

Area

The size of a surface or the amount of space of a flat or two-dimensional shape is called its *area*.

Common units of area are: square millimetres (mm^2)
 square centimetres (cm^2)
 square metres (m^2)
 hectares
 square kilometres (km^2)

The unit used would depend on the size of the area.

1 mm^2 is the area equal to a square with a side length of 1 mm.

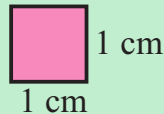
1 cm^2 is the area equal to a square with a side length of 1 cm.

1 m^2 is the area equal to a square with a side length of 1 m.

1 hectare is the area equal to a square with a side length of 100 m.

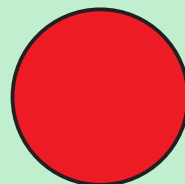
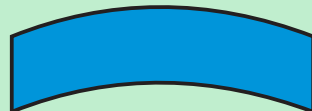
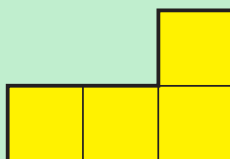
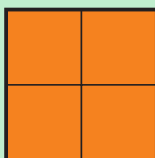
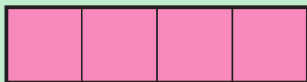
1 km^2 is the area equal to a square with a side length of 1 km.

This square has an area of 1 cm^2 .



But many shapes would have the same area.

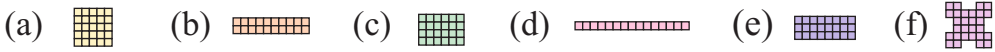
Examples All the shapes below have an area of 4 cm^2 .



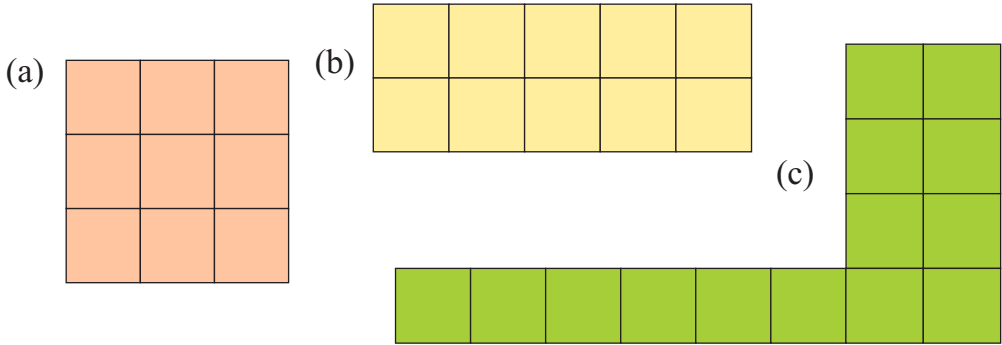
Area

EXERCISE 12A

1. Each of the small squares in the following shapes is 1 mm^2 .
How many mm^2 are in each shape?



2. Each of the squares in the following shapes is 1 cm^2 .
How many cm^2 are in each shape?



3. How many mm^2 are in one cm^2 ?



4. Choose the alternative which is the best estimate of the area of each of the following objects.

(a) The display of your calculator.

A 1 mm^2 **B** 10 mm^2 **C** 10 cm^2 **D** 100 cm^2

(b) A page of this book.

A 4 cm^2 **B** 40 cm^2 **C** 400 cm^2 **D** 4000 cm^2

(c) A squash court.

A 50 m^2 **B** 500 m^2 **C** 5000 m^2 **D** $50\,000 \text{ m}^2$

(d) New South Wales

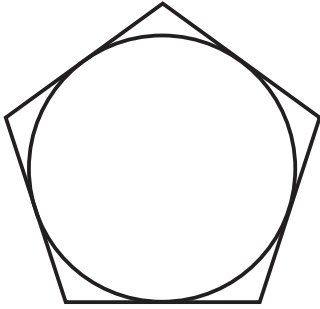
A 8000 km^2 **B** $80\,000 \text{ km}^2$ **C** $800\,000 \text{ km}^2$ **D** $8\,000\,000 \text{ km}^2$

(e) Your foot print.

