## 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, think of a quantity that could be appropriately measured with the given units.

Quantities

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

Units

* 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)

### 16.2: Building with 8 Cubes

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

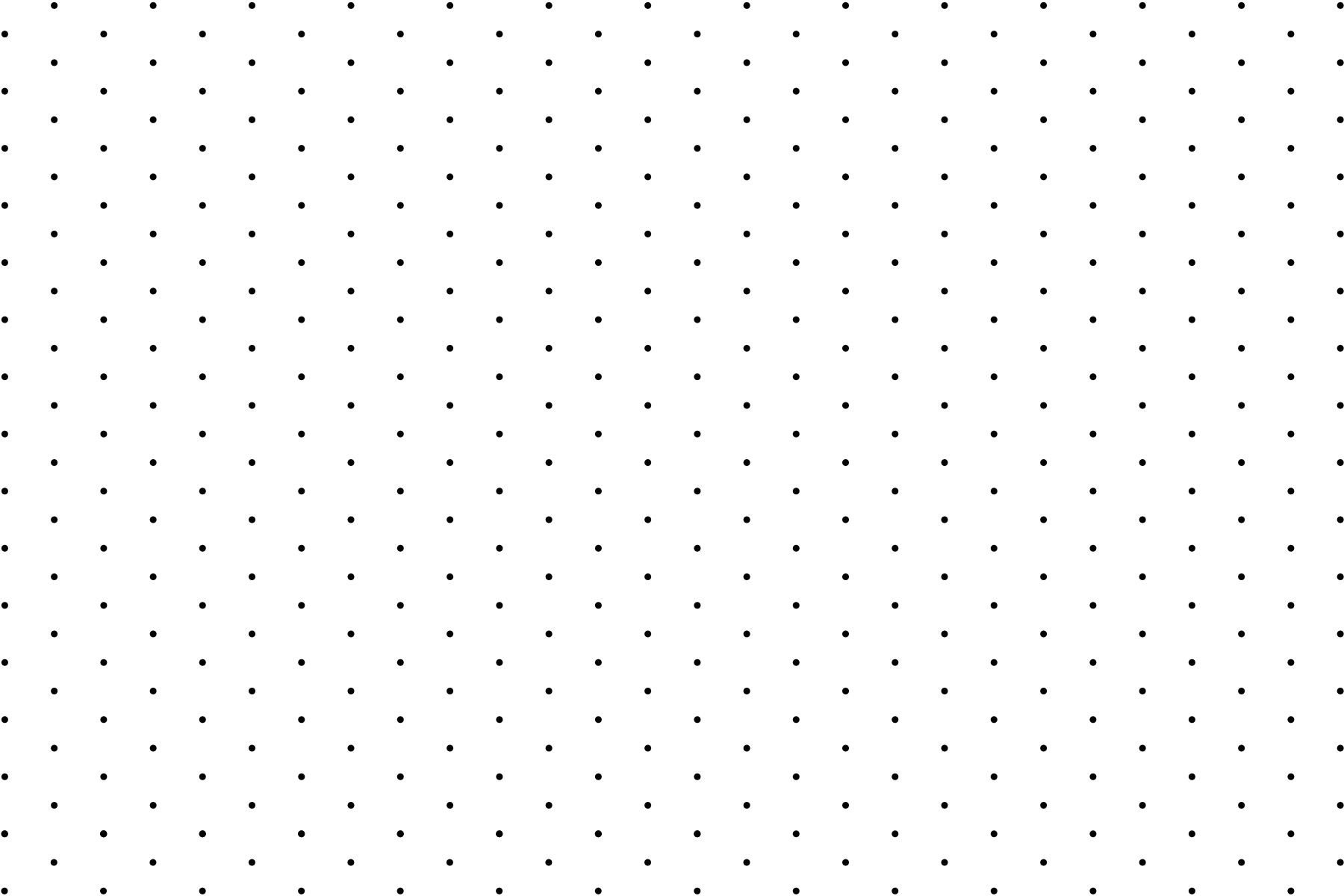
1. Give it a name or a label (e.g., Mai’s First Shape or Diego’s Steps).
2. Determine the **volume**.
3. Determine the surface area.
4. Record the name, volume, and surface area on a sticky note.

