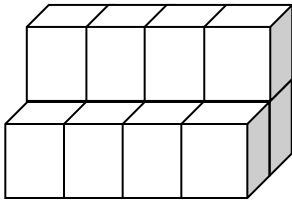


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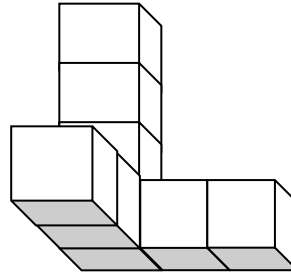
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1. Tell the volume of each solid figure made of 1-inch cubes. Specify the correct unit of measure.

a.

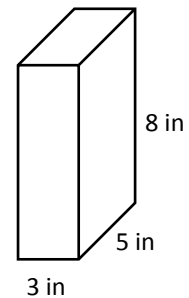


b.

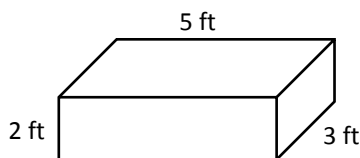


2. Jack found the volume of the prism pictured to the right by multiplying 5×8 and then adding $40 + 40 + 40 = 120$. He says the volume is 120 cubic inches.

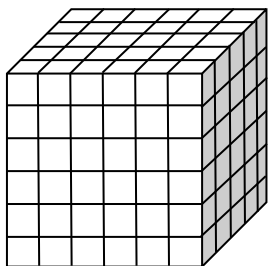
a. Jill says he did it wrong. He should have multiplied the bottom first (3×5) and then multiplied by the height. Explain to Jill why Jack’s method works and is equivalent to her method.



b. Use Jack’s method to find the volume of this right rectangular prism.

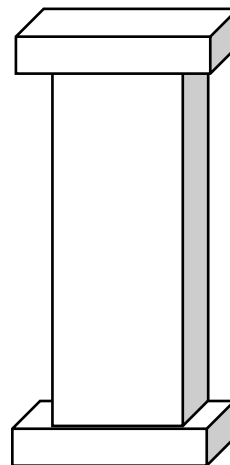


3. If the figure below is made of cubes with 2 cm side lengths, what is its volume? Explain your thinking.

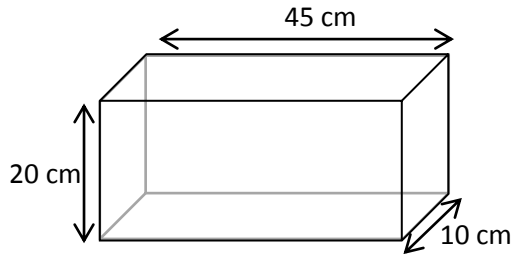


4. The volume of a rectangular prism is 840 in^3 . If the area of the base is 60 in^2 , find its height. Draw and label a model to show your thinking.

5. The following structure is composed of two right rectangular prisms that each measure 12 inches by 10 inches by 5 inches and one right rectangular prism that measures 10 inches by 8 inches by 36 inches. What is the total volume of the structure? Explain your thinking.

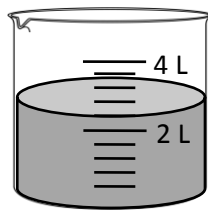


6. a. Find the volume of the rectangular fish tank. Explain your thinking.

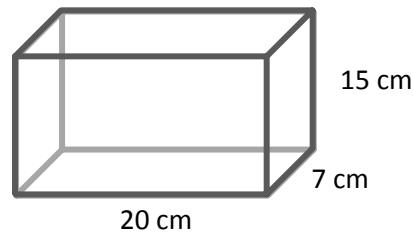


- b. If the fish tank is completely filled with water and then 900 cubic centimeters are poured out, how high will the water be? Give your answer in centimeters, and show your work.

7. Juliet wants to know if the chicken broth in this beaker will fit into this rectangular food storage container. Explain how you would figure it out without pouring the contents in. If it will fit, how much more broth could the storage container hold? If it will not fit, how much broth will be left over? (Remember: $1 \text{ cm}^3 = 1 \text{ mL}$.)