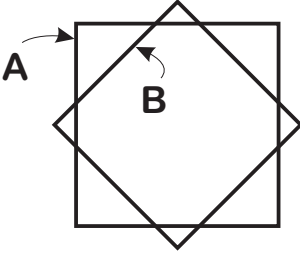
A 16 cm^2 **B** 160 cm^2 **C** 1600 cm^2 **D** $16\,000 \text{ cm}^2$

5. State which one of the following pairs of objects has the larger area.
 (a) A square with side length 10 cm or a circle with diameter 10 cm.

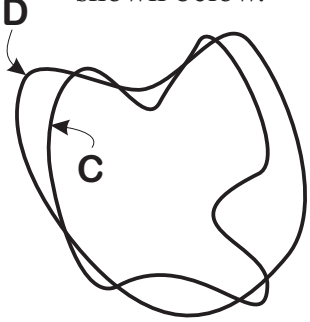
(b) The circle or pentagon shown below.



(c) Square **A** or **B** shown below.

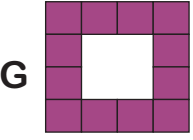
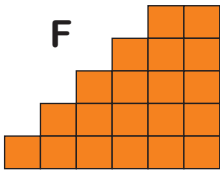
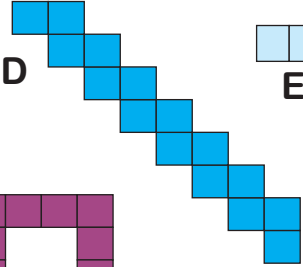
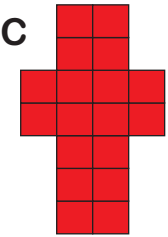
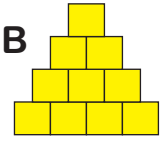
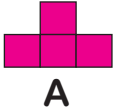


(d) Shape **C** or **D** shown below.



6. If the area of shape **A** is 1 unit, match the shapes below with the following areas.

- (a) 3 units (b) 5 units (c) 4.5 units
- (d) $\frac{1}{2}$ unit (e) 2.5 units (f) $3\frac{3}{4}$ units



7. Four matches can be formed into a square with area of 1 unit.

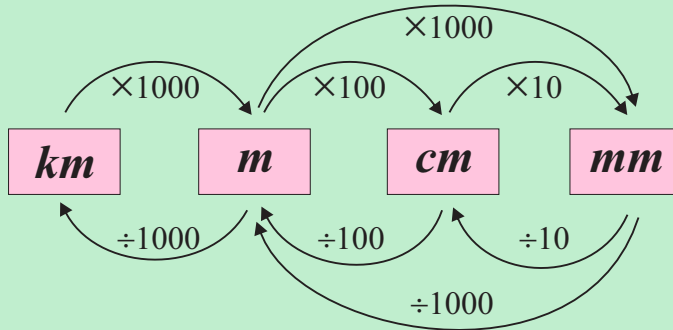


Six matches can be formed into a shape with an area of 2 units.

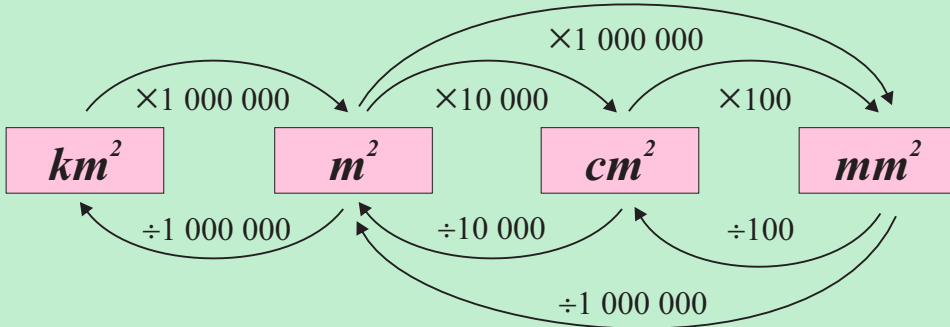
- (a) Use 8 matches to form a shape with an area of 2 units.
- (b) Use 8 matches to form a shape with an area of 3 units.
- (c) Use 8 matches to form a shape with an area of 4 units.
- (d) Use 10 matches to form a shape with an area of 4 units.
- (e) Use 12 matches to form a shape with an area of 5 units (2 ways).
- (f) Use 12 matches to form a shape with an area of 6 units.
- (g) Use 12 matches to form a shape with an area of 9 units.

