Angles, Shapes And Mensuration

For students aged 11 - 15 years who are underachieving at their year level.

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Contents

Teachers' Notes

This resource is focused on the Measurement and Geometry Strand of the Australian Mathematics Curriculum. It is intended for lower ability students and those who need further opportunity to consolidate these core areas in Mathematics. Each section provides students with the opportunity to consolidate written and mental methods of calculation, with an emphasis on process and understanding.

The section entitled *Angles* enables students to review types of angles and naming angles. There is the opportunity to practise drawing angles and using angles within a context. Students then have the opportunity to investigate angles in a triangle and to also classify the different types of triangles. These activities are a useful way to scaffold a new unit of Mathematics and will help build confidence for lower ability students to attempt more challenging problems at their year level.

The section entitled *Shapes And Mensuration* familiarises students with units of length, mass and capacity and provides activities to consolidate unit conversions using mental strategies. The activities then move on to exploring perimeter and area of rectangles and triangles and allow for a thorough consolidation of these foundational concepts. Students then engage with simple volume and capacity ideas.

The activities can be used for individual students needing further consolidation in a mainstream classroom or as instructional worksheets for a whole class of lower ability students. The activities are tied to Curriculum Links in the Australian Curriculum ranging from grade levels of Year 4 through to Year 7 and are appropriate for students requiring extra support in Years 7, 8 and 9.

It is hoped that *Angles, Shapes And Mensuration* will be used to help teachers provide appropriate resources and support to those students in greatest need. The book as a whole can be used as a programme of work for those students on a Modified Course or Independent Learning Programme. Activities are sufficiently guided so that students can work independently and at their own pace without constant supervision and guidance from the teacher.

✪ Looking At Different Angles
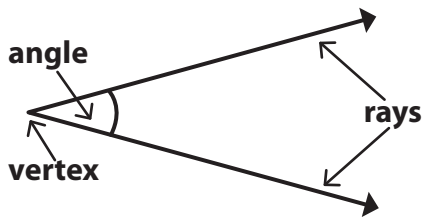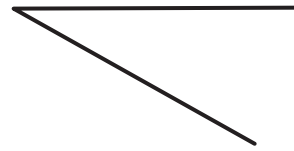
angle

rays

vertex

- An angle is the amount of turn between two lines around a common point. The lines are known as rays and the point at which they meet is called a **vertex**.
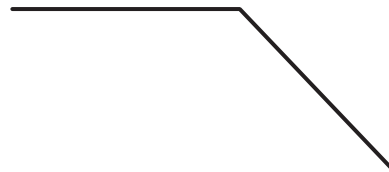
- A **right** angle is an angle that measures exactly 90°. They are often marked with a square at the angle.
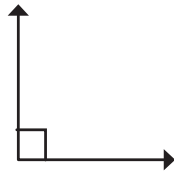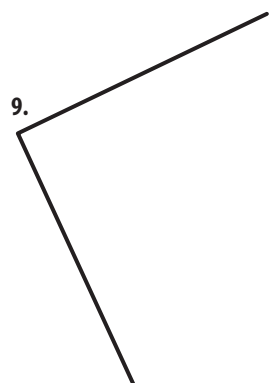
- An **acute** angle is an angle less than 90°.

- An **obtuse** angle measures between 90° and 180°.

SAMPLE

✶ TASK A — Draw two examples of an acute angle and obtuse angle.

✶ TASK B — Tick the angles below that are right angles. Draw a circle around the acute angles and put a cross inside the angles that are obtuse.
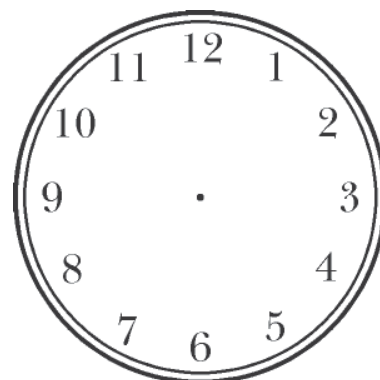
1.

2.

3.

4.

5.

6.

7.

8.