Beaker



Storage Container

**Mid-Module Assessment Task
Standards Addressed**
Topics A–B

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

- 5.MD.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
- 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 which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.
- 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.
- 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.
 - 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.
 - 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.

Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop *on their way to proficiency*. In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for students is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the students CAN do now and what they need to work on next.

A Progression Toward Mastery				
Assessment Task Item and Standards Assessed	STEP 1 Little evidence of reasoning without a correct answer. (1 Point)	STEP 2 Evidence of some reasoning without a correct answer. (2 Points)	STEP 3 Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer. (3 Points)	STEP 4 Evidence of solid reasoning with a correct answer. (4 Points)
<p>1</p> <p>5.MD.3 5.MD.4</p>	<p>The student has neither the correct volume nor the correct unit of measure for either figure.</p>	<p>The student calculates the volume incorrectly for both figures but uses the correct unit of measure.</p>	<p>The student calculates the volume for one figure correctly and uses the correct unit of measure for both.</p>	<p>The student correctly calculates the volume and uses the correct unit of measure for both:</p> <p>a. 12 in^3 b. 8 in^3</p>
<p>2</p> <p>5.MD.5a 5.MD.5b</p>	<p>The student is unable to explain the equivalence of the two approaches and is unable to find the volume of the prism in part (b) using Jack’s method.</p>	<p>The student makes an attempt to explain the equivalence of the two approaches but uses faulty logic and is unable to find the volume of the prism in part (b) using Jack’s method.</p>	<p>The student explains the equivalence between the two approaches by explaining that the sides may be multiplied in any order because any face can be used as the base of the figure but is unable to use Jack’s method to calculate the volume of the prism in part (b). The student may not score more than 3 points if the student does not label part (b) as cubic feet (ft^3).</p>	<p>In part (a), the student correctly explains the equivalence between the two approaches by explaining the sides may be multiplied in any order because any face can be used as the base of the figure. The student also uses Jack’s method to correctly calculate the area of the prism in part (b) as $(3 \text{ ft} \times 2 \text{ ft}) \times 5 \text{ ft} = 30 \text{ ft}^3$.</p>



A Progression Toward Mastery

<p>3</p> <p>5.MD.5a</p>	<p>The student is neither able to calculate the volume of the figure nor explain the reasoning used.</p>	<p>The student uses a correct method for finding the volume of the cube but does not consider the size of the cubes (2 cm side lengths) and does not explain the reasoning used.</p>	<p>The student uses a correct method for finding the volume of the cube and is able to explain the reasoning used but does not consider the size of the cubes (2 cm side lengths). The student may not score more than 3 points if the student does not correctly identify the units as cubic centimeters (cm^3).</p>	<p>The student correctly answers $1,440 \text{ cm}^3$ and is able to explain the reasoning used.</p>
<p>4</p> <p>5.MD.5</p>	<p>The student is neither able to calculate the height of the prism nor able to draw and label a model.</p>	<p>The student is able to either find the missing height or draws an unlabeled model.</p>	<p>The student draws a labeled model showing 60 in^2 and some inches high but makes a calculation error when finding the height of the prism.</p>	<p>The student clearly does the following:</p> <ul style="list-style-type: none"> ▪ Draws a three-dimensional rectangular prism as a model. ▪ Labels the model, including inches for height and inches squared for the base. ▪ Calculates the height of the prism as 14 in.
<p>5</p> <p>5.MD.5c</p>	<p>The student is able to calculate the volume of one part of the figure but is unable to explain the reasoning used.</p>	<p>The student explains the reasoning used but makes more than one calculation error.</p>	<p>The student explains the reasoning used but makes one calculation error. The student may not score more than 3 points if the student does not correctly identify the units as cubic inches (in^3).</p>	<p>The student does the following:</p> <ul style="list-style-type: none"> ▪ Correctly calculates the volume of the prism as $4,080 \text{ in}^3$. ▪ Clearly explains the reasoning used.



