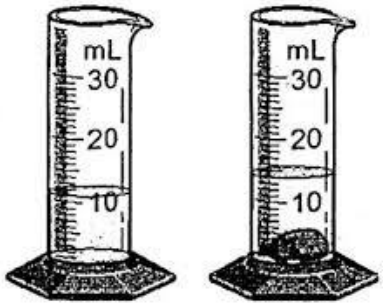
Week 14
Term 2
2021

HAWKER COLLEGE
Engage | Inspire | Achieve

EM1 Learning Brief: Measurement

Goals



Weekly Goals: Mass, Volume and Capacity

- use metric units of volume, their abbreviations, conversions between them, and appropriate choices of units (EMA26)
- understand the relationship between volume and capacity (EMA27)
- estimate volume and capacity of various objects (EMA28)
- calculate the volume of objects, such as cubes and rectangular and triangular prisms (EMA29)

Theoretical Components

Resources:

PDF file - Week 14 Notes and Exercises and Mathspace.co

Knowledge Checklist

- Volumes in cm^3 of rectangular prisms
- Volume of rectangular prisms and as area of cross section × height
- Application to irregular shapes
- Converting units of volume
- Relation between volume and capacity

Order

1. Work through the Week 14 notes and view any videos or solutions posted by your teacher
2. Complete the Exercises
3. Complete the Portfolio Task and submit on Google Classroom by the due date

Practical Components

There are 3 Exercises in this week's booklet. Read any notes and worked examples before you begin.

Remember to regularly check Google Classrooms

Portfolio Task

The Portfolio Task may be found at the end of the Notes and Exercises Google document

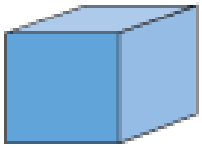
WEEK 14 NOTES AND EXERCISES

MEASURING VOLUME

The amount of wheat a silo can hold, the quantity of sand in a truck and the amount of concrete required for a driveway are applications of **volume**.

Volume measures the space inside a solid shape. **Cubic units** are used for volume. The diagram shows a cube with sides of 1 cm. Its volume is 1 cm^3.

Motorbikes are often described by the size of the cylinders in their engine. The cylinders in the engine in a 750 cc bike have a volume of 750 cm^3.



Volumes of Rectangular Prisms

An objects volume is a measure of the space an object occupies. The formula for the volume of a rectangular prism is:

$$V = L \times D \times H$$

Where L = length, D = depth and H = height.

Example

Mia keeps her gardening tools in a box which is the shape of a rectangular prism.
a) Calculate the volume of the box in:
(i) cubic centimetres
(ii) cubic metres.

Solution

The formula for the volume is

$V = L \cdot D \cdot H$

a) (i) If you want the volume in cubic centimetres, make all the measurements centimetres before you substitute them into the formula.

$V = 110 \cdot 45 \cdot 40$ cm3 = 198 000 cm3

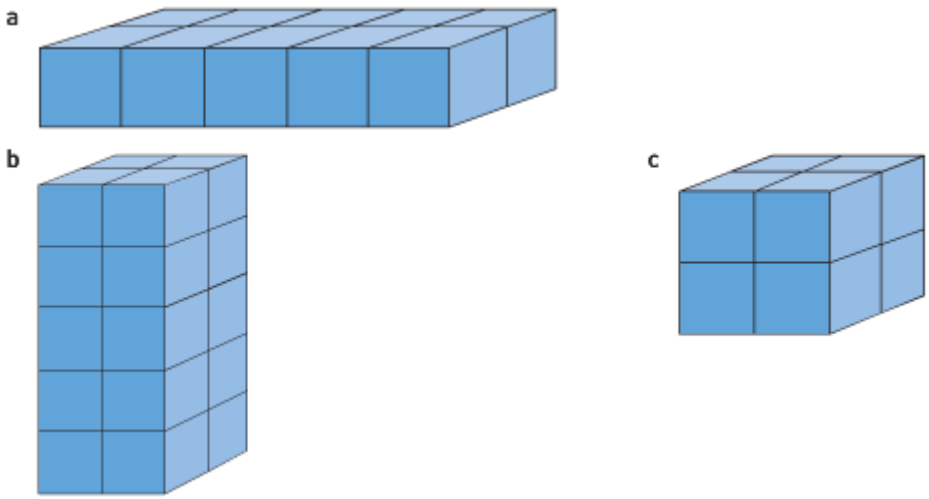
(ii) If you want the volume in cubic metres, make all the measurements metres before you substitute them into the formula.