### 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.

* 

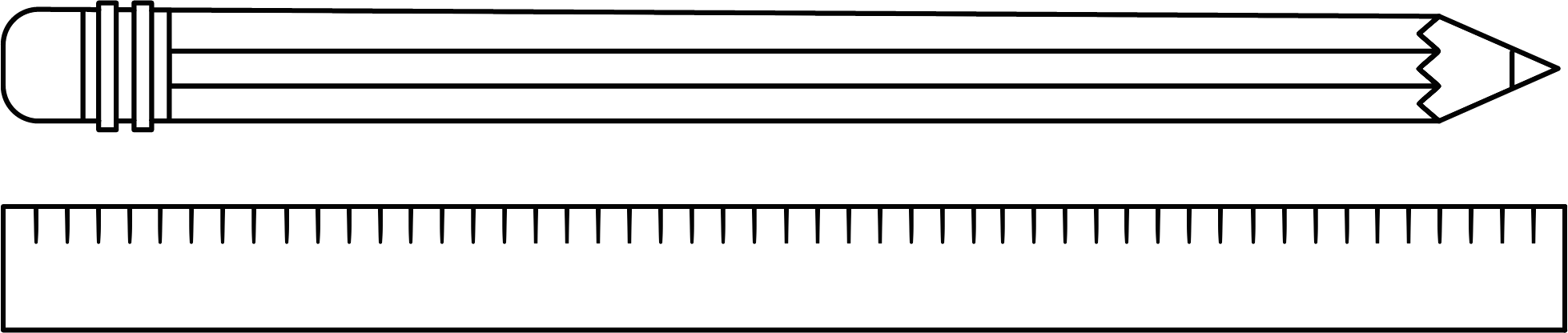
1. Analyze the volumes and surface areas of the prisms. What do you notice? Write 1 or 2 observations about them.

#### Are you ready for more?

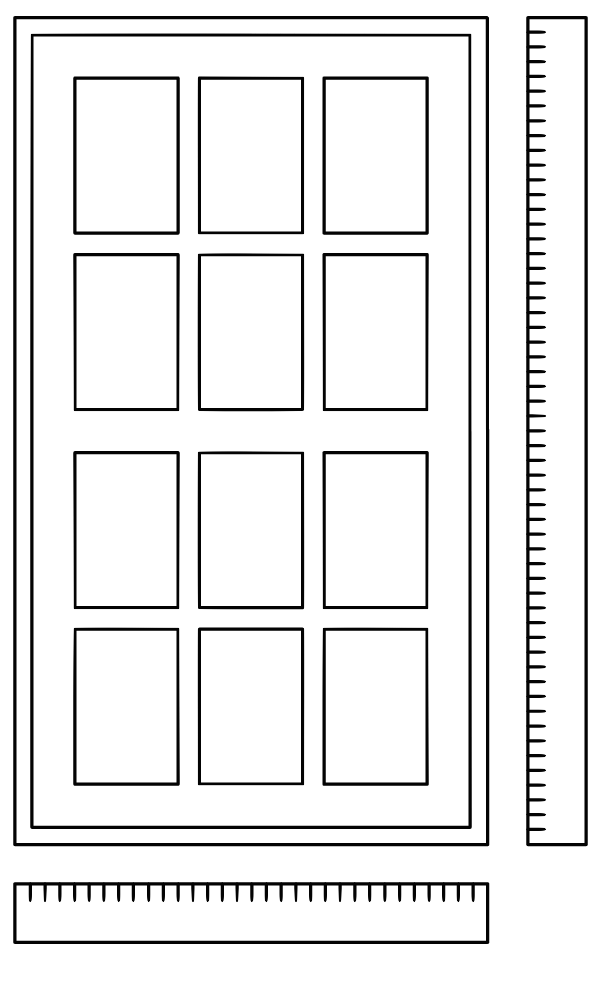
Can you find more examples of prisms that have the same surface areas but different volumes? How many can you find?