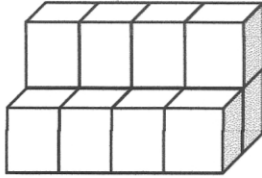
A Progression Toward Mastery				
<p>6</p> <p>5.MD.5b</p>	<p>The student is unable to correctly answer any part of the task.</p>	<p>The student correctly answers either part (a) or part (b) but does not explain the reasoning used.</p>	<p>The student calculates either part (a) or part (b) correctly and explains the reasoning used. The student may not score more than 3 points if the student does not correctly identify the units as cubic centimeters (cm^3).</p>	<p>The student correctly does the following:</p> <ol style="list-style-type: none"> Calculates $9,000 \text{ cm}^3$ and clearly explains the reasoning used. Calculates 18 cm and shows correct work and reasoning.
<p>7</p> <p>5.MD.3</p>	<p>The student attempts a calculation but does not achieve an answer or explain her thinking.</p>	<p>The student attempts part of the answer but miscalculates or does not explain her thinking.</p>	<p>The student explains her thinking and correctly calculates either the volume in the beaker or the volume of the container but makes a mistake in the other, leading to incorrect answers.</p>	<p>The student does the following:</p> <ul style="list-style-type: none"> ▪ Clearly explains a method for determining if the contents will fit without pouring—the volume of the beaker is 2,400 mL = $2,400 \text{ cm}^3$. The volume of the storage container is $2,100 \text{ cm}^3$. ▪ Correctly answers that the broth will not fit. ▪ Correctly answers that Juliet will have 300 mL more (or 300 cm^3), or 0.3 L more, broth that will not fit in the storage container.

Name Jane

Date _____

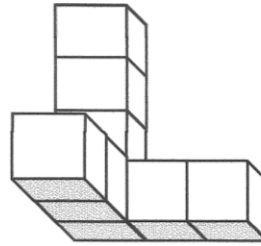
1. Tell the volume of each solid figure made of 1-inch cubes. Specify the correct unit of measure.

a.



12 in³

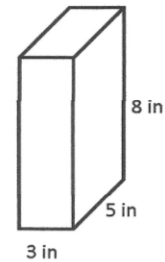
b.



8 in³

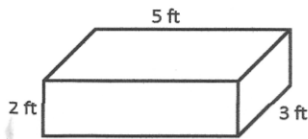
2. Jack found the volume of the prism pictured to the right by multiplying 5×8 and then adding: $40 + 40 + 40 = 120$. He says the volume is 120 cubic inches.

a. Jill says he did it wrong. He should have multiplied the bottom first (3×5) and then multiplied by the height. Explain to Jill why Jack's method works and is equivalent to her method.



Jack thought of it like slices. He figured the area of one slice (8×5). Then he visualized 2 more slices, so he added $40 + 40 + 40$ which is 120. This is the same answer he would have gotten if he multiplied $(3 \times 5) \times 8$.

b. Use Jack's method to find the volume of this right rectangular prism.

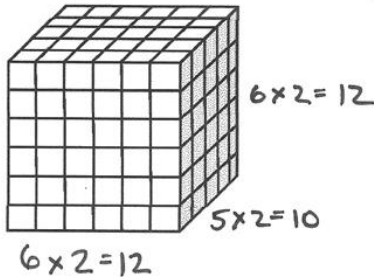


$$3 \times 2 = 6$$

$$6 + 6 + 6 + 6 + 6 = 30$$

The volume of this right rectangular prism is 30ft³.

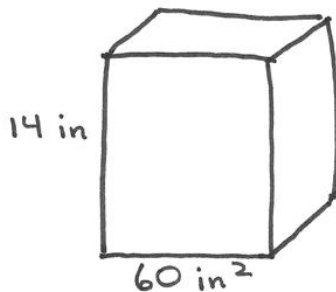
3. If the figure below is made of cubes with 2 cm side lengths, what is its volume? Explain your thinking.



The volume is
1,440 cm³.

$12 \times 12 \times 10 = 144 \times 10 = 1,440$
First I counted the cubes. Since each cube is worth 2 cm each, I doubled the number on each side. Then I could have added the layers, but multiplying is faster.

4. The volume of a rectangular prism is 840 in³. If the area of the base is 60 in², find its height. Draw and label a model to show your thinking.



$V = 840 \text{ in}^3$

$\frac{840}{60} = \frac{84}{6} = 14$

The height is 14 inches.

