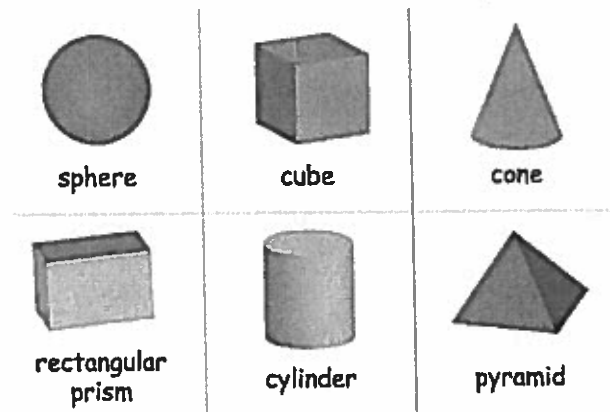


VOLUME Instructional Sheet

The **VOLUME** is the space occupied by a 3 dimensional shape or solid.
Here are some solids that you should be familiar with:



A cylinder is like a water bottle. When you fill it with water, the volume of water is measured in litres (L) or millilitres (mL). *The volume of liquid is measured with litres or millilitres, and 1000mL = 1L*

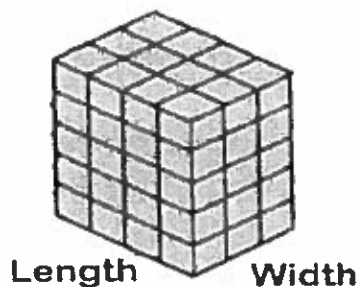
We are just going to focus on calculating the volume of a rectangular prism (like a box).

To calculate the volume, you just need to calculate the area (floor space) of the box, then calculate the height. Think of the volume of a rectangular prism or box as the many layers of the floor (base) area stacked on top of each other.

This rectangular prism is made up of small cubes.

- On the top (or bottom base) layer, there are 12 cubes ($4 \times 3 = 12$)
- There are 5 layers of 12 cubes
- Therefore, there are 60 cubes in total ($5 \times 12 = 60$)

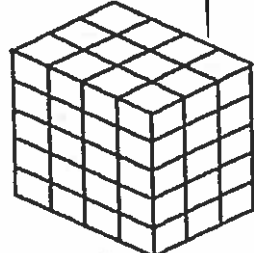
Volume = base layer x height
= length x width x height
= $L \times W \times H$



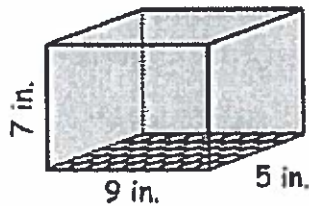
A base of 4 by 3 and a height of 5 results in 60 cubic units.

$$V = L \cdot W \cdot H$$

| | |

$$4 \cdot 3 \cdot 5 = 60 \text{ u}^3$$


Let's look at another example,



Multiplying the length and width of a rectangular prism gives the area of the prism's base.

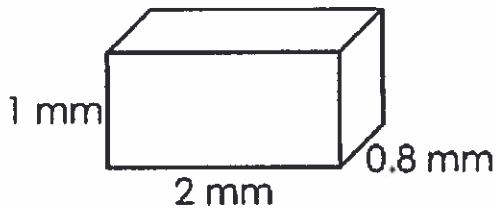
Notice that the bottom of the prism is covered with 45 square units. We have to multiply by the prism's height to turn the square units into cubic units.