Conversions

Remember the conversion factors for changing from one unit of *length* to another:



The conversion factors for changing from one unit of *area* to another are the square of these as shown below.



Convert the following areas to the units shown in the brackets.

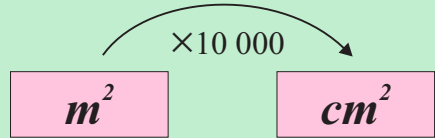
Examples

1. 3 m^2 (cm^2)

To change from m^2 to cm^2 : $\times 10\,000$

$$= 3 \times 10\,000$$

$$= \mathbf{30\,000 \text{ cm}^2}$$

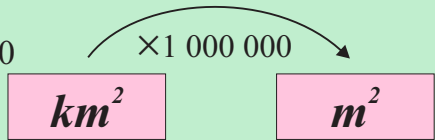


2. 4.935 km^2 (m^2)

To change from km^2 to m^2 : $\times 1\,000\,000$

$$= 4.935 \times 1\,000\,000$$

$$= \mathbf{4\,935\,000 \text{ m}^2}$$

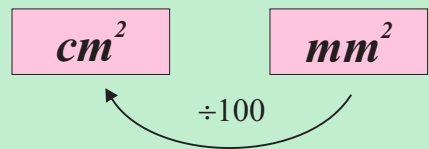


3. 820 mm^2 (cm^2)

To change from mm^2 to cm^2 : $\div 100$

$$= 820 \div 100$$

$$= \mathbf{8.2 \text{ cm}^2}$$

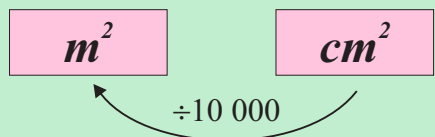


4. 795 cm^2 (m^2)

To change from cm^2 to m^2 : $\div 10\,000$

$$= 795 \div 10\,000$$

$$= \mathbf{0.0795 \text{ m}^2}$$



EXERCISE 12B

1. Change the following areas to the units shown in the brackets.

- | | |
|--|---|
| (a) 5 km^2 (m^2) | (b) 9 m^2 (cm^2) |
| (c) 2 cm^2 (mm^2) | (d) 2.7 km^2 (m^2) |
| (e) 5.391 m^2 (cm^2) | (f) 0.058 cm^2 (mm^2) |
| (g) 0.0092 m^2 (mm^2) | (h) 0.00041 km^2 (m^2) |
| (i) 23.8 cm^2 (mm^2) | (j) 0.00579 m^2 (mm^2) |

2. Change the following areas to the units shown in the brackets.

- | | |
|---|--|
| (a) 6000 mm^2 (cm^2) | (b) $95\,000 \text{ cm}^2$ (m^2) |
| (c) $780\,000 \text{ m}^2$ (km^2) | (d) $107\,800 \text{ cm}^2$ (m^2) |
| (e) $410\,000 \text{ mm}^2$ (cm^2) | (f) $35\,280\,000 \text{ m}^2$ (km^2) |

3. Change the following areas to the units shown in the brackets.

- | | |
|--|---|
| (a) 43 cm^2 (mm^2) | (b) 7500 m^2 (km^2) |
| (c) 8.3 mm^2 (cm^2) | (d) 2.32 cm^2 (m^2) |
| (e) $76\,000 \text{ mm}^2$ (cm^2) | (f) $5\,380\,000 \text{ m}^2$ (km^2) |
| (g) 7.2 cm^2 (mm^2) | (h) 8.3 m^2 (km^2) |

4. (a) The floor area of a room was calculated to be $90\,000 \text{ cm}^2$.

Convert this area to m^2 .

(b) Which of these units is more convenient? Why?

5. (a) The area of a computer screen was calculated to be $60\,000 \text{ mm}^2$.