9.
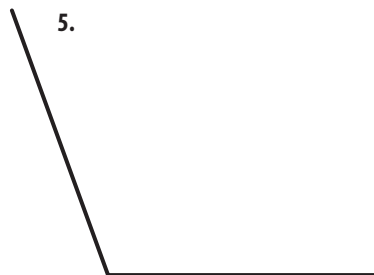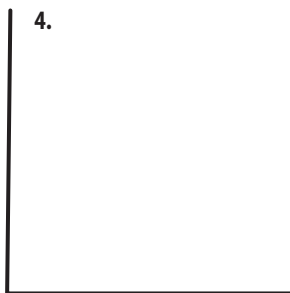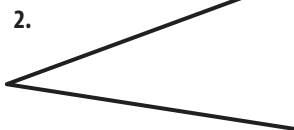
✱ An Angle On Time

● We see changing angles on a clock face every minute.

✱ TASK A   What sized angle is shown for the times below?
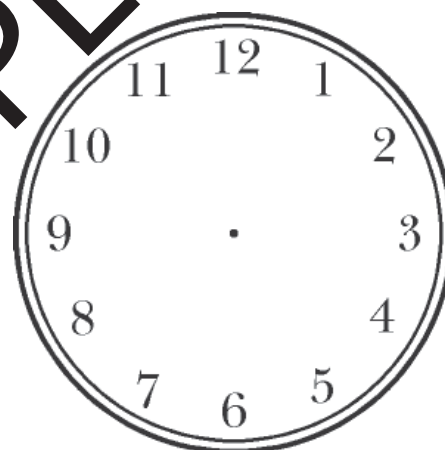Hint: Use this clock face and pencil lines to help you.

e.g. 5.30 - 15°   11.00 ....   Noon ....   3.00 ....

7.00 ....   8.30 ....   9.00 ....   3.45 ....

✱ TASK B   Draw the times in the clock faces below using your ruler.
What angles are they showing?

7.16 ....°   11.17 ....°

✱ TASK C: CLOCK QUIZ

1. How many degrees does an hour hand move between 11.00 and 12.00? _____

2. How many degrees are formed at exactly 6.00? _____

3. After 3.00, when is the very next time that the hands form a perfect right angle? _____

4. What is the reflex angle size when a clock's hands say 4.30? _____

5. What kind of angle is formed by the clock hands at these times?
Measure from the hour hand, e.g. 11.45 - reflex.

a. 3.45 ....   **b.** 11.30 ....   **c.** 9.33 ....

d. 7.45 ....   **e.** 12.45 ....   **f.** 2.17 ....

g. 1.55 ....   **h.** 5.58 ....   **i.** 12.37 ....

✱ Length Conversions 1

✱ TASK A — Converting millimetres to centimetres

To convert mm to cm we divide by 10.
Write this in symbols on the diagram right.

To convert cm to mm we multiply by 10.
Write this in symbols on the diagram right.
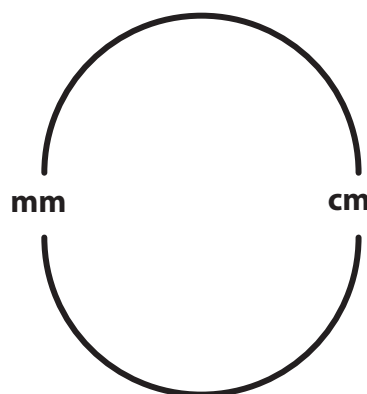
mm   **cm**

Convert each of the following.

a) 1 cm = _____mm	b) 50 mm = _____ cm	c) 35 mm = _____cm
d) 20 cm = _____ mm	e) 7.2 cm = _____ mm	f) 4 mm = _____cm

✱ TASK B — Converting centimetres to metres

To convert cm to m we divide by 100.
Write this in symbols on the diagram right.

