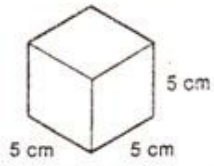
VOLUME

1. Use the formula to find the volume of each rectangular prism. (Dimensions are in centimetres.)
Write answers only.

	Length	Breadth	Height	Volume
(a)	6	5	2	60 cm³
(b)	10	3	2	60
(c)	12	2	2	48
(d)	8	2	3	48
(e)	7	2	5	70
(f)	7	5	2	70
(g)	6	4	3	72
(h)	10	6	3	180

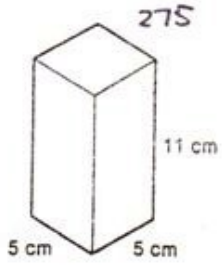
2. Find the volume of each solid.

(a)

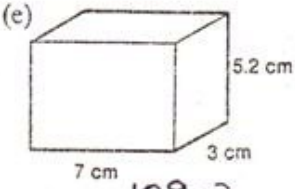


125

(c) 275

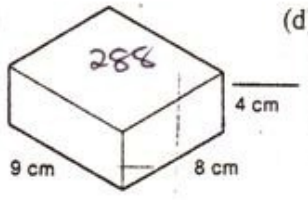


(e)

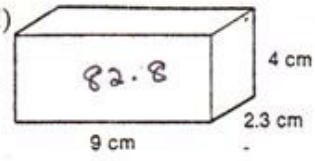


109.2

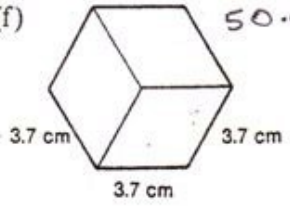
(b) 288



(d) 82.8



(f) 50.623

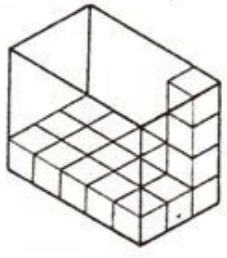


3. A cube has sides 3 cm long. What is its volume? 27

4. A box is 4 cm long, 12 cm wide and 17 cm high. What is its volume? 816

5. A school case is 50 cm long, 38 cm wide and 15 cm high. What is its capacity? 28500

6.



This box contains some centicubes.
(a) What is the capacity of the box when empty? 60
(b) How many cubes have been packed in it? 18
(c) What volume remains? 42

7. This is an unfinished cube (made using centicubes).
(a) What would be the volume of the completed cube? 27
(b) What volume is missing? 3
(c) What is the volume of this solid? 24

CONVERSION OF VOLUMES

1. Use $1\ cm^3 = 1000\ mm^3$ to change to mm^3:
   (a) $2\ cm^3$ (b) $3.4\ cm^3$ (c) $5.76\ cm^3$ (d) $0.29\ cm^3$ (e) $13.14\ cm^3$
2. Use $1000\ mm^3 = 1\ cm^3$ to change to cm^3:
   (a) $3000\ mm^3$ (b) $1500\ mm^3$ (c) $1001\ mm^3$ (d) $900\ mm^3$ (e) $324\ mm^3$
3. Use $1\,000\,000\ cm^3 = 1\ m^3$ to change to m^3:
   (a) $2\,000\,000\ cm^3$ (b) $200\,000\ cm^3$ (c) $20\,000\ cm^3$
4. Use $1000\ mL = 1\ L$ to change to L:
   (a) 9000 mL (b) 69 000 mL (c) 2800 mL (d) 600 mL
5. Use $1\ m^3 = 1000\ L$ to change to L:
   (a) $5\ m^3$ (b) $6.4\ m^3$

ESTIMATING VOLUMES

The head of a pin is about *half* a *cubic millimetre*, a sugar cube is a little *more* than a *cubic centimetre* and about four television sets could fit into a cubic metre.

How many of your classmates would fit in a cubic metre?

