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Unit 1, Lesson 16: Distinguishing Between Surface Area and Volume

Let's contrast surface area and volume.

16.1: Attributes and Their Measures

For each quantity, choose one or more appropriate units of measurement.

For the last two rows, think of a quantity that could be appropriately measured with the given units.

Quantities

Units

1. Perimeter of a parking lot:

2. Volume of a semi truck:

3. Surface area of a refrigerator:

4. Length of an eyelash:

5. Area of a state:

6. Volume of an ocean:

7. _____: miles

8. _____: cubic meters

• millimeters (mm)

• feet (ft)

• meters (m)

• square inches (sq in)

• square feet (sq ft)

• square miles (sq mi)

• cubic kilometers (cu km)

• cubic yards (cu yd)

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16.2: Building with 8 Cubes

m.openup.org/1/6-1-16-2



Your teacher will give you 16 cubes. Build two different shapes using 8 cubes for each. For each shape:

- Give a name or a label (e.g., Mae’s First Shape or Eric’s Steps).
- Determine the volume.
- Determine the surface area.
- Record the name, volume, and surface area on a sticky note.

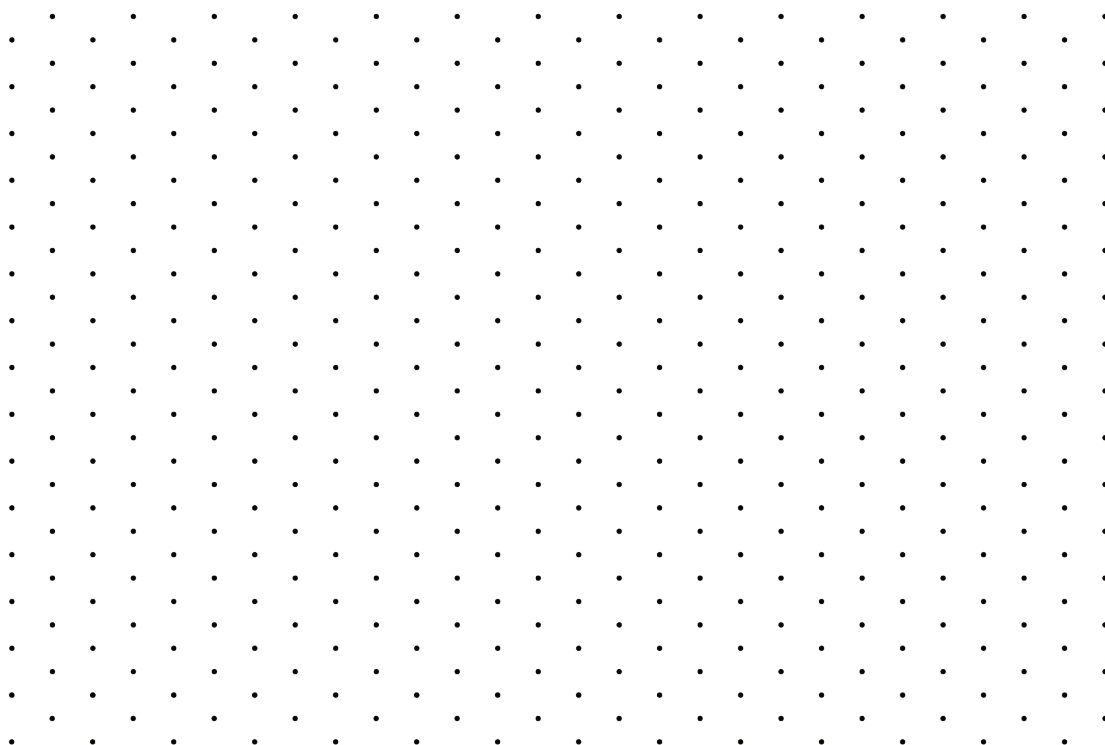
Pause for further instructions.

16.3: Comparing Prisms Without Building Them

Three rectangular prisms each have a height of 1 cm.

- Prism A has a base that is 1 cm by 11 cm.
- Prism B has a base that is 2 cm by 7 cm.
- Prism C has a base that is 3 cm by 5 cm.

1. Find the surface area and volume of each prism. Use the dot paper to draw the prisms, if needed.



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2. Analyze the volumes and surface areas of the prisms. What do you notice? Write 1–2 observations about them.

Are you ready for more?

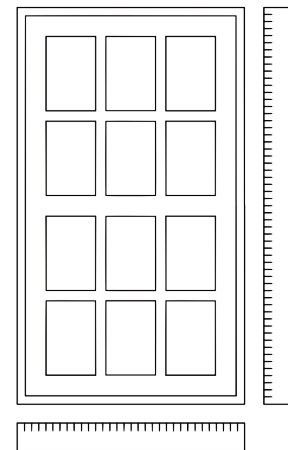
Can you find more examples of prisms that have the same surface areas but different volumes? How many can you find?