To convert m to cm we multiply by 100.
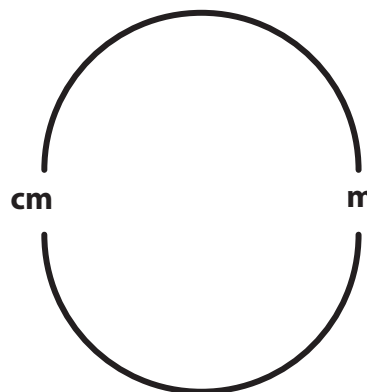**Write this in symbols on the diagram right.**

cm   **m**

Convert each of the following.

a) 5 m = _____cm	b) 200 cm = _____m	c) 42 m = _____cm
d) 351 m = _____cm	e) 527 cm = _____m	f) 32 cm = _____m

✱ TASK C — Converting metres to kilometres

To convert m to km we divide by 1000.
Write this in symbols on the diagram right.

To convert km to m we multiply by 1000.
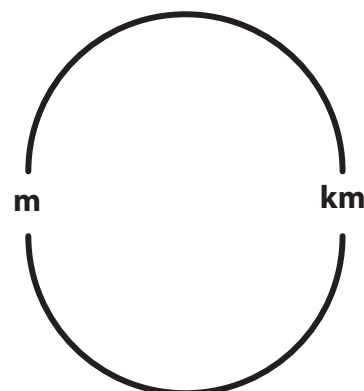**Write this in symbols on the diagram right.**

m   **km**

Convert each of the following.

a) 3 km = _____m	b) 2000 m = _____km	c) 4.3 km = _____m
d) 355 m = _____km	e) 12 m = _____km	f) 215 km = _____m

✪ Converting Units

● When converting between units, you move the decimal point the number and direction of the little 'bumps'.

Example))))► How many km in 534.6 m?

☆ Start at the decimal point .
☆ We are we going from 'm' to 'km'.
☆ Move the decimal three places to the left (we follow the 'bumps' from 'm' to 'km').

i.e. 534.6 m = .5 3 4. = .534 km.

0.1

(✱ TASK A) **Convert the following units.**

a) 235 m = _____ km   b) 0.087 g =_____ mg

c) 1.27 km = _____ m   d) 690 mL = _____ L

e) 26 cm =_____ mm   f) 7568 mm = _____ m

g) 0.0037 kg = _____ mg   h) 2734 cm = _____ km

i) 200 mg = _____ g   j) 35 km =_____ m

k) 250 mL =_____ L   l) 4 678 mg =_____ kg

m) 0.0016 km = _____ mm   n) 1.26 L = _____ mL

o) 3.67 cm = _____ m   p) 0.127 g = _____ mg

✱ Perimeter 2

● Perimeter is the distance around an object. Look at the example below.
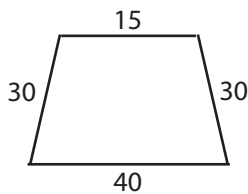
Fybnqnf

3 cm

3 cm   3 cm

3 cm
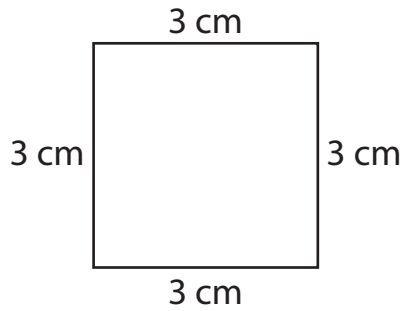
To work out the perimeter,
add up all the sides.

3 + 3 + 3 + 3 = 12 cm

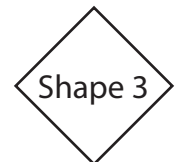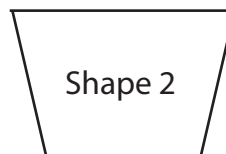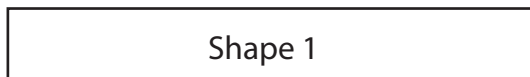**✱ TASK A** Work out the perimeter of these shapes. These are in mm.

20

20   20

20

_____ + _____ + _____ + _____ = _____ mm

15

30   30

40
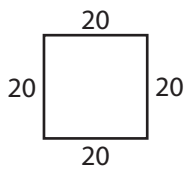
_____ + _____ + _____ + _____ = _____ mm

✱ TASK B Measure all the sides and then work out the perimeters in mm.