Set 10E

1. Which unit of measurement would you use to give the volume of the following?
   (a) a blackboard duster cm^3
   (b) your bedroom m^3
   (c) a match mm^3
   (d) concrete used to make a tennis court m^3
   (e) this textbook cm^3
   (f) soil taken out of the ground to install a swimming pool m^3
   (g) a pencil cm^3
   (h) a cereal packet cm^3
2. Choose the *most likely* volume of:

(a) a match head	2 mm^3	2 cm^3	2 m^3
(b) a banana	40 mm^3	40 cm^3	40 m^3
(c) a tennis ball	48 mm^3	48 cm^3	48 m^3
(d) a matchbox	25 mm^3	25 cm^3	25 m^3
(e) a television	0.04 mm^3	0.04 cm^3	0.04 m^3
(f) a fridge	1 mm^3	1 cm^3	1 m^3
(g) a lounge room	75 mm^3	75 cm^3	75 m^3
(h) an egg	22 mm^3	22 cm^3	22 m^3
(i) a loaf of bread	4500 mm^3	4500 cm^3	4500 m^3
(j) a brick	1800 mm^3	1800 cm^3	1800 m^3
(k) a shoe box	4500 mm^3	4500 cm^3	4500 m^3
(l) a swimming pool	3000 mm^3	3000 cm^3	3000 m^3

3. Complete this table in your book.

Item	*Estimate of volume*	*Measurements*			*Calculation of volume*
		Length	*Breadth*	*Height*	

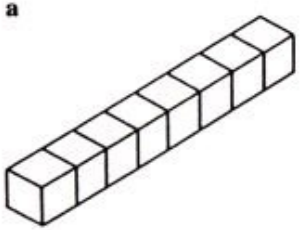
Include these items: book, schoolbag, room, matchbox, blackboard duster, breakfast cereal packet, telephone directory, computer disk drive.

Estimate the volume of each item first. Check by measurement and calculation.

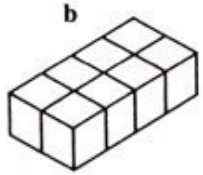
VOLUME

1 By counting the centimetre cubes find the volumes of the following in cm^3.

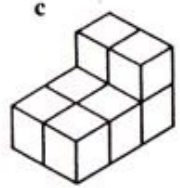
a



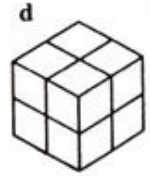
b



c



d



2 Use centimetre cubes to build as many different-shaped stacks as possible containing:

a four cubes **b** six cubes **c** ten cubes

3 Below are some stacks of centimetre cubes in the shape of rectangular prisms or cuboids.

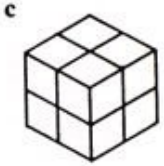
i Make a table similar to the one below, and complete the first column by counting the centimetre cubes in each of the stacks.

	Volume by counting cubes	Length (l)	Width (w)	Height (h)	Volume $V = l \times w \times h$
a					
b					

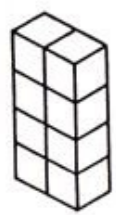
a

b

c

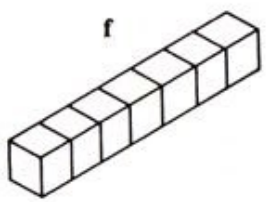


d

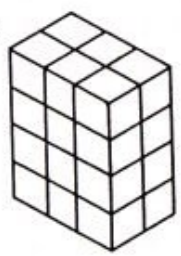


e

f



g



ii Now complete the other columns for the length, width and height of the stacks, by counting the centimetres along the edges of each stack.

iii Calculate the volumes of the stacks by multiplying together the length, width and height each time. Enter your results in the last column of your table. What do you notice about the results in the first and last columns of your table?

4 Suppose you have a case for carrying cassettes but you also store them in a shoe box at home.

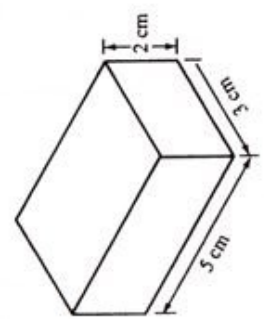
a How could you decide which container holds the most cassettes?

b With your method, could you decide how much larger one container is than the other?

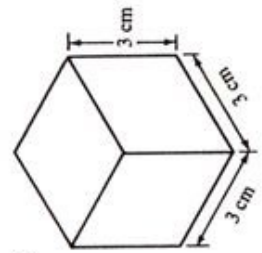
c Would this method tell you, for example, how many bars of chocolate each container would hold without you having to actually buy enough to fill them and check?

