



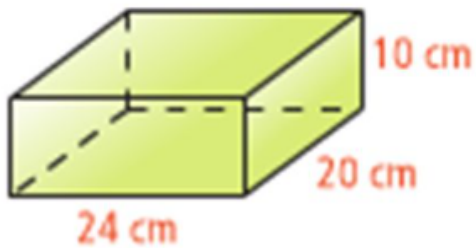
Chapter 6
Geometry & Measurement

Lesson 7
Volume Day 2

1) a) Find the volume of the following rubric cube



b) Find the volume of the following



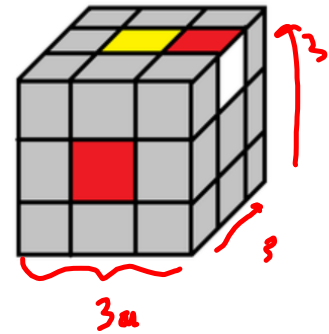


Chapter 6
Geometry & Measurement

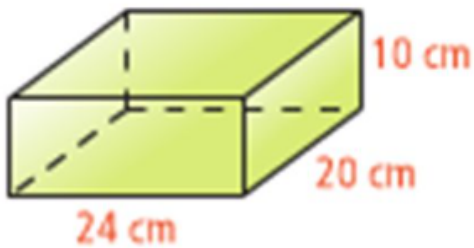
Lesson 7
Volume Day 2

1) a) Find the volume of the following rubric cube

$$\begin{aligned}
 V &= L \times w \times H \\
 &= 3 \text{ units} \times 3 \text{ units} \times 3 \text{ units} \\
 &= \underbrace{9 \text{ units}^2} \times 3 \text{ units} \\
 &= \underbrace{27 \text{ units}^3}
 \end{aligned}$$



b) Find the volume of the following

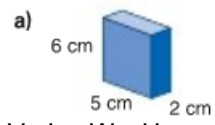


$$\begin{aligned}
 V &= L \times w \times H \\
 &= \underbrace{24 \text{ cm} \times 20 \text{ cm}} \times 10 \text{ cm} \\
 &= \underbrace{480 \text{ cm}^2} \times 10 \text{ cm} \\
 &= \underbrace{4800 \text{ cm}^3}
 \end{aligned}$$

Practice



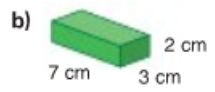
1. Find the volume of each rectangular prism.



$$V = L \times W \times H$$

$$= 5 \text{ cm} \times 2 \text{ cm} \times 6 \text{ cm}$$

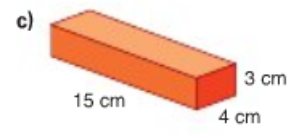
$$= 60 \text{ cm}^3$$



$$V = L \times W \times H$$

$$= 7 \text{ cm} \times 3 \text{ cm} \times 2 \text{ cm}$$

$$= 42 \text{ cm}^3$$



$$V = L \times W \times H$$

$$= 15 \text{ cm} \times 4 \text{ cm} \times 3 \text{ cm}$$

$$= 180 \text{ cm}^3$$

2. Estimate, then calculate, the volume of a rectangular prism with these dimensions.

	Length (cm)	Width (cm)	Height (cm)
a)	6	2	2
b)	9	4	7
c)	18	9	12
d)	30	15	6

2a) $V = L \times W \times H$
 $= 6 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm}$
 $= 24 \text{ cm}^3$

2c) $V = L \times W \times H$
 $= 18 \text{ cm} \times 9 \text{ cm} \times 12 \text{ cm}$
 $= 1944 \text{ cm}^3$

2b) $V = L \times W \times H$
 $= 9 \text{ cm} \times 4 \text{ cm} \times 7 \text{ cm}$
 $= 252 \text{ cm}^3$

2d) $V = L \times W \times H$
 $= 30 \text{ cm} \times 15 \text{ cm} \times 6 \text{ cm}$
 $= 2700 \text{ cm}^3$



3. A dog box is built to fit in the back of a pick-up truck. It is used to transport sled dogs and supplies to a race. A dog box that holds 3 dogs is 117 cm long, 97 cm wide, and 61 cm tall. Each dog compartment is 38 cm long, 97 cm wide, and 46 cm tall.

a) What is the volume of each dog compartment?
 b) What is the volume of the dog box that is not used to hold dogs? How did you find out?



a) **Compartment**

$$V = L \times W \times H$$

$$= 38 \text{ cm} \times 97 \text{ cm} \times 46 \text{ cm}$$

$$= 169\,556 \text{ cm}^3$$

$$\times 3 = 508\,668 \text{ cm}^3$$

b) **Total box volume**

$$V = L \times W \times H$$

$$= 117 \text{ cm} \times 97 \text{ cm} \times 61 \text{ cm}$$

$$= 692\,289 \text{ cm}^3$$

$$692\,289 \text{ cm}^3 - 508\,668 \text{ cm}^3$$

$$= 183\,621 \text{ cm}^3$$

183 621 cm³ is the volume of the box that does not hold dogs

Recall Volume of Rectangular Prism

Volume is the amount of space inside a 3D object

(How much to fill up a box)

- it is measured in cubic units

example) mm^3 , cm^3 , m^3 , km^3

Volume of rectangular Prism = $L \times W \times H$

Demonstrate with paper stack

Volume of rectangular Prism = $L \times W \times H$

area of the base x Height

Rectangle

$$V = \text{area base} \times H$$

$$\text{Height} = \text{Volume} \div \text{area of base}$$

$$\text{Area of base} = \text{Volume} \div \text{Height}$$





1) If a box has a volume of 60 cm^3 and the dimensions of the base is 5 cm by 4 cm , what is the height of the box?

