# Assessment : End-of-Unit Assessment

Problem 1

Students identify different ways to find the volume of a rectangular prism, including:

- multiplying length, width, and height
- decomposing into layers that are one cube thick and multiplying the number of cubes in one layer by the number of layers
- choosing a face as the base and multiplying its area and the corresponding height

Students who select B or D are using the wrong operation. Students may not select C or E if they do not think about the different ways of decomposing the prism.

Statement

Select **all** expressions that represent the volume of this rectangular prism in cubic units.
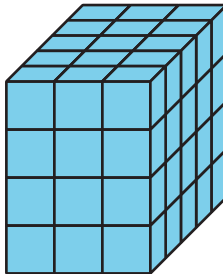
A. $3 \times 4 \times 5$

B. $3 + 4 + 5$

C. $20 + 20 + 20$

D. $15 \times 15 \times 15 \times 15$

E. 5×12
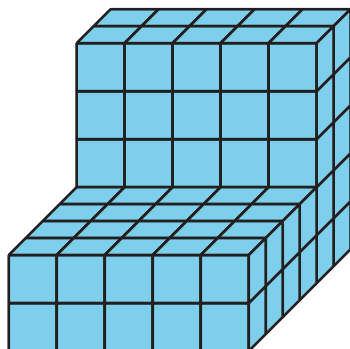
Solution

["A", "C", "E"]

Aligned Standards

5.MD.C.5.a, 5.OA.A.2

Problem 2

Students find the volume of a figure. No strategy is suggested but students will likely cut the figure into two rectangular prisms and add the volumes of those prisms. But they may decompose the figure in any way that allows them to count the total number of cubes that make the figure.

Statement

Find the volume of the figure. Explain or show your reasoning.

Solution

90 cubes. Sample responses:

- A vertical cut makes a 2 by 4 by 5 rectangular prism and a 2 by 5 by 5 rectangular prism. The volume is $(2 \times 4 \times 5) + (2 \times 5 \times 5)$ or 90 cubes.

- A horizontal cut makes a 2 by 6 by 5 rectangular prism and a 3 by 2 by 5 rectangular prism. The volume is $(2 \times 6 \times 5) + (3 \times 2 \times 5)$ or 90 cubes.

- There are 5 vertical layers with 18 cubes in each layer. So there are 5×18 or 90 total cubes in the figure.
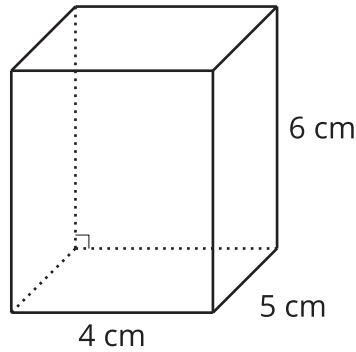
Aligned Standards

5.MD.C.5.c

Problem 3

Students select different ways to fill a rectangular prism with centimeter cubes. The 3 correct options represent the different ways of decomposing the prism into layers. Options B and C both give the correct value but do not correspond to the structure of the rectangular prism. Students who select B and C likely understand how to find the volume of the prism but are using that value to assess the correctness of the answer rather than the structure of the expressions.

Statement

Select **all** expressions that represent a way to fill the rectangular prism with layers of centimeter cubes for a base.

A. 5×24

B. 10×12

C. 8×15

D. 6×20

E. 4×30

Solution

["A", "D", "E"]

Aligned Standards

5.MD.C.5.a, 5.OA.A.2

Problem 4

Students find the volume of rectangular prisms given their side lengths. For the first prism they are given the length, width, and height and for the second one they are given the area of the base and the height. They also need to pay attention to the units for the measurements which determine the units for the volume.

Statement

Find the volume of a rectangular prism with the given side lengths.

1. The length is 2 units, the width is 5 units, and the height is 7 units.
2. The base has an area of 200 square inches and the height is 6 inches.

Solution

1. 70 cubic units
2. 1,200 cubic inches

Aligned Standards

5.MD.C.5.b

Problem 5

Students find the volume of a figure composed of two rectangular prisms. Since one of the side lengths is 1 foot, the calculations are not difficult. Students need to decide how to decompose the figure and there are 3 main choices, namely a horizontal cut, a vertical cut, or completing the shape to make a rectangular prism and using subtraction.