5 Find the volume of each of the following solids:

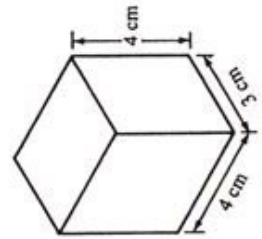
a



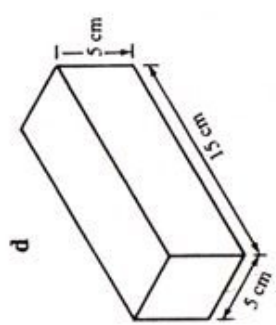
b



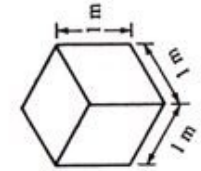
c



d



e



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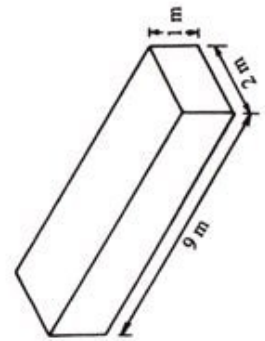
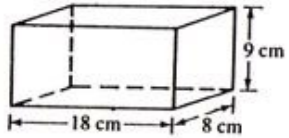


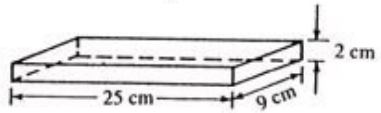
6 What volume of soil must be removed from a hole being dug for a swimming pool in the shape of a rectangular prism 25 m long, 15 m wide and 4 m deep?

7 What volume of concrete is needed for a rectangular barbecue area 10·5 m long, 8·3 m wide and 0·2 m thick?

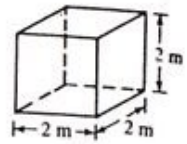
a



b



c



10 Find the volume of each rectangular prism. Round your answer to the nearest cubic unit.

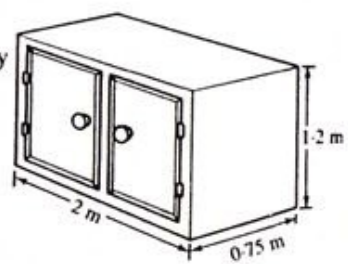
	Length	Width	Height
a	3 m	3 m	5 m
b	12·5 cm	9·2 cm	17 cm
c	2·4 m	85 m	3·1 m
d	45 mm	24 mm	12 mm

11 Find the volume of each triangular prism. Round your answer to the nearest cubic unit.

	Base		Height of prism
	Length	Height	
a	13 cm	7 cm	15 cm
b	16 m	8·9 m	24 m
c	9 mm	47 mm	26 mm
d	25 cm	21 cm	20 mm

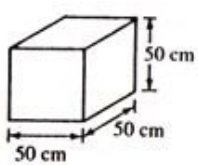
12 Kiersuki made a storage cabinet for the patio. The dimensions were 2 m by 0·75 m by 1·2 m. What is the volume of the cabinet?

Melissa painted the outside of the cabinet. How much surface area did she cover if she painted all but the bottom of the cabinet?

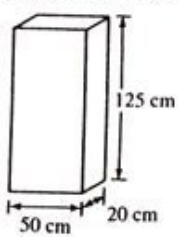


13 The Blaxland Moving Company has three kinds of boxes.

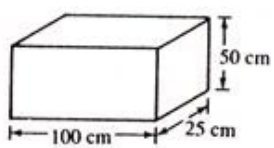
a



b



c



i Find the volume of each box.
ii Find the surface area of each box.
iii Do boxes with the same volume have to have the same surface area?
iv Which box took the least amount of cardboard to make?

14 The Wentworth-Lawson Packaging Company built two boxes.
Box A had dimensions of 3 cm by 3 cm by 2 cm.
Box B had dimensions of 6 cm by 3 cm by 1 cm.
a Which box had the greater volume?
b Which box required the least amount of material to make?