Shape 1

Shape 2

Shape 3

Shape 1   _____ + _____ + _____ + _____ = _____ mm

Shape 2   _____ + _____ + _____ + _____ = _____ mm

Shape 3   _____ + _____ + _____ + _____ = _____ mm

✱ TASK C Use cm to work out the perimeter of this page.

_____ cm + _____ cm + _____ cm + _____ cm =   _____ **cm**

Can you work it out in mm too?

_____ mm + _____ mm + _____ mm + _____ mm =   _____ **mm**

✪ Areas Of Rectangles 1

✱ TASK A Calculate the area of the following rectangles using Area = Length x Width.

a) [rectangle] 2 m
10 m

....

b) [rectangle] 5 m
6 m ....

c) [rectangle] 24 cm
7 cm

....
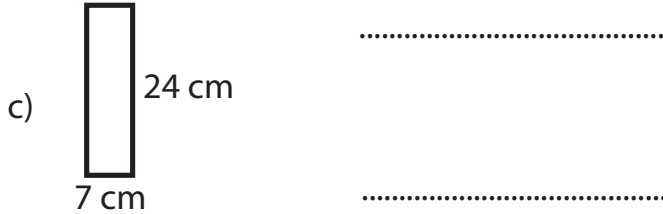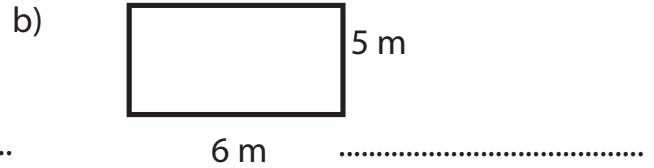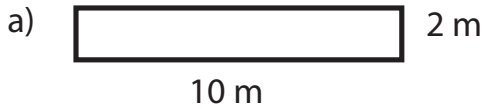
d) [rectangle] 6 km
6 km ....

Look at the two methods below. Total area is calculated by working out the area of the rectangles that fit into the polygon.

Nfui pe!2 ⫸ **Subtraction**

6 m
[shape] 3 m
2 m
2 m
4 m

[shape] 2 m 5 m
2 m
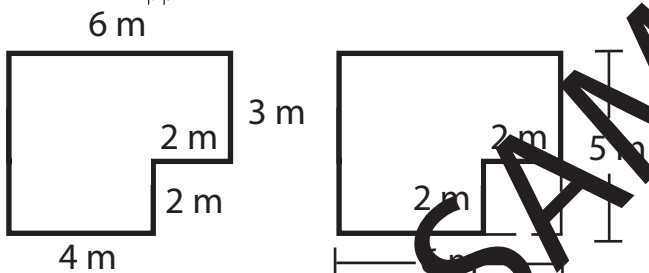
Area of large rectangle

= l x w = 6 x 5 = 30 m²

Area of small rectangle

= l x w = 2 x 2 = 4 m²

Total area = 30 - 4 = 26 m²

Nfui pe!3 ⫸ **Addition**

6 m
[shape] 3 m
2 m
4 m
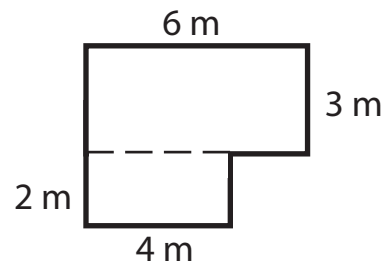
Area of large rectangle

= l x w = 6 x 3 = 18 m²

Area of small rectangle

= l x w = 2 x 4 = 8 m²

Total area = 18 + 8 = 26 m²

SAMPLE

✱ TASK B Use one of the methods to find the area of these shapes.

15 m
[shape] 5 m
12 m
2 m
3 m

[staircase shape]
2 cm

6 km   5 km
[shape]   4 km
3 km   10 km
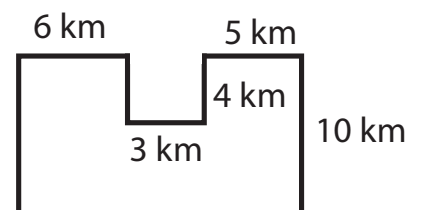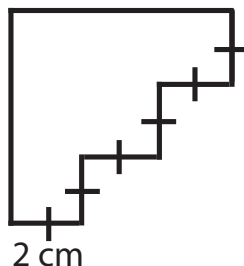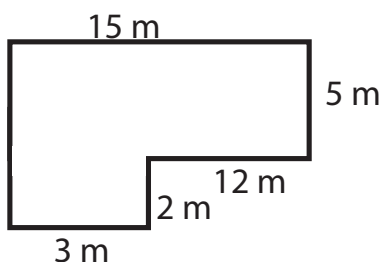
a) ....   b) ....   c) ....