Convert this area to cm^2 .

(b) Which of these units is more convenient? Why?

6. Choose which unit of area would be most convenient to measure the following areas.

A km^2 **B** m^2 **C** cm^2 **D** mm^2

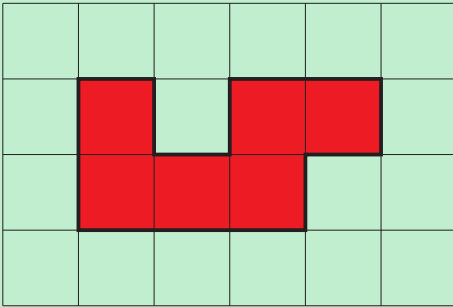
- The area of a football ground.
- The area of a paddock on a farm.
- The area of Kakadu National Park.
- The area of a piece of paper.
- The area of a finger nail.
- The floor area of a house.

Using a Grid

Use the 1 cm square grid to find the area of the shapes below.

Examples

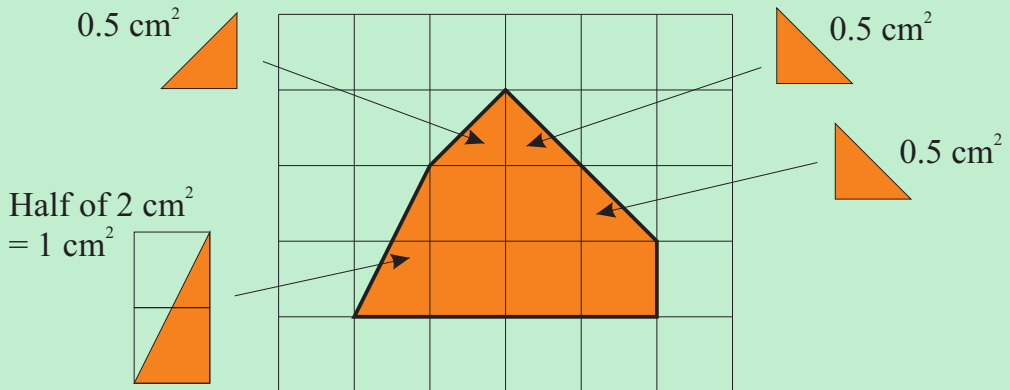
1.



To find the area add all the 1 cm^2 squares in the shape.