$V = 1{\cdot}1 \cdot 0{\cdot}45 \cdot 0{\cdot}40$ m3 = 0·198 m3

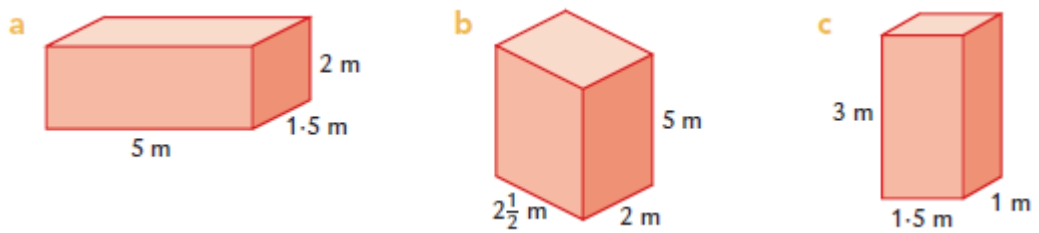
Exercise 1

Determine the volume of each of the following prisms, constructed from 1 cm^3 blocks.

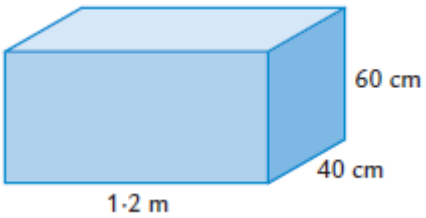
Q1.



Q2. Calculate the volumes of these rectangular prisms in cubic metres. Show working.



Q3. Calculate the volume of this rectangular prism in cubic centimetres and cubic metres.



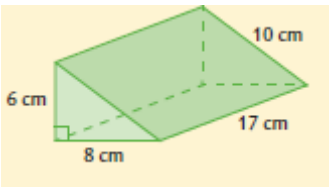
Volumes of regular prisms

The volume of a prism can be calculated with the formula:

$V = A \times H$
where A = area of the cross-section
H = height at right angles to the cross-section.

Example

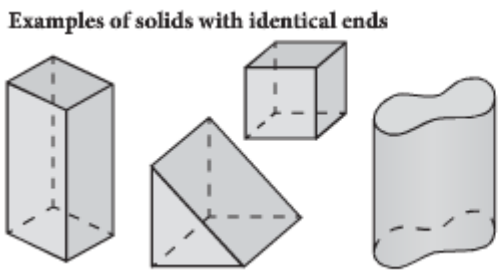
Calculate the volume of this triangular prism.

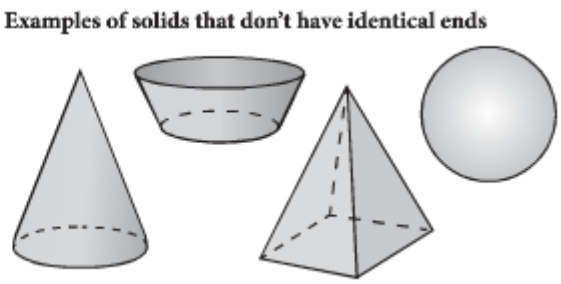


Solution

The cross-section of the prism is a triangle.
Area of triangle = $\frac{1}{2}bh$ = 0.5 × 6 × 8 = 24 cm^2
Volume = area of triangle × height = 24 × 17 = 408 cm^3

Volumes of Irregular Shapes





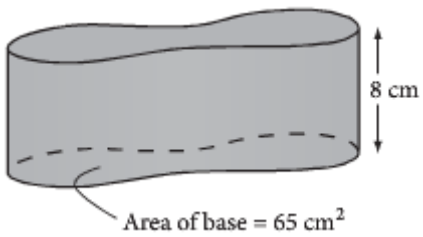
The diagrams show some solids that have identical shapes at either end. Thus they have the same cross-section throughout. The other shapes do not have identical ends or cross sections. A solid with flat sides and identical ends is called a **prism**.

The volume of a solid with identical ends = $A \times h$

where A is the area of the end or base and h is the height.

Example

The area of the base of this solid is 65 cm^2. What is the volume of the solid?



Solution

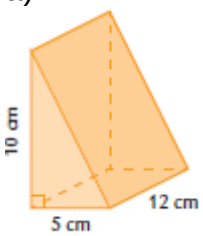
Both ends of the solid are identical, so we can use the formula V = A × h

V = A × h = 65 × 8 = 520 cm^2

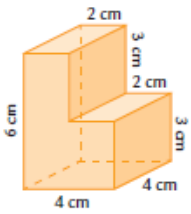
Exercise 2

1. Calculate the volume of these solids.

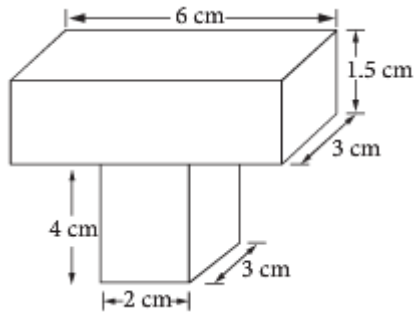
a)