Lesson 16 Summary

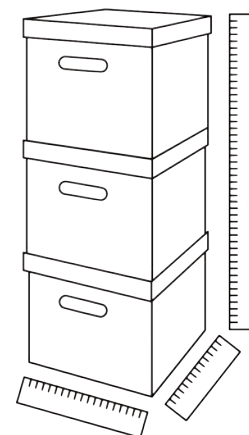
Length is a one-dimensional attribute of a geometric figure. We measure lengths using units like millimeters, centimeters, meters, kilometers, inches, feet, yards, and miles.



Area is a two-dimensional attribute. We measure area in square units. For example, a square that is 1 centimeter on each side has an area of 1 square centimeter.



Volume is a three-dimensional attribute. We measure volume in cubic units. For example, a cube that is 1 kilometer on each side has a volume of 1 cubic kilometer.



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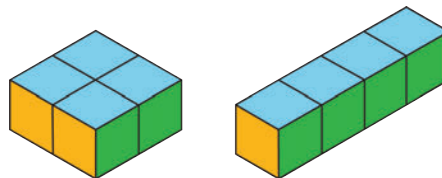
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Surface area and volume are different attributes of three-dimensional figures. Surface area is a two-dimensional measure, while volume is a three-dimensional measure.

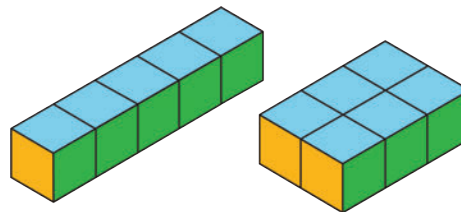
Two figures can have the same volume but different surface areas. For example:

- A rectangular prism with side lengths of 1 cm, 2 cm, and 2 cm has a volume of 4 cu cm and a surface area of 16 sq cm.
- A rectangular prism with side lengths of 1 cm, 1 cm, and 4 cm has the same volume but a surface area of 18 sq cm.



Similarly, two figures can have the same surface area but different volumes.

- A rectangular prism with side lengths of 1 cm, 1 cm, and 5 cm has a surface area of 22 sq cm and a volume of 5 cu cm.
- A rectangular prism with side lengths of 1 cm, 2 cm, and 3 cm has the same surface area but a volume of 6 cu cm.



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Unit 1, Lesson 16: Distinguishing Between Surface Area and Volume

1. Match each quantity with an appropriate unit of measurement.

- | | |
|--|-----------------------|
| A. The surface area of a tissue box | 1. Square meters |
| B. The amount of soil in a planter box | 2. Yards |
| C. The area of a parking lot | 3. Cubic inches |
| D. The length of a soccer field | 4. Cubic feet |
| E. The volume of a fish tank | 5. Square centimeters |

2. Here is a figure built from snap cubes.



- Find the volume of the figure in cubic units.
- Find the surface area of the figure in square units.

c. True or false: If we double the number of cubes being stacked, both the volume and surface area will double. Explain or show how you know.

3. Lin said, "Two figures with the same volume also have the same surface area."

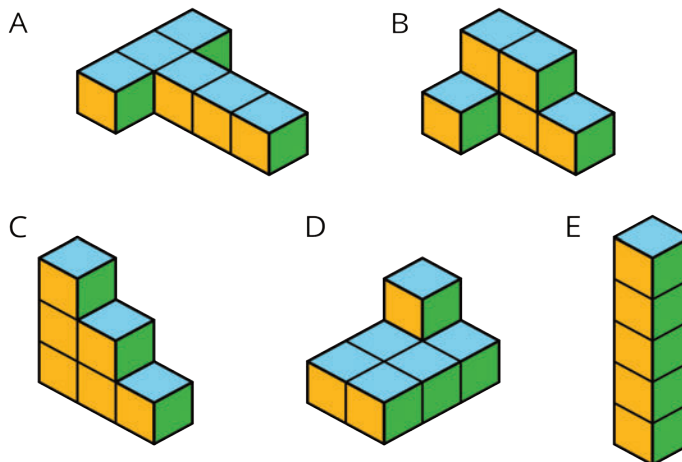
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a. Which two figures suggest that her statement is true?

b. Which two figures could show that her statement is *not* true?

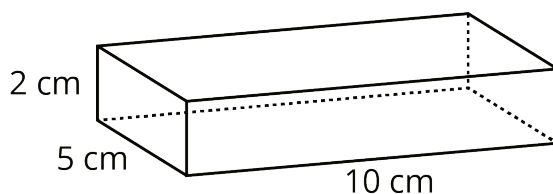


4. Draw a pentagon (five-sided polygon) that has an area of 32 square units. Label all relevant sides or segments with their measurements, and show that the area is 32 square units.

(from Unit 1, Lesson 11)

5. a. Draw a net for this rectangular prism.

b. Find the surface area of the rectangular prism.



(from Unit 1, Lesson 15)