

Student Name

Mathematics Stage 4

AREA

Book 4 Choose appropriate units of measurement
for area and convert between units

Version: 260207

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CONTENTS

Overview	2
Converting Units of Area	4
Check Your Understanding	10

OVERVIEW

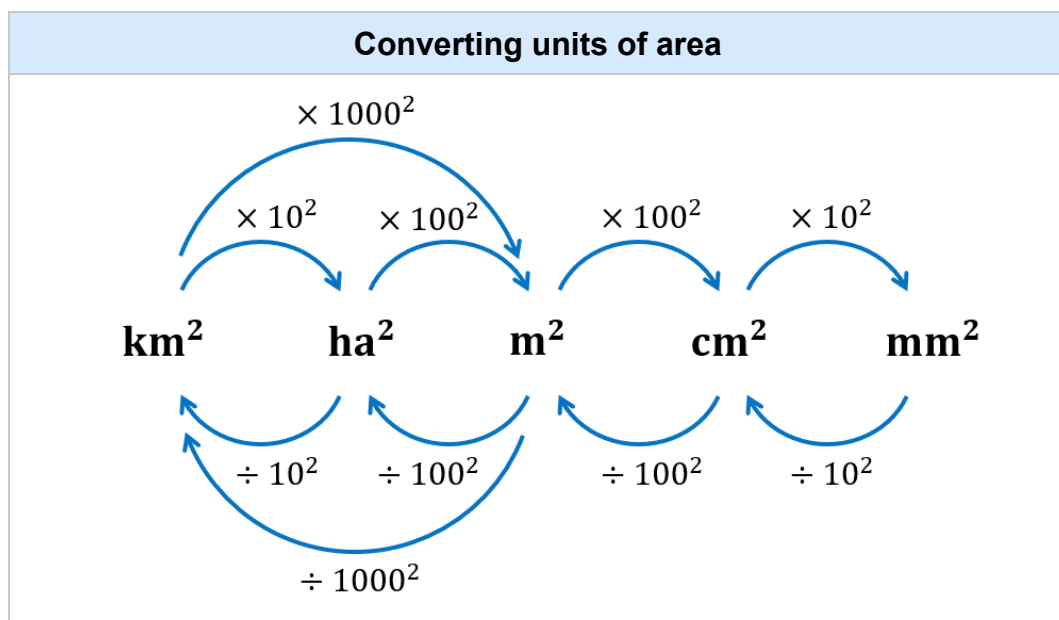
SYLLABUS CONTENT

MA4-ARE-C-01 applies knowledge of area and composite area involving triangles, quadrilaterals and circles to solve problems

Choose appropriate units of measurement for area and convert between units

- Choose appropriate units of measurement for area and convert between units
- Choose an appropriate unit to measure the area of different shapes and surfaces, and justify the choice
- Convert between metric units of area using $1 \text{ cm}^2 = 100 \text{ mm}^2$, $1 \text{ m}^2 = 10\,000 \text{ cm}^2$, $1 \text{ ha} = 10\,000 \text{ m}^2$, and $1 \text{ km}^2 = 1\,000\,000 \text{ m}^2 = 100 \text{ ha}$

SUMMARY



REVIEW OF PRIOR KNOWLEDGE

1 Convert these units of length.

a 5 cm to mm

b 2 m to cm

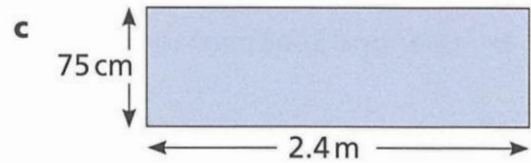
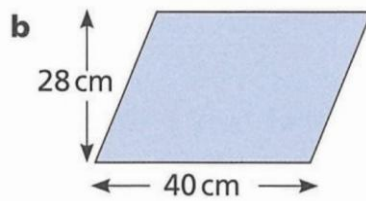
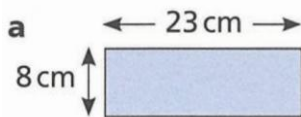
c 3.5 km to m