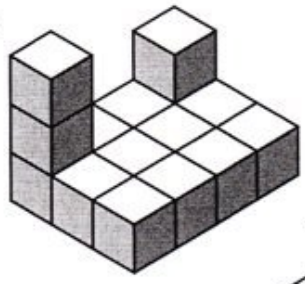
15 a First estimate the volumes of the objects in this table below. Then use the formula to calculate their volume. Copy the table and then enter your results in the table.
b Find the area of the base of each of the objects in the table by multiplying the length by the width. Enter your results in the appropriate column of the table.
c Multiply the base area of each object in the table by the object's height. Enter the results in the last column of the table. Compare the results in the last column with the results in the Volume column. What do you discover?

	Estimate (cm^3)	Measurements (to nearest cm)			Volume (cm^3)	Area of base (cm^2)	Base × height (cm^3)
		Length	Width	Height			
Matchbox		5	4	2			
Cassette		11	7	2			
250 g butter		11	5	5			
This book		28	21	1			
Video		19	11	3			
1 L milk carton		7	7	20			
Brick		23	10	7			
Breakfast cereal packet		19	7	25			

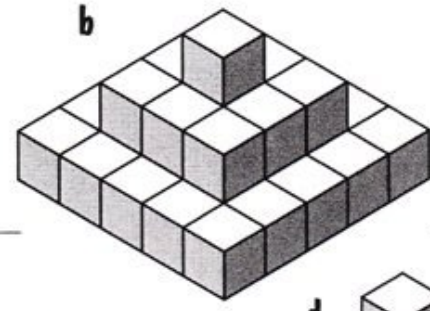
10.1 Volume

1 Find the volume of each of these solids in units^3.

a



b



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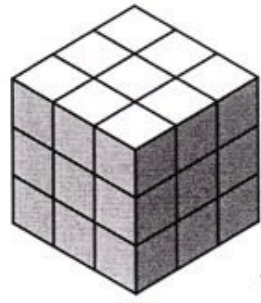

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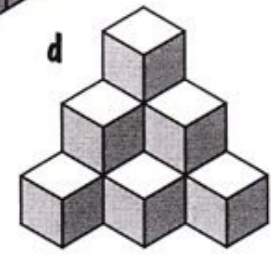
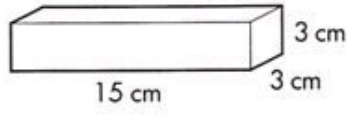
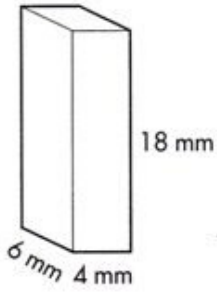


2 Find the volume of each of these solids.

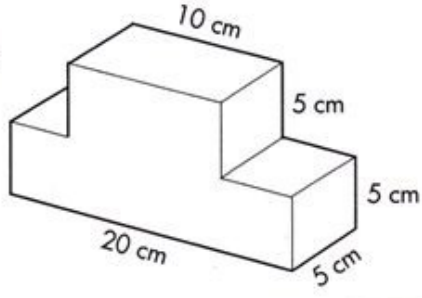
a



b



c



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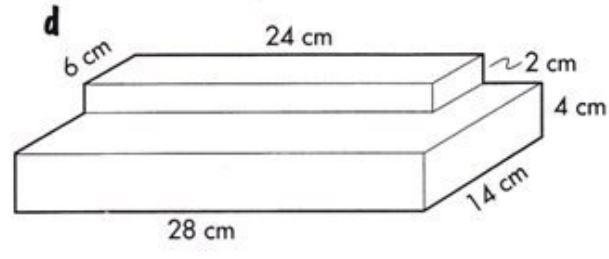

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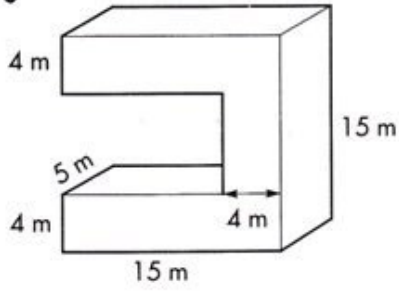