Area of the base = $L \times w$

$= 5 \text{ cm} \times 4 \text{ cm}$
 $= 20$

Height = Volume \div area of base

$= 60 \text{ cm}^3 \div (20 \text{ cm}^2)$

$= 3 \text{ cm}$

$$\begin{array}{l} V = L \times w \times H \\ 60 = 5 \times 4 \times H \\ 60 = 20 \times H \end{array}$$

2) If a box has a volume of 84 m^3 and the dimensions of the base is 3 m by 7 m , what is the height of the box?

Area of the base = $L \times w$

$= 3 \text{ cm} \times 7 \text{ cm}$

$= 21 \text{ cm}^2$

Height = Volume \div area of base

$= 84 \text{ cm}^3 \div (21 \text{ cm}^2)$

$= 4 \text{ cm}$

OR

$$\begin{array}{l} V = L \times w \times H \\ 84 = 3 \times 7 \times H \\ 84 = 21 \times H \\ 4 \end{array}$$

3) A box has the area of the base as 36 cm² and the height 5cm, what is its volume?

$$\begin{aligned}v &= \text{area base} \times \text{height} \\ &= 36 \text{ cm}^2 \times 5 \text{ cm} \\ &= 180 \text{ cm}^3\end{aligned}$$



4) If the volume of a box is 140 m³, and the height is 7 m, then what is the area of the base?

$$v = \text{area base} \times \text{height}$$

$$140 \text{ m}^3 = \underline{\quad} \times 7 \text{ cm}$$

↓
20 cm²

Class/Homework

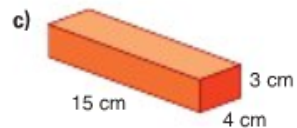
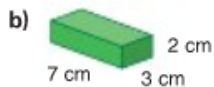
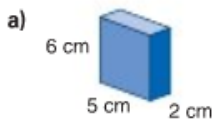
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#4, #5, #6a, 7ab,

Practice



1. Find the volume of each rectangular prism.



2. Estimate, then calculate, the volume of a rectangular prism with these dimensions.

	Length (cm)	Width (cm)	Height (cm)
a)	6	2	2
b)	9	4	7
c)	18	9	12
d)	30	15	6



3. A dog box is built to fit in the back of a pick-up truck. It is used to transport sled dogs and supplies to a race. A dog box that holds 3 dogs is 117 cm long, 97 cm wide, and 61 cm tall. Each dog compartment is 38 cm long, 97 cm wide, and 46 cm tall.



- What is the volume of each dog compartment?
- What is the volume of the dog box that is not used to hold dogs? How did you find out?

4. During the buffalo hunt, the Métis used a Red River cart to carry buffalo meat and fur. The cart was made of wood and was usually pulled by oxen. The top of this cart has the shape of a rectangular prism with volume $1\,350\,000\text{ cm}^3$. The area of its base is about $13\,500\text{ cm}^2$. About how high is the top of the cart? Which strategy did you use to find out?

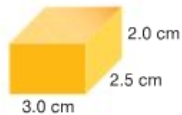


5. A rectangular prism has volume 90 cm^3 . The prism has length 9 cm and width 5 cm . What is its height? How do you know?

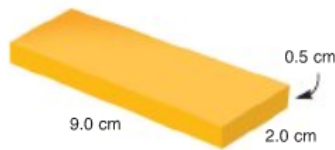


6. A rectangular prism has volume 192 cm^3 .
- The prism is 16 cm high. What is the area of its base? How do you know?
 - What other possible measurements of height and base area could the rectangular prism have? What strategy did you use to find out?

7. Canada's Food Guide recommends that we eat 2 to 4 servings of dairy products every day.
- a) This piece of cheese is 1 serving of dairy products. What is its volume?



- b) Is the block of cheese at the right more or less than 1 serving? How do you know?



8. Each block in a child's set of building blocks is 15 cm long, 10 cm wide, and 5 cm high. Suppose you put the blocks in a box that is 50 cm long, 35 cm wide, and 30 cm high.



- a) What is the volume of each block? Of the box?
- b) Suppose you only consider the volume. How many blocks would you expect to fit in the box?
- c) Suppose you arrange the blocks neatly in layers. How many different ways can you layer the blocks? How many blocks fit in the box each way?
- d) Compare your answers to parts b and c. Explain any differences.
- e) Which is the best way to pack the blocks? Why?