- The bottom area covers 45 square inches ($9 \times 5 = 45$).
- Now multiply it by the height ($45 \times 7 = 315$)
- The volume of this rectangular prism is 315 cubic inches

$$\text{Volume} = \text{Length} \times \text{Width} \times \text{Height}$$

Let's look at two other examples,

Example 1 (millimetres)

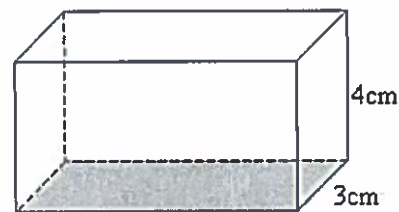


$$\begin{aligned}\text{Volume} &= \text{length} \times \text{width} \times \text{height} \\ &= 2\text{mm} \times 0.8\text{mm} \times 1\text{mm}\end{aligned}$$

$$\text{Volume} = 1.6 \text{ mm cubed or } 1.6 \text{ mm}^3$$

Example 2

(Volume = 72 cm³)



$$\begin{aligned}\text{length} \times \text{width} \times \text{height} &= \text{Volume} \\ \text{length} \times 3 \text{ cm} \times 4 \text{ cm} &= 72 \text{ cm}^3 \\ \text{length} \times 12 \text{ cm}^2 &= 72 \text{ cm}^3\end{aligned}$$

$$? \times 12 = 72$$

$$\text{Length} = 6 \text{ cm}$$

Volume can be expressed in a number of units that are connected:

- litres (L) and millilitres (mL) for liquid volume, remember 1000mL = 1L
- millimetres (mm), centimetres (cm), and metres (m) cubed for non-liquid space
 - these units are cubed (mm³, cm³, m³) compared to area which is squared (ie. cm²)
 - remember 10mm = 1cm and 1000mm = 1m, 100cm = 1m
- in fact, 1mL of water = 1 cm³ and 1L of water = 1000 cm³ ...COOL, for us Math Nerds!

Volume of a Rectangular Prism



Quick Review

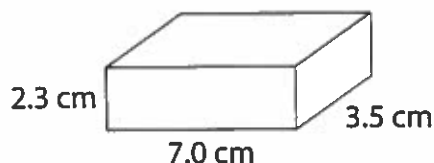
You can use a formula to find the volume of a rectangular prism. The volume is the product of the prism's length, width, and height.

Volume = length \times width \times height

$$V = \ell \times w \times h$$

This rectangular prism is 7.0 cm long, 3.5 cm wide, and 2.3 cm high.

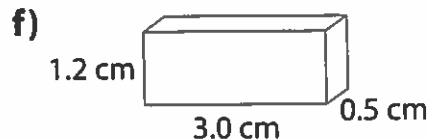
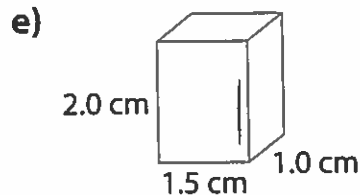
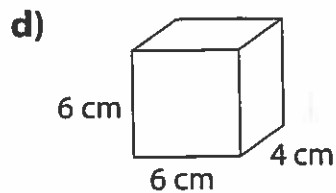
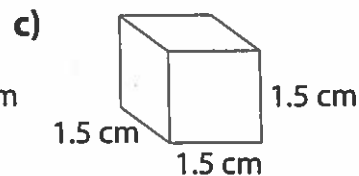
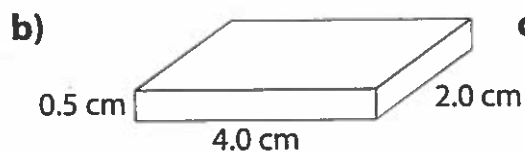
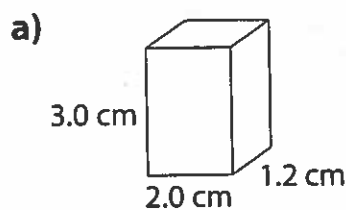
$$\begin{aligned} \text{Volume} &= 7.0 \text{ cm} \times 3.5 \text{ cm} \times 2.3 \text{ cm} \\ &= 24.5 \text{ cm}^2 \times 2.3 \text{ cm} \\ &= 56.35 \text{ cm}^3 \end{aligned}$$



The volume of the prism is 56.35 cm³.