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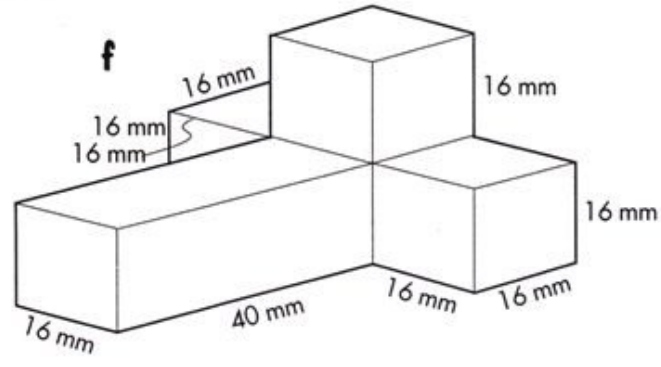
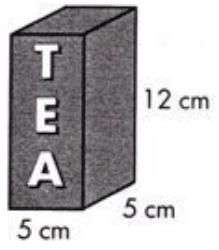
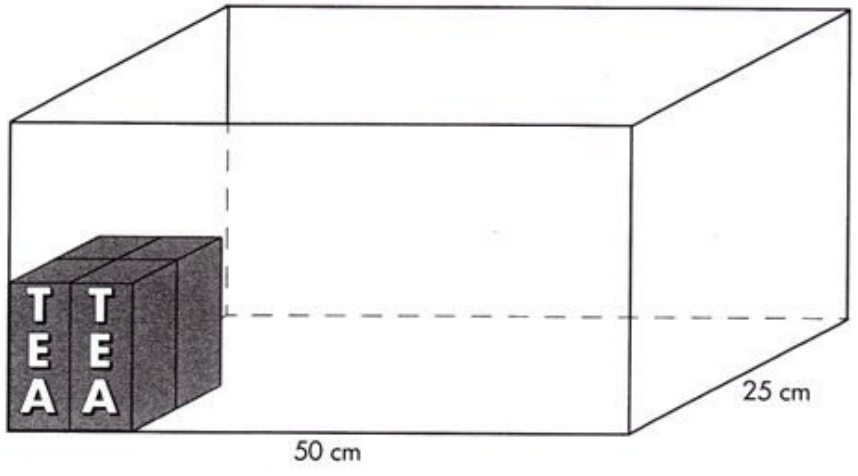


Tea anyone?

3 A packet of tea is 5 cm × 5 cm × 12 cm. One hundred tea packets are placed in a box with a base of 50 cm × 25 cm. The packets of tea are stacked upright in the box.





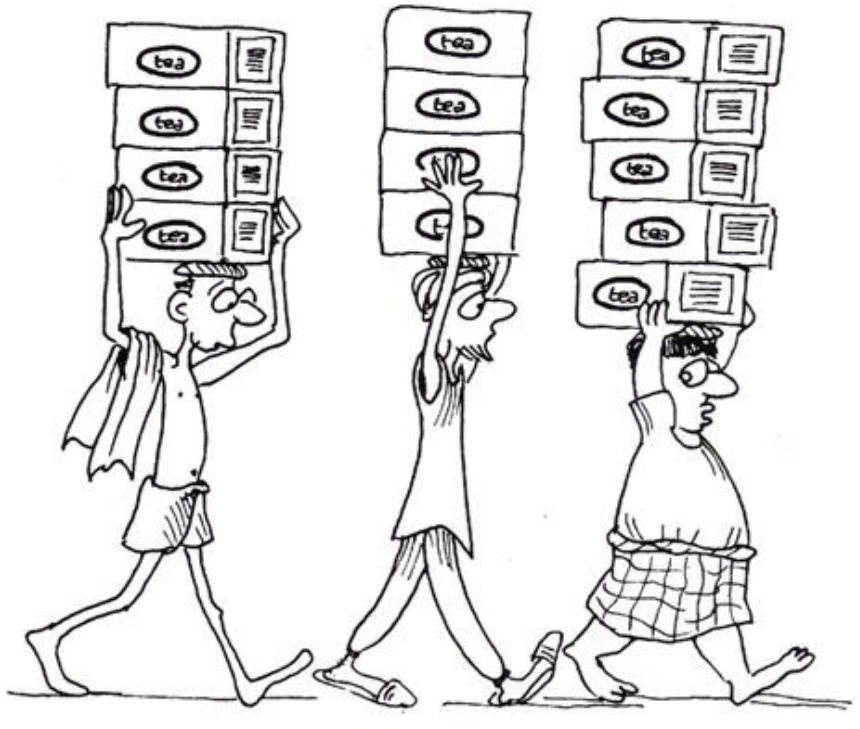
a How many packets of tea fit on the base of the box? _____