$$\text{Area} = 6 \text{ cm}^2$$

2. In this example there are several parts of squares and 5 whole 1 cm^2 squares to be added to find the total area.

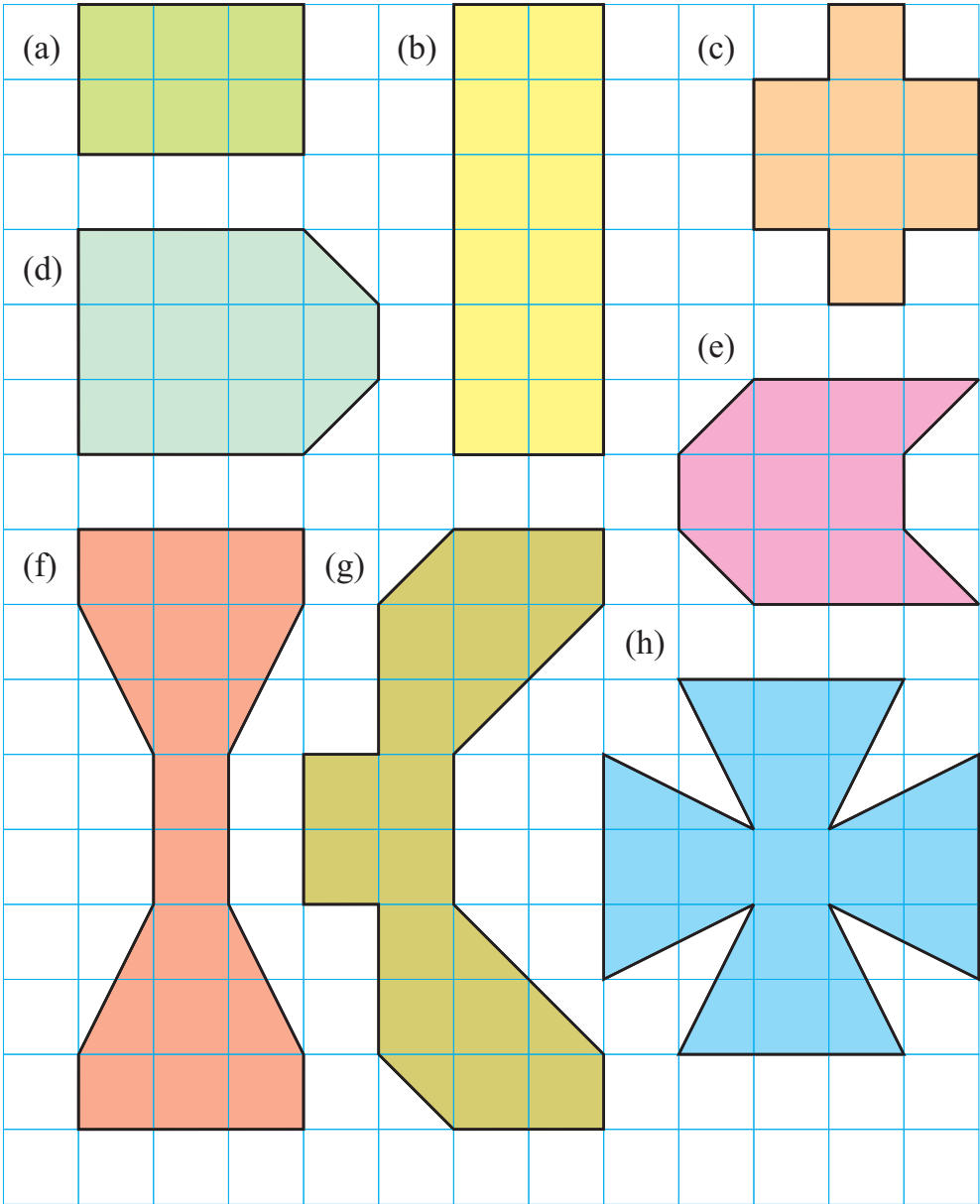


$$\text{Area} = 5 \text{ squares} + 0.5 + 0.5 + 0.5 + 1$$

$$\text{Area} = 7.5 \text{ cm}^2$$

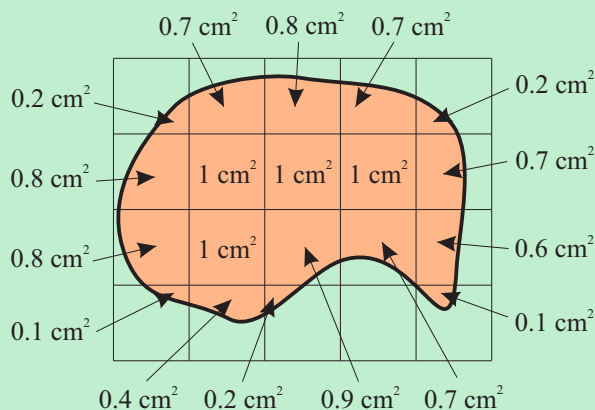
EXERCISE 12C

1. Use the 1 cm grid to find the area of the shapes below.



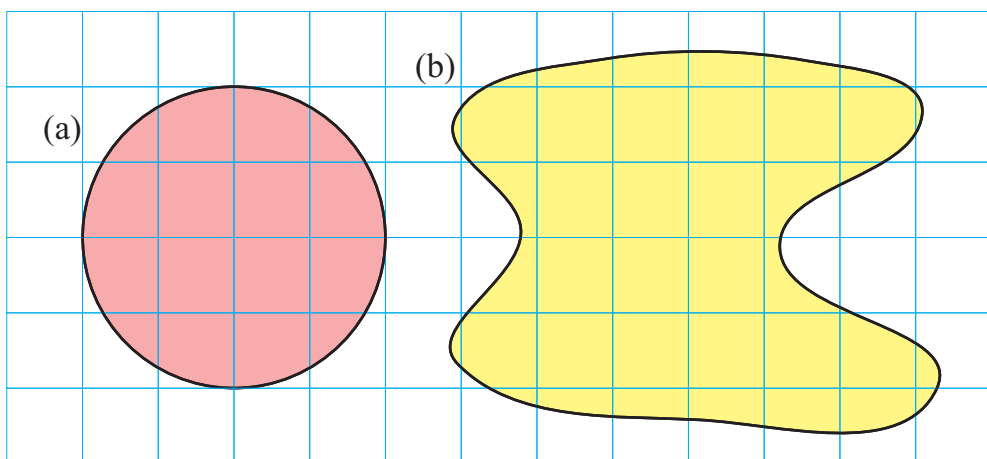
Example

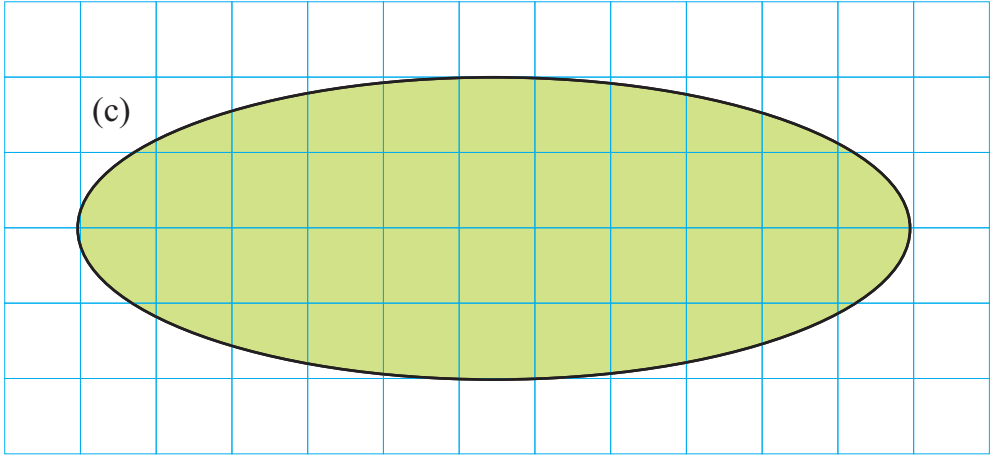
It is only possible to find an approximate area of a shape with curves when using a grid. Estimate the area of the shape in each square then add all these to find the approximate total area.