Statement

Find the volume of the prism. Explain or show your reasoning.
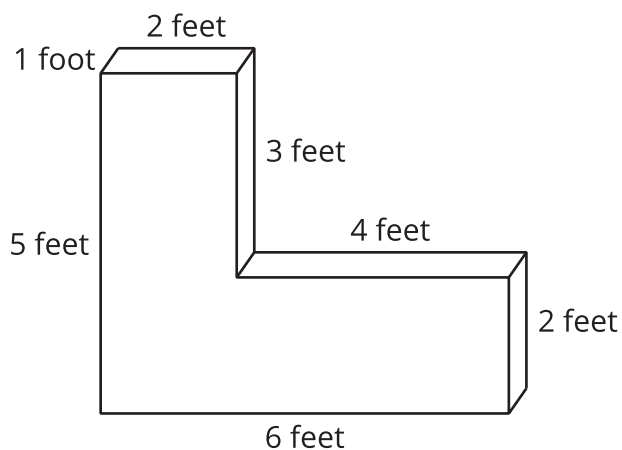
Solution

18 cubic feet. Sample explanation: $(6 \times 2 \times 1) + (3 \times 2 \times 1) = 12 + 6 = 18$.
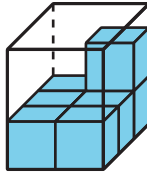
Aligned Standards

5.MD.C.5.c

Problem 6

Students see a rectangular prism that is partly filled with unit cubes, without gaps or overlaps, where the cubes do not, and cannot, fill the container exactly. Students identify that in this situation they cannot calculate the volume exactly, but they can say that it is at least the number of cubes that fit completely inside the prism. Students may choose response A if they count the cubes that are shown in the image. Students may select response C if they notice that 12 cubes will fit inside the prism but do not identify that they don't fill up all of the space.

Statement

Which statement describes the volume of the rectangular prism in cubic units?

A. The volume is 7 cubic units.

B. The volume is less than 12 cubic units.

C. The volume is 12 cubic units.

D. The volume is greater than 12 cubic units.

Solution

D

Aligned Standards

5.MD.C.3.b, 5.MD.C.4

Problem 7

Students design a composite prism to meet certain criteria. The context is a tiered garden. While slightly different from the garden context that they worked on in the lesson, students have the scaffold of an image which indicates the overall shape. They choose the side lengths which amounts to choosing a length, two widths, and two heights. There are some constraints for the choices that they can make but there are many possibilities that meet the criteria and are realistic. Students may use unrealistic side lengths, such as 1 foot wide and 100 feet long, which meet the given criteria. The diagram will not necessarily reflect the measurements students choose (that is, it will not be drawn to scale).
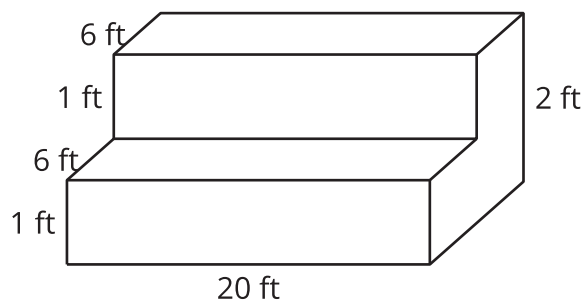
Statement

Mai's class is designing a garden with two levels and this general shape.
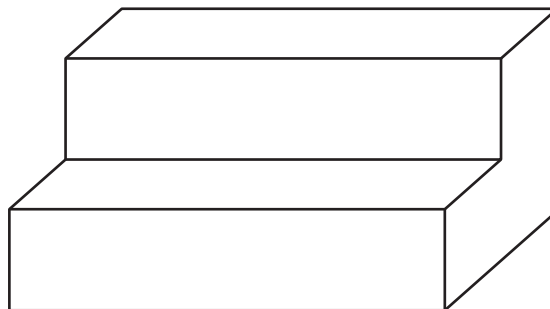
- The garden should have at least 200 square feet for the plants.
- The volume should be less than 500 cubic feet.

1. Recommend side lengths for the tiered garden that fit the needs of Mai's class.

2. Label the diagram to show your choices for the side lengths.

Solution

1. Sample response: I decided to make each level 6 feet wide and 20 feet long. So that makes 240 square feet total for the plants. The lower section is 1 foot deep so that means that it uses 120 cubic feet of soil. The upper section is 2 feet deep so it uses 240 cubic feet of soil and that's 360 cubic feet altogether.

2.

Aligned Standards

5.MD.C.5.c