✪ Cubic Metres

1. A box has dimensions of 40 cm x 30 cm x 60 cm.
   a) What is the volume in cm^3?
   b) Convert this to m^3.

   ....

   ....

2. A shipping container is 17 m x 3.1 m x 3.5 m. Calculate its volume in m^3.

   ....

   ....

3. A refrigerator has dimensions of 160 cm x 45 cm x 35 cm. How many cubic metres would it take up?
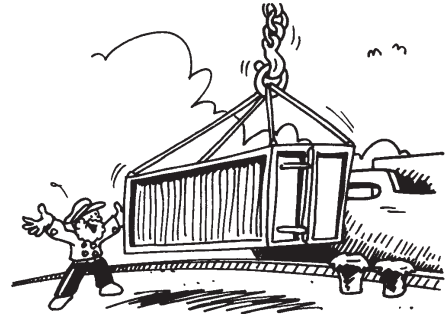
   ....

   ....

4. Fill in the missing numbers:

	Dimensions			Volume	
	Length	**Width**	**Depth**	**cm^3**	**m^3**
a	41 cm	360 cm	240 cm		
b	4.2 m	1.3 m	0.8 m		
c	100 cm	60 cm			0.24
d		80 cm	40 cm	96000	
e	75 cm		3.2 m		4.5
f	2.4 m	1.3 m		84600	

5. An Olympic pool has a length of 50 m, a width of 10 m and a depth of 6 m. What is the volume in m^3?

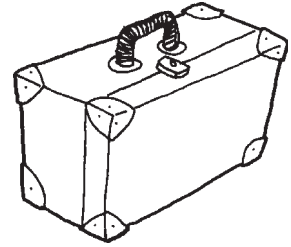6. An ice box has dimensions of 0.9 m x 0.35 m x 0.4 m. What is its volume?

   ....

✱ Capacity

Word Problems

1. What is the capacity of a suitcase that has dimensions of 80 cm x 50 cm x 15 cm?
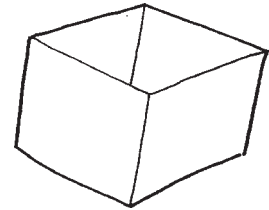
   _____

   _____

   _____

2. A packing box is in the shape of a cube with a side of 0.8 m. What is its capacity?

   _____

   _____

   _____
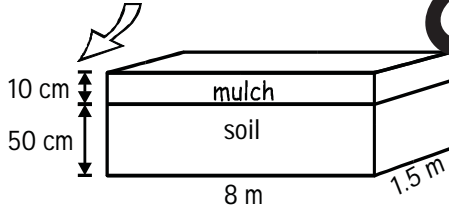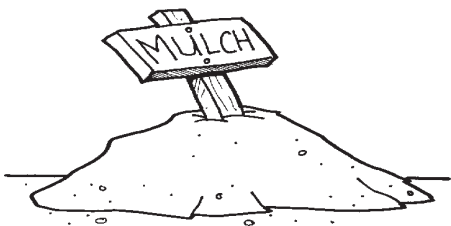
3. Ms Thomas wanted to fill a garden bed with good soil. If the garden bed had the dimensions as shown below and soil cost $20/m³, how much would it cost her?

   Be careful of these units!

   10 cm — mulch
   50 cm — soil
   8 m   1.5 m

   _____

   _____

   _____

   _____

   Ms Thomas then wanted to spread mulch on top of the soil to a depth of 10 cm. What volume of mulch would she need?

   MULCH

   _____

   _____

   _____

4. Which has the larger capacity: a box with a height of 4 cm, length of 13 cm and width of 8 cm, or a cube with sides of 7.5 cm?

   _____

   _____

   _____