b How many layers of packets of tea are there in a full box? _____

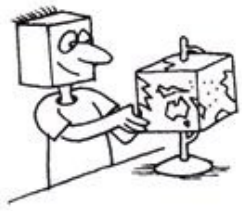
c How high is the box? _____

d If each packet of tea weighs 45 g, how much will a full box weigh?

_____



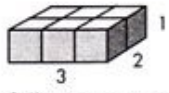
10.5 The world of cuboids

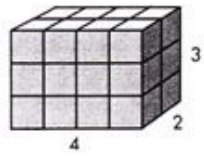


What is a cuboid?

- A cuboid is a model made from joining cubes.
- A cuboid has six faces and twelve edges.

Example



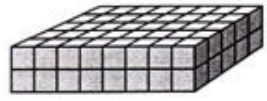


To help with the following questions, a set of interlocking cubes would be useful.

1 Make a cuboid with edges of length 2, 3 and 5. Find its volume.

_____

2 Find the volume of the cuboid shown below.



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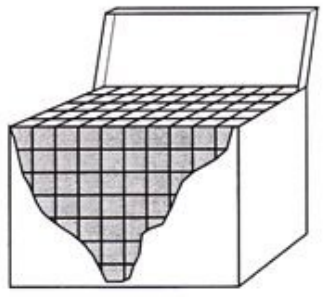
3 How many cubes are in the box?



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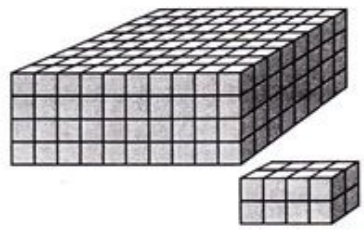
4 A large cuboid was broken up into several smaller cuboids. How many smaller cuboids could be made?



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5 343 interlocking cubes were joined to form a large cube. How long is one edge of the cube? (Note: a cube has all edges equal in length.)

_____

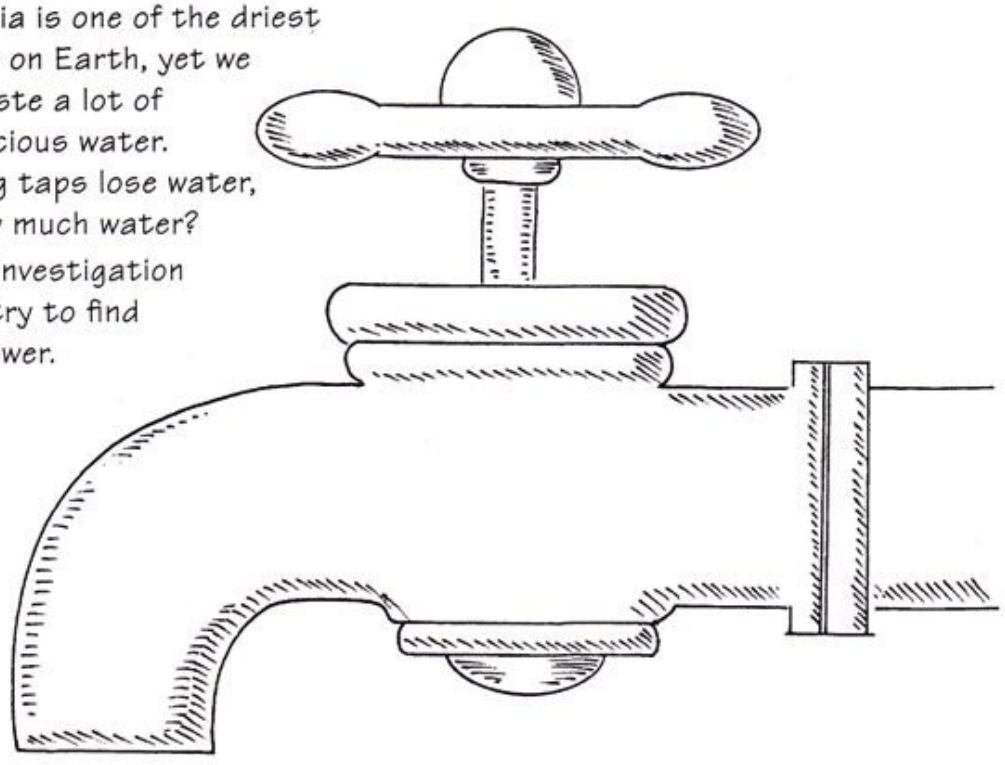
6 Give lengths of the edges of three cuboids each with a volume of 36.