Elearning Gr 6 Math Ch. 6 Lesson 7 Geom & Measure_ Volume of rectangular prism Day 2.notebook

4. During the buffalo hunt, the Métis used a Red River cart to carry buffalo meat and fur. The cart was made of wood and was usually pulled by oxen. The top of this cart has the shape of a rectangular prism with volume $1\,350\,000\text{ cm}^3$. The area of its base is about $13\,500\text{ cm}^2$. About how high is the top of the cart? Which strategy did you use to find out?



$$V = L \times W \times H$$

$$= \text{Area of base} \times \text{Height}$$

$$1\,350\,000\text{ cm}^3 = 13\,500\text{ cm}^2 \times H$$

$$H = \text{Volume} / \text{area of base}$$

$$1\,350\,000\text{ cm}^3 \div 13\,500\text{ cm}^2 = 100\text{ cm}$$

100 cm

The top of the cart is 100 cm high

5. A rectangular prism has volume 90 cm^3 .
The prism has length 9 cm and width 5 cm.
What is its height? How do you know?

$$V = L \times W \times H$$

$$= 9\text{ cm} \times 5\text{ cm} \times \underline{\quad}\text{ cm}$$

$$90\text{ cm}^3 = 45\text{ cm}^2 \times \frac{\quad}{2}\text{ cm}$$

the height is 2 cm



6. A rectangular prism has volume 192 cm^3 .
- The prism is 16 cm high. What is the area of its base?
How do you know?
 - What other possible measurements of height and base area could the rectangular prism have?
What strategy did you use to find out?

$$V = L \times W \times H$$

$$= \text{Area of base} \times \text{Height}$$

$$192\text{ cm}^3 = \underline{\quad}\text{ cm}^2 \times 16\text{ cm}$$

$$12$$

The area of the base is 12 cm^2

$$\text{OR}$$

$$\text{area of base} = \text{Volume} / \text{height}$$

$$192\text{ cm}^3 \div 16\text{ cm}$$

$$= 12\text{ cm}^2$$

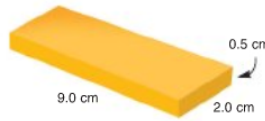
- b) For example: To have volume of 196 cm^3
Height 2 cm, base area 96 cm^2 ,
Height 3 cm with base area 64 cm^2 ,
Height 4 cm with base area 48 cm^2 ,
Height 6 cm with base area 32 cm^2 ,
Height 8 cm with base area 24 cm^2 ,

7. Canada's Food Guide recommends that we eat 2 to 4 servings of dairy products every day.
 a) This piece of cheese is 1 serving of dairy products.

What is its volume?
 $V = L \times W \times H$
 $= 3.0 \text{ cm} \times 2.5 \text{ cm} \times 2.0 \text{ cm}$
 $= 15 \text{ cm}^3$



$V = L \times W \times H$
 $= 9.0 \text{ cm} \times 2.0 \text{ cm} \times 0.5 \text{ cm}$
 $= 9 \text{ cm}^3$



- b) Is the block of cheese at the right more or less than 1 serving? How do you know?

b) Since 9 cm^3 is smaller than 15 cm^3 , the block of cheese is less than 1 serving.

8. Each block in a child's set of building blocks is 15 cm long, 10 cm wide, and 5 cm high. Suppose you put the blocks in a box that is 50 cm long, 35 cm wide, and 30 cm high.



- a) What is the volume of each block? Of the box?
 b) Suppose you only consider the volume. How many blocks would you expect to fit in the box?
 c) Suppose you arrange the blocks neatly in layers. How many different ways can you layer the blocks? How many blocks fit in the box each way?
 d) Compare your answers to parts b and c. Explain any differences.
 e) Which is the best way to pack the blocks? Why?

Block
 $V = L \times W \times H$
 $= 15 \text{ cm} \times 10 \text{ cm} \times 5 \text{ cm}$
 $= 750 \text{ cm}^3$

Box
 $V = L \times W \times H$
 $= 50 \text{ cm} \times 35 \text{ cm} \times 30 \text{ cm}$
 $= 52\,500 \text{ cm}^3$

b) $52\,500 \text{ cm}^3 \div 750 \text{ cm}^3 = 70$ you would expect 70 blocks to fit in the box

1 serving:
 8. b) $52\,500 \div 750 = 70$
 c) There are two possible arrangements when each layer has a height of 5 cm; one uses 54 blocks, the other 60 blocks. There are two possible arrangements when each layer has a height of 10 cm; one uses 60 blocks, the other 63 blocks. There are two possible arrangements when each layer has a height of 15 cm; one uses 60 blocks, the other 70 blocks.
 d) There is only one arrangement where all 70 blocks fit. There are spaces left in all other arrangements, so 70 blocks do not fit.
 e) The best way to pack the box is to orient the blocks so that the 10-cm lengths fit along the 50-cm edge, the 5-cm lengths fit along the 35-cm edge, and the 15-cm lengths fit along the 30-cm edge. This way the blocks completely fill the box.

REFLECT: The volume of a rectangular prism is the product of its length, width, and height because length times width gives the number of cubes in each layer, and height times the number of cubes in each layer gives the number of cubes in all, which is the volume.