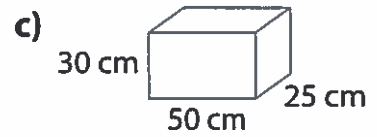
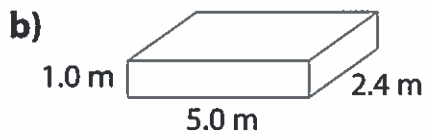
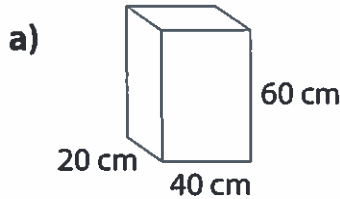
Try These

1. Find the volume of each rectangular prism.



Practice

1. Find the volume of each box.



2. Work with a partner.

- a) Find 4 small boxes. Label the boxes A, B, C, and D.
b) Measure the dimensions of each box. Estimate, then calculate, each volume. Record your results in the table.

Box	Length	Width	Height	Estimated Volume	Actual Volume
A					
B					
C					
D					

3. Complete each table.

a)

Length (cm)	Width (cm)	Height (cm)	Volume (cm ³)
6	9	3	
8		2	80
4	3		48
	5	5	125

b)

Length (cm)	Width (cm)	Height (cm)	Volume (cm ³)
5.3	4.0	7.1	
6.0	3.2		96
	2.0	1.1	22
12.0		4.0	120

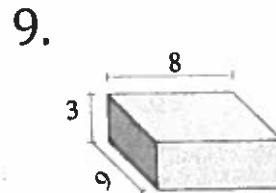
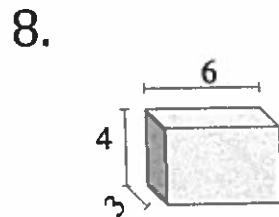
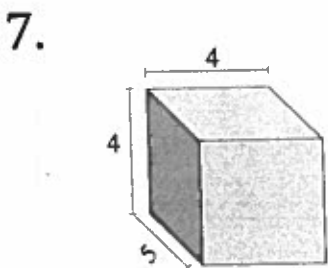
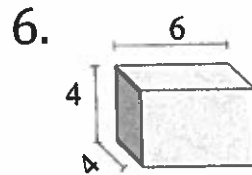
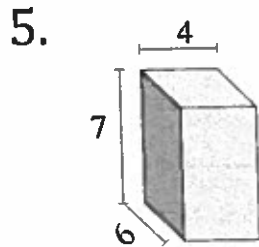
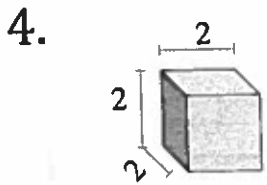
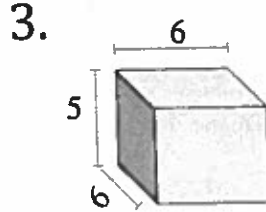
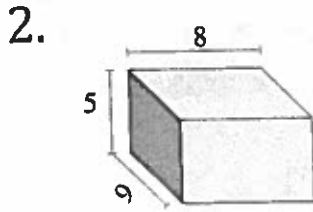
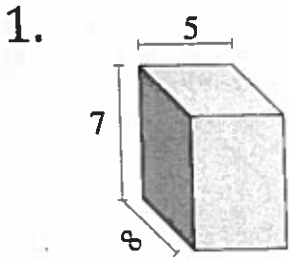
Stretch Your Thinking

Jocelyn built a rectangular prism with 36 centimetre cubes.
What might be the dimensions of the prism? Give as many answers as you can.

Springing into Volume

Name: _____

Find the volume for the following rectangular prisms. Write your answers in the column on your right. All answers are in cm^3 . Use the answers to solve the riddle at the bottom.