_____

7 Give lengths of the edges of as many cuboids as you can with a volume of 72. _____

10.6 Wasted water

Australia is one of the driest nations on Earth, yet we still waste a lot of our precious water. Dripping taps lose water, but how much water? In this investigation we will try to find the answer.



1 Count the number of drips in one minute. See if you have a tap that drips, otherwise open a tap slightly so that it drips slowly.

2 Use a glass to collect the amount of water that drips from the tap in five minutes. Mark a line on the glass to show the level of water.

3 Use the marked glass to find how long it takes to fill a one litre container.

4 Use the above information to answer these questions:

- **a** How many drips does it take to fill a one litre container?
- **b** How many drips fall from the tap in one week?
- **c** How many litres are lost from the dripping tap in one week?

5 In your home town, find or estimate the number of dwellings (houses and flats). If each dwelling has one dripping tap, how many litres of water are lost in one week? one year? (The last Australian Census might be of assistance to you.)

6 In Australia there are about 5 400 000 households. If each household has one dripping tap, how many litres of water are lost in one week? one year?

Chapter 12

Area and Volume 1

Student Name	Class	Score
Parent Signature	Date	

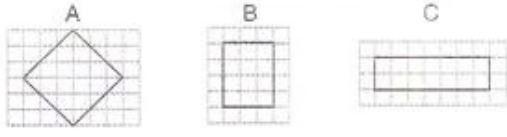
12:01 The Definition of Area

Outcome MS 4.1

Area is measured in **square units** such as m^2 and cm^2.

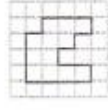
The area of this square is exactly 1 cm^2.

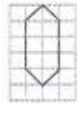
1 Write down the letters of these three shapes so that they are in order from smallest area to largest area. _____

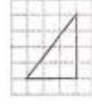


2 Work out the areas of these shapes by counting squares and parts of squares. Each square represents 1 cm^2.

a  _____

b  _____

c  _____

d  _____

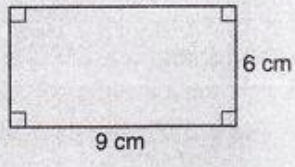
12:02 Area of a Rectangle

Outcome MS 4.1

Area of rectangle = base × height

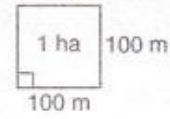
$A = b \times h$

Example: What is the area of this rectangle?



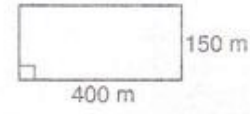
Area = $b \times h$ = 9 cm × 6 cm = 54 cm^2

Land areas are measured in **hectares** (ha).



1 ha = 10 000 m^2

Example: A city park is rectangular. It measures 400 m by 150 m.

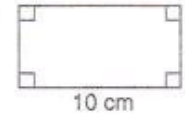


Its area = 400 m × 150 m = 60 000 m^2

To change the area units to ha, divide by 10 000:

Area = 6 ha

1 Calculate the areas of these rectangles.

a 

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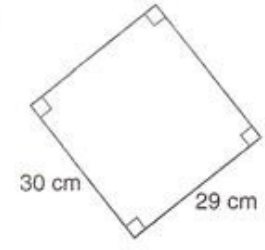
b 

_____

c 

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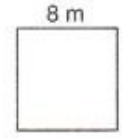
2 Calculate the area of this square.



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