d 2.1 m to mm

e 400 mm to m

f 500 cm to km

2 Calculate the area of these shapes. Answer in cm^2



3 Calculate the following:

a 60×10^2

b $600 \div 10^2$

c 8.9×100^2

d $720 \div 100^2$

e $67912 \div 1000^2$

f 0.37×100^2

CONVERTING UNITS OF AREA

UNITS OF AREA

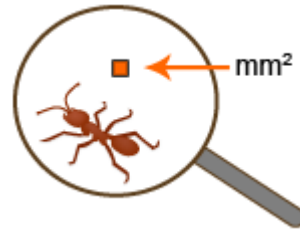
- Area is measured in square units.
- 6 square centimetres (cm^2) means an area covered by 6 squares that have 1 cm on each side.

■

1 square millimetre

1 square mm

1 mm^2



An ant's head is about 1 mm^2



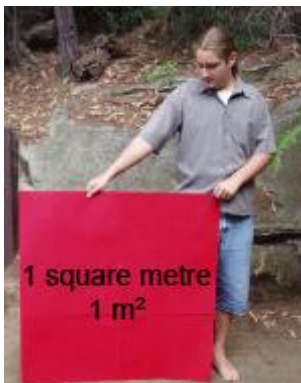
1 square centimetre

1 square cm

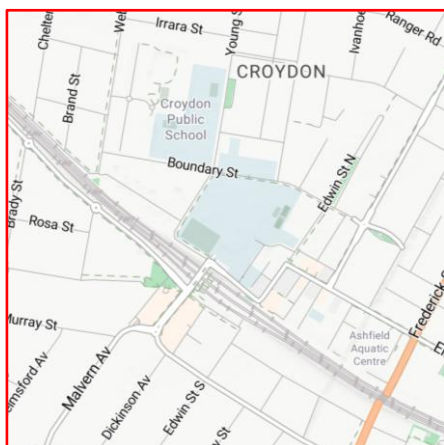
1 cm^2



A fingernail is about 1 cm^2



This tabletop is about 1 m^2



Very large areas are usually measured in square kilometres.

This is an area of a square with 1 kilometre on each side.

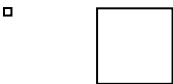
Example Choose the most appropriate unit of area.

Circle which unit of measurement would be the most appropriate to measure these areas.

I would measure my desk in:	mm ²	cm ²	m ²	km ²
I would measure my page in:	mm ²	cm ²	m ²	km ²
I would measure an insect in:	mm ²	cm ²	m ²	km ²
I would measure my phone in:	mm ²	cm ²	m ²	km ²
I would measure a basketball court in:	mm ²	cm ²	m ²	km ²
I would measure the size of Sydney in:	mm ²	cm ²	m ²	km ²
I would measure the tip of a pen in:	mm ²	cm ²	m ²	km ²
I would measure the size of Australia in:	mm ²	cm ²	m ²	km ²
I would measure a soccer field in:	mm ²	cm ²	m ²	km ²
I would measure the room in:	mm ²	cm ²	m ²	km ²

Investigation Units of area.

The square on the left has area 1 mm² and the square on the right has area 1 cm²



Describe what a square mm is

Describe what a square cm is

How many squares of 1 mm² can fit in a square of 1 cm²?

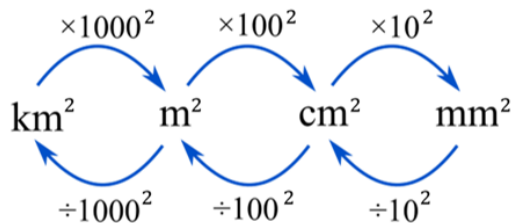


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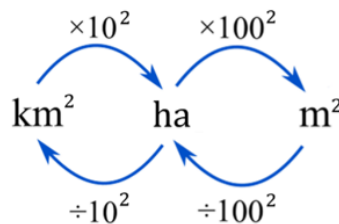
How many mm in a cm?

How many mm² in a cm²?

CONVERTING UNITS OF AREA



- A **hectare** is the area covered by a square where each side is 100 m.
- We use hectares as a measure between square metres and square kilometres.



Example Convert units of area.