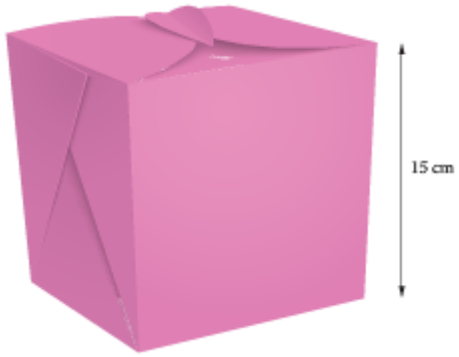
b)



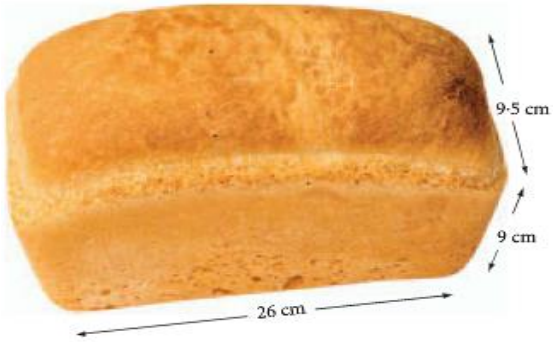
c)



2. The area of the food box base is 300 cm^2. Calculate the volume of the box.



3. The end of this loaf of bread is a rectangle 9 by 9.5 cm.



a) What is the area of the end of the loaf of bread?

b) The loaf is 26 cm long. What is the volume of the loaf of bread?

c) The loaf of bread can be cut into 22 slices. Calculate the volume of each slice of bread to the nearest cm^3.

Converting Units

1 cm^3 = 10 × 10 × 10 mm = 1000 mm^3

1 m^3 = 100 × 100 × 100 = 1000000 cm^3

Large to small

m^3 to cm^3 multiply by 1000000

cm^3 to mm^3 multiply by 1000

Small to large

cm^3 to m^3 divide by 1000000

mm^3 to cm^3 divide by 1000

Exercise 3

Q1. Complete the statements.

a) 5 cm^3 = mm^3

b) 2 m^3 = cm^3

c) 500 mm^3 = cm^3

d) 0.25 m^3 = cm^3

e) 24000 cm^3 = m^3

f) 36000 mm^3 = cm^3

Q2. If you were to measure the volume of the following items what units would you use; mm^3, cm^3 or m^3?

a Your calculator.
b Your maths classroom
c An EFTPOS card
d A glass of water
e A mobile phone
f The contents of a box of breakfast cereal.

2021 EM1

PORTFOLIO TASK WEEK 14

Question 1

Aaron only has a small area where he can use to grow vegetables. He digs out a garden 3 m long by 55 cm deep and 45 cm wide. He plans to replace the old soil with compost.

a) What is the volume of soil he needs to remove? Give your answer in cubic metres.

b) How many litres of compost will he need? Given that 1 cubic metre holds 1000 litres.

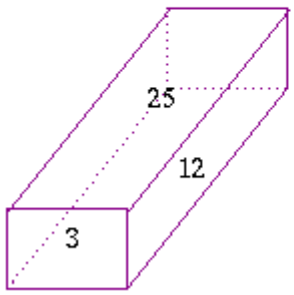
c) If he takes this soil away in a wheelbarrow that holds 60 litres, how many barrow loads will he take away?

d) The compost is available in 50 litre bags. How many bags will she need to buy?

e) He plans to line the edge of the garden with timber. What length of timber will he need?

Question 2

The diagram shows a rectangular box (a cuboid).
The areas of the faces are 3, 12 and 25 square centimetres.
What is the volume of the box?



Marking Rubric **Week 14** **Name:**

CRITERIA	EXPECTATIONS	POSS	MULT	GIVEN	TOTAL
Practical	Student completes practical work, including exercises and Mathspace task, of the brief to an acceptable standard set by the teacher.	**2**	**3**		**/6**
Portfolio Task	Student completes the portfolio task of the brief to an acceptable standard set by the teacher.	**2**	**2**		**/4**
Reasoning and Communication	Student responses are accurate and appropriate in presentation of mathematical ideas in different contexts, with clear and logical working out shown.	**4**	**-**		**/4**
Concepts and Techniques	Student submitted work selects and applies appropriate mathematical modelling and problem-solving techniques to solve practical problems, and demonstrates proficiency in the use of mathematical facts, techniques, and formulae.	**4**	**-**		**/4**
	Submission Guidelines				
Timeliness	Student submits the exercises, Mathspace task and portfolio by the set deadline. See scoring guidelines for specific details.	**2**	**-**		**/2**
				FINAL	**/20**

Student Reflection:
How did you go with this week's work?

What was interesting?

What did you find easy?

What do you need to work on?