### 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.



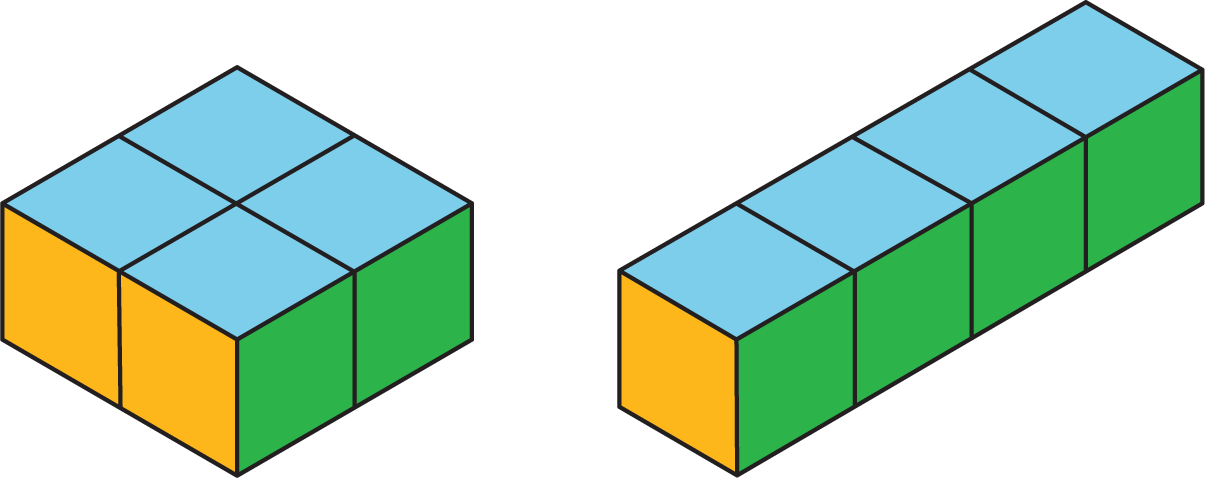
*Volume* is a three-dimensional attribute. We measure volume in cubic units. For example, a cube that is 1 kilometer on each side has a volume of 1 cubic kilometer.



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.

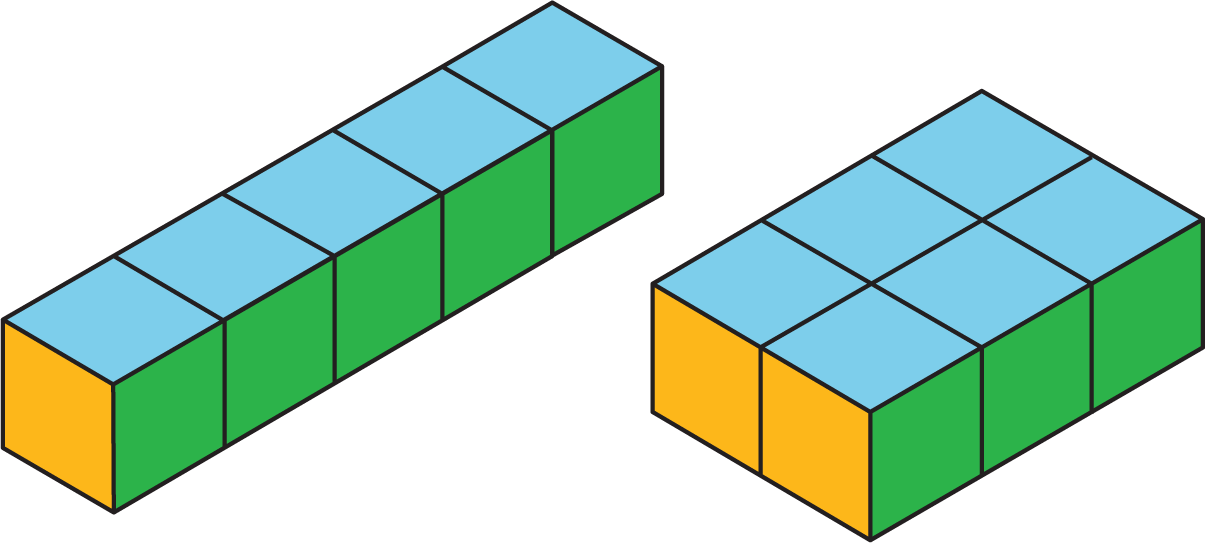
Two figures can have the same volume but different surface areas. For example:

* 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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