20 m² to cm² $\times 100^2$ m² → cm² $20 \text{ m}^2 \times 100^2$ = 200 000 cm²	5 ha to m² $\times 100^2$ ha → m² $5 \text{ ha} \times 100^2$ = 50 000 m²	1500 mm² to cm² $\div 10^2$ mm² → cm² $1500 \text{ mm}^2 \div 10^2$ = 15 cm²
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Convert these units of area.

a 5 cm² to mm² $\times 10^2$ cm² → mm² 500 mm²	b 2 m² to cm² $\times 100^2$ m² → cm² 20000 cm²	c 35 000 m² to ha $\div 100^2$ m² → ha 3.5 ha
d 2.1 m² to mm² 2 100 000 mm²	e 400 cm² to m² 0.04 m²	f 0.53 ha to m² 5300 m²

Key ideas

- Area is measured using units; 5 m² means the area that 5 squares of side length would cover.
- To convert between metres and centimetres, the conversion factor is
- To convert between square metres and square centimetres, the conversion factor is

1 Express these areas in cm^2

a 3 m^2 $30\,000 \text{ cm}^2$	b 0.5 m^2 5000 cm^2	c 16 m^2 $160\,000 \text{ cm}^2$	d $\frac{1}{4} \text{ m}^2$ 2500 cm^2
e 500 mm^2 5 cm^2	f 8000 mm^2 80 cm^2	g 25 mm^2 0.25 cm^2	

2 Express these areas in m^2

a $80\,000 \text{ cm}^2$ 8 m^2	b 5000 cm^2 0.5 m^2	c 300 cm^2 0.03 m^2	d $642\,000 \text{ cm}^2$ 64.2 m^2
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3 Convert these units of area.

a $90\,000 \text{ cm}^2$ to m^2 9 m^2	e 9 m^2 to cm^2 $90\,000 \text{ cm}^2$	i 0.04 m^2 to mm^2 $40\,000 \text{ mm}^2$
b 900 cm^2 to m^2 0.09 m^2	f 9 cm^2 to m^2 0.0009 m^2	j 36 km^2 to m^2 $36\,000\,000 \text{ m}^2$
c $90\,000 \text{ mm}^2$ to m^2 0.09 m^2	g 0.9 m^2 to cm^2 9000 cm^2	k 3.6 km^2 to m^2 $3\,600\,000 \text{ m}^2$
d 90 m^2 to cm^2 $900\,000 \text{ cm}^2$	h 0.04 m^2 to cm^2 400 cm^2	l 0.1 km^2 to m^2 $100\,000 \text{ m}^2$

4 Convert these units of area.

a 4000 cm^2 to m^2 0.4 m^2	b 74300 m^2 to km^2 0.0743 km^2	c 2000 mm^2 to cm^2 20 cm^2
d 310 km^2 to m^2 $310\,000\,000 \text{ m}^2$	e 0.34 ha to m^2 3400 m^2	f 3 m^2 to cm^2 $30\,000 \text{ cm}^2$
g 10920 mm^2 to m^2 0.01092 m^2	h 6 km^2 to ha 600 ha	i 13 cm^2 to mm^2 1300 mm^2
j 15 ha to km^2 0.15 km^2	k 27 ha to m^2 $270\,000 \text{ m}^2$	

5 Consider the triangle to the right.

a Calculate the area of this triangle, giving answer in cm^2 .

$$39 \text{ cm}^2$$

b Convert your answer mm^2 .

$$3900 \text{ mm}^2$$

c Redo the calculation by first converting 13 cm and 6 cm to mm, then calculate the area, giving answer in mm^2 .

$$130 \text{ mm} \times 60 \text{ mm} = 7800 \text{ mm}^2$$

d When doing area calculations, does it matter if you first convert the lengths or convert the area at the end? Which do you prefer?

Students tend to make mistakes converting units of area, so it is recommended you convert units before calculating area.