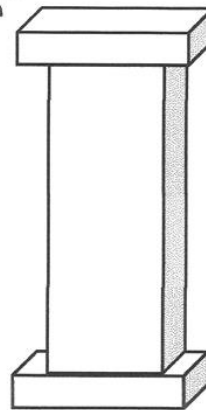
5. The following structure is composed of two right rectangular prisms that each measure 12 inches by 10 inches by 5 inches and one right rectangular prism that measures 10 inches by 8 inches by 36 inches. What is the total volume of the structure? Explain your thinking.

$12 \text{ in} \times 10 \text{ in} \times 5 \text{ in} = 120 \text{ in}^2 \times 5 = 600 \text{ in}^3$
 $600 \text{ in}^3 \times 2 = 1,200 \text{ in}^3$

$10 \text{ in} \times 8 \text{ in} \times 36 \text{ in} = 360 \text{ in}^2 \times 8 \text{ in} = 2,880 \text{ in}^3$

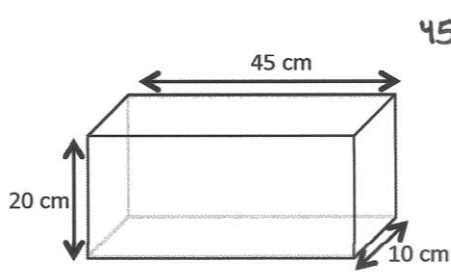
$$\begin{array}{r} 360 \\ \times 8 \\ \hline 2,880 \\ + 1,200 \\ \hline 4,080 \end{array}$$

I found the volume of the top piece, then doubled it. I added that to the volume of the middle piece.



The volume of the structure is 4,080 in³.

6. a. Find the volume of the rectangular fish tank. Explain your thinking.

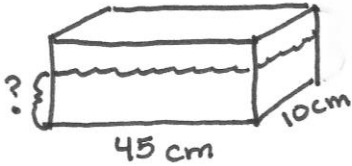


$$45 \text{ cm} \times 20 \text{ cm} \times 10 \text{ cm} = 900 \text{ cm}^2 \times 10 \text{ cm} = 9,000 \text{ cm}^3$$

I multiplied all the sides to get the volume.

The volume of the fish tank is $9,000 \text{ cm}^3$.

- b. If the fish tank is completely filled with water, and then 900 cubic centimeters are poured out, how high will the water be? Give your answer in centimeters, and show your work.

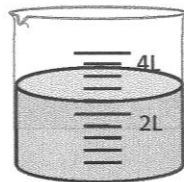


$$\begin{array}{r} 9,000 \text{ cm}^3 \\ - 900 \text{ cm}^3 \\ \hline 8,100 \text{ cm}^3 \end{array}$$

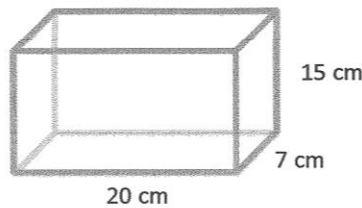
$$\begin{array}{r} 18 \\ 450 \overline{) 8,100} \\ \underline{- 4,500} \\ 3,600 \\ \underline{- 3,600} \\ 0 \end{array}$$

The water is 18 cm high.

7. Juliet wants to know if the chicken broth in this beaker will fit into this rectangular food storage container. Explain how you would figure it out without pouring the contents in. If it will fit, how much more broth could the storage container hold? If it will not fit, how much broth will be left over? (Remember $1 \text{ cm}^3 = 1 \text{ mL}$.)



beaker



storage container

First, I found the volume of the storage container.
 $20 \text{ cm} \times 15 \text{ cm} \times 7 \text{ cm} = 300 \text{ cm}^2 \times 7 \text{ cm} = 2,100 \text{ cm}^3 = 2.1 \text{ L}$

Since each line on the beaker is 400 mL, the beaker is holding 2.4 L of broth. The broth will not fit in the container. $2.4 \text{ L} - 2.1 \text{ L} = 0.3 \text{ L}$ Juliet will have 0.3 L or 300 mL of broth left over.