length, width, and height of the box.*

Extension Activities

1. Developing an intuitive understanding about volume by exploring rectangular prisms.

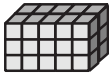

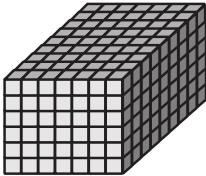

A. Determine the volumes of boxes with various dimensions by filling them with unit cubes.

Sample: A $3 \times 5 \times 2$ box holds 30 unit cubes, a $2 \times 3 \times 4$ box holds 24 unit cubes, a $6 \times 7 \times 9$ box holds 378 unit cubes, and a $1 \times 1 \times 1$ box holds only 1 unit cube.

2. Developing an understanding of the meaning of the volume formula.

A. Construct a table with five columns: length, width, height, diagram, and volume.

Sample: Have students use unit cubes to fill various size boxes and then create a table so that students can look for a relationship between the dimensions and the volume.

Length	Width	Height	Diagram	Volume
3 in.	5 in.	2 in.		30 in.^3
2 in.	3 in.	4 in.		24 in.^3
6 in.	7 in.	9 in.		378 in.^3
1 in.	1 in.	1 in.		1 in.^3