6 Calculate the area of a rectangle with dimensions 12 cm and 0.2 m. Answer in an appropriate unit.

$$240 \text{ cm}^2$$

7 Julia says there are 100 square centimetres in a square metre. Explain why she is incorrect.

Each side of a square metre is 1 metre, which is 100 cm, so $100 \text{ cm} \times 100 \text{ cm}$ is $10\,000 \text{ cm}^2$

8 A rural property is rectangular in shape with sides 350 m and 500 m.

a Find its area in square metres and in hectares.

$$175\,000 \text{ m}^2 = 17.5 \text{ ha}$$

b The owner wants to plant 8 mangroves per ha, how many trees should be planted?

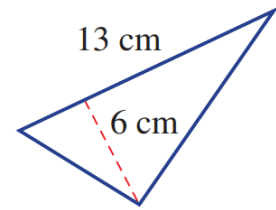
$$140 \text{ trees}$$

9 A postage stamp has an area of 5 cm^2 . How many postage stamps will cover an area of 1 m^2 ?

$$10000 \div 5 = 2000 \text{ stamps}$$

10 An e-reader has area of 400 cm^2 . How many e-readers will cover an area of 1 m^2 ?

$$10000 \div 400 = 25 \text{ ereaders}$$



- 11 Rebecca is tiling her kitchen floor. The floor is a rectangle, measuring 8 m by 6 m.
Each tile is a square measuring 20 cm by 20 cm.
The tiles are sold in boxes of 10 and each box costs \$8.50.
Work out the total cost of the tiles needed for the kitchen floor.

Area of kitchen = 48 m² = 480 000 cm²

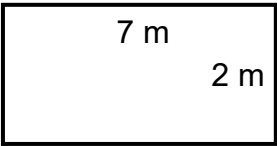
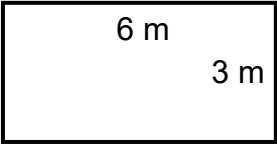
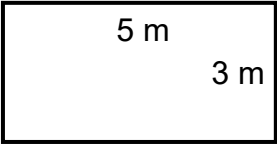
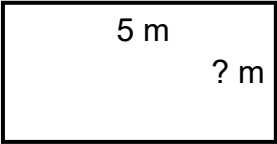
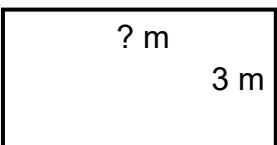
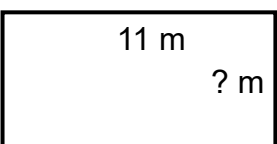
Area of tile = 400 cm²

Number of tiles needed = 480 000 ÷ 400 = 1200

Number of boxes needed = 120

Total cost = 120 × \$8.50 = \$1020

- 12 Fill in the table.

Shape	Area in square m	Area in square cm	Area in square mm
	14	140 000	14 000 000
	18	180 000	18 000 000
	15	150 000	15 000 000
	20	200 000 cm ²	20 000 000
	21	210 000	21 000 000 mm ²
	2.2 m ²	22 000	2 200 000

- 13 Each side of a square is made 10 times as long.
a How many times as large is the new square compared to the old square?

100 times larger

- b Will this be true if the radius of a circle were made 10 times longer? Justify your answer.

Yes, as $A = \pi r^2$ the radius is squared.

CHECK YOUR UNDERSTANDING

Convert units of area

1 What is the area of this square in square centimetres?



- a** 100 cm² **b** 10 000 cm² **c** 0.01 cm² **d** 0.0001 cm²

2 1 m² = mm²

- a** 1000 **b** 10 000 **c** 1 000 000 **d** 100 000 000

3 9 m² = mm²

- a** 9000 **b** 90 000 **c** 9 000 000 **d** 900 000 000

4 9 km² = m²

- a** 2000 **b** 2 000 000 **c** 20 000 **d** 2 000 000 000

5 1 000 000 cm² = m²

- a** 1 **b** 10 **c** 100 **d** 10 000

6 600 cm² = m²

- a** 0.06 **b** 60 000 **c** 6 **d** 0.6

7 0.43 m² = cm²

- a** 0.0043 **b** 43 **c** 430 **d** 4300

8 10 cm² = m²

- a** 100 **b** 1000 **c** 0.001 **d** 0.0001