$$\begin{aligned} \text{Area} &= 0.1 + 0.8 + 0.8 + 0.2 + 0.7 + 0.8 + 0.7 + 0.2 + 0.7 \\ &\quad + 0.6 + 0.1 + 0.7 + 0.9 + 0.2 + 0.4 + 1 + 1 + 1 + 1 \\ \text{Area} &= 11.9 \text{ cm}^2 \end{aligned}$$

2. Use the 1 cm grid to find the approximate area of the shapes below.



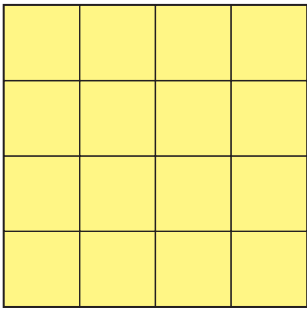


Squares and Rectangles

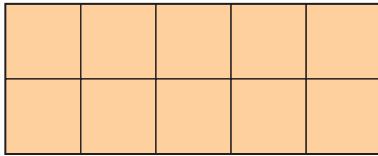
EXERCISE 12D

1. Find the area of each of the following shapes if each small square is 1 cm^2 .

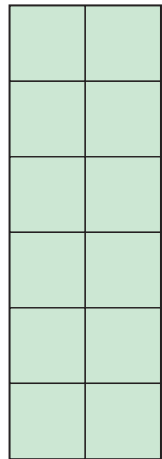
(a)



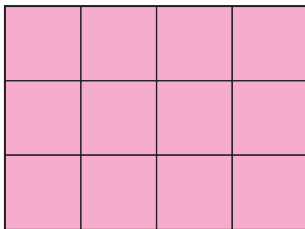
(b)



(c)



(d)



2. Use the dimensions shown to find the area of each of the following rectangles.

Example

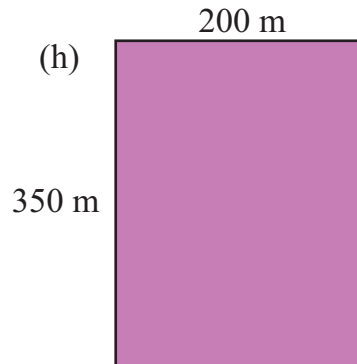
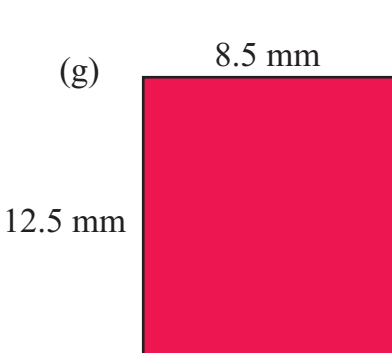
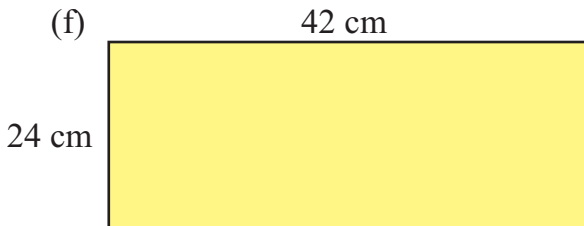
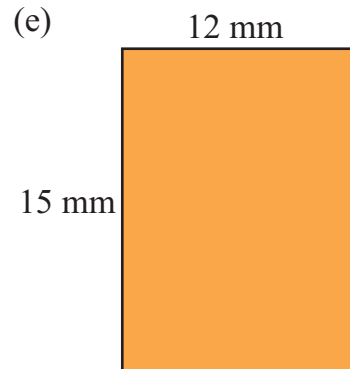
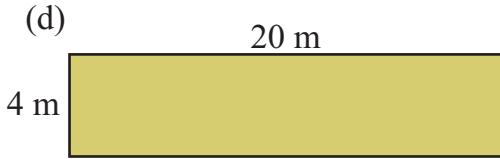
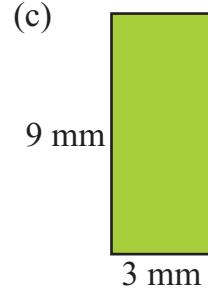
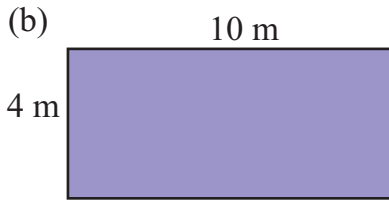
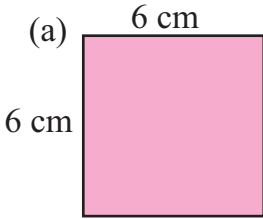
Area of a rectangle = length \times width



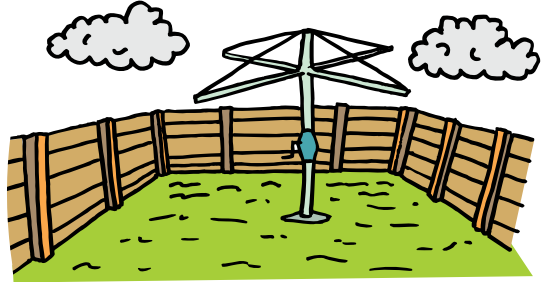
6 m

8 m

$$\begin{aligned} \text{Area} &= 8 \times 6 \\ &= 48 \text{ m}^2 \end{aligned}$$



3. (a) Find the area of a square with 9 metre sides.
 (b) Find the area of a $9\text{ cm} \times 12\text{ cm}$ rectangle.
4. Lin wants to plant lawn in her yard. The dimensions of her yard are $30\text{ metres} \times 40\text{ metres}$.
- (a) What is the area of Lin's yard?
 (b) The amount of lawn seed required is 1 kg for every 100 m^2 .
 How many kilograms of lawn seed will Lin need?
 (c) Lin's lawn seed grew well.
 