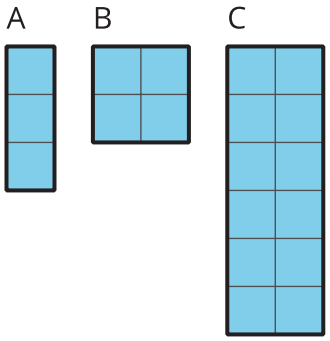
Unit 6, Lesson 9

Volume of Right Prisms

Let's look at volumes of prisms.

9.1 Three Prisms with the Same Volume

Rectangles A, B, and C represent bases of three prisms.



1. If each prism has the same height, which one will have the greatest **volume**, and which will have the least? Explain your reasoning.

2. If each prism has the same volume, which one will have the tallest height, and which will have the shortest? Explain your reasoning.

9.2 Finding Volume with Cubes

Your teacher will give you a paper with a shape on it and some snap cubes.

1. Using the face of a snap cube as your area unit, what is the area of the shape? Explain or show your reasoning.

2. Use snap cubes to build the shape from the paper. Add another layer of cubes on top of the shape you have built. Describe this three-dimensional object.

3. What is the volume of your object? Explain your reasoning.

4. Right now, your object has a height of 2 units. What would the volume be:
   a. if it had a height of 5 units?

   b. if it had a height of 8.5 units?

9.3 Can You Find the Volume?

Your teacher will give you a set of three-dimensional figures.

1. For each figure, determine whether the shape is a prism.
2. For each prism:
   a. Find the area of the base of the prism.
   b. Find the height of the prism.
   c. Calculate the volume of the prism.

	Is it a prism?	area of prism base (cm^2)	height (cm)	volume (cm^3)
figure A				
figure B				
figure C				
figure D				
figure E				
figure F				

Are you ready for more?

Imagine a large, solid cube made out of 64 white snap cubes. Someone spray paints all 6 faces of the large cube blue. After the paint dries, they disassemble the large cube into a pile of 64 snap cubes.

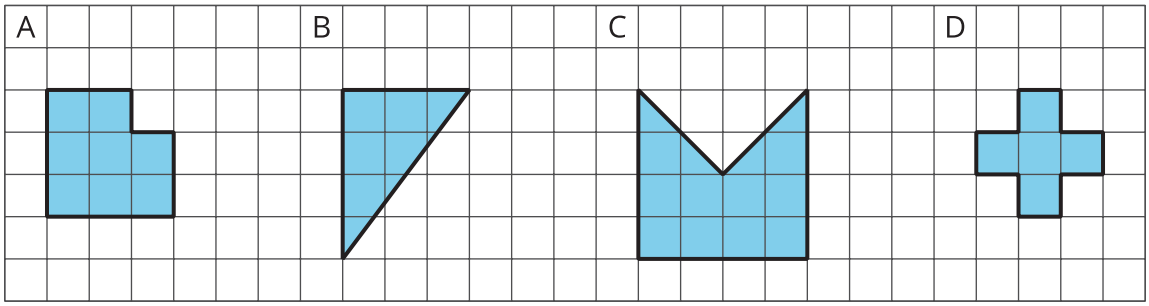
1. How many of those 64 snap cubes have exactly 2 faces that are blue?

2. What are the other possible numbers of blue faces the cubes can have? How many of each are there?

3. Try this problem again with some larger-sized cubes that use more than 64 snap cubes to build. What patterns do you notice?

9.4 What's the Prism's Height?

There are 4 different prisms that all have the same volume. Here is what the base of each prism looks like.



1. Order the prisms from shortest to tallest. Explain your reasoning.

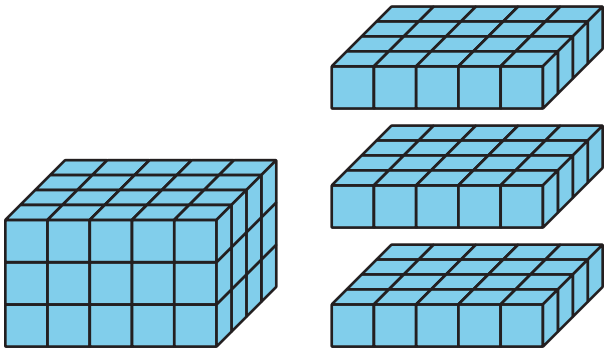
2. If the volume of each prism is 60 units^3, what would be the height of each prism?

3. For a volume other than 60 units^3, what could be the height of each prism?

4. Discuss your thinking with your partner. If you disagree, work to reach an agreement.

Lesson 9 Summary

Any cross-section of a prism that is parallel to the base will be identical to the base. This means we can slice prisms up to help find their volume. For example, if we have a rectangular prism that is 3 units tall and has a base that is 4 units by 5 units, we can think of this as 3 layers, where each layer has $4 \cdot 5$ cubic units. The **volume** of the figure is the number of cubic units that fill a three-dimensional region without any gaps or overlaps.



That means the volume of the original rectangular prism is $3(4 \cdot 5)$, or 60, cubic units.

This works with any prism! If we have a prism with a height of 3 cm that has a base with an area of 20 cm^2, then the volume is $3 \cdot 20$ cm^3 regardless of the shape of the base. In general, the volume of a prism with height h and area B is

$$V = B \cdot h$$

For example, these two prisms both have a volume of 100 cm^3.