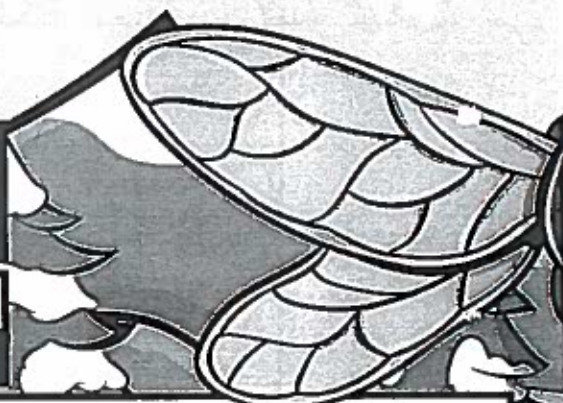
- | |
|--------------|
| 1. _____ (F) |
| 2. _____ (R) |
| 3. _____ (E) |
| 4. _____ (A) |
| 5. _____ (D) |
| 6. _____ (U) |
| 7. _____ (O) |
| 8. _____ (L) |
| 9. _____ (C) |

What kind of garden does a baker have?

	“		”		
8 cm^3	280 cm^3	72 cm^3	80 cm^3	96 cm^3	360 cm^3
N					
216 cm^3	8 cm^3	360 cm^3	168 cm^3	180 cm^3	FREE



What kind of flying insect is never cold?

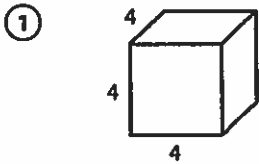


Solve the following problems and match your answers to the answers in the Legend. Then record the corresponding letter of the correct answer in the rectangles at the bottom to answer the riddle.
Note: The problem numbers match the numbered rectangles.

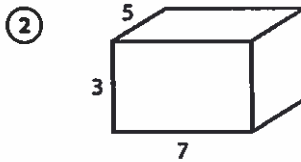
- | | | | | | |
|----------------|----------------|--------------|--------------|----------------|---------------|
| L 148.3 | E 76 | C 1.3 | A 105 | J 224.1 | W 52.5 |
| O 64 | K 101.5 | T 0.3 | Y 0.2 | H 84 | |

LEGEND →

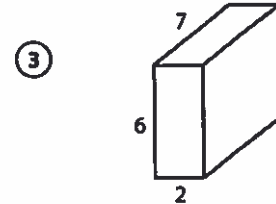
Find the volume of each rectangular prism. Round to the nearest tenth.



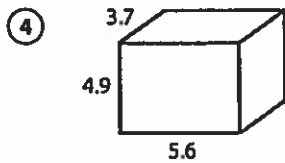
Volume = _____ units³



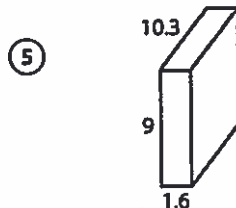
Volume = _____ units³



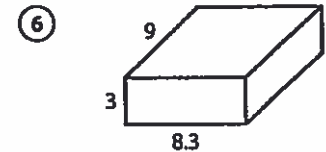
Volume = _____ units³



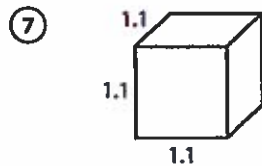
Volume = _____ units³



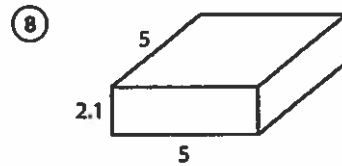
Volume = _____ units³



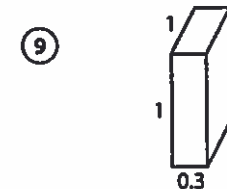
Volume = _____ units³



Volume = _____ units³



Volume = _____ units³



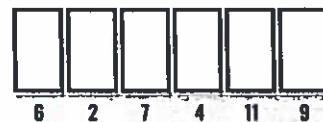
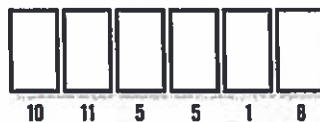
Volume = _____ units³

⑩ A cube measures 0.6 units on one edge. What is its volume?

_____ units³

⑪ A box measures 4 units tall, 3 units wide, and 7 units long. A cube measuring 2 units on one side is placed in the box. How many cubic units of water could be poured inside the large box if some of the space is taken up by the cube?

_____ units³



Skill: Finding the volume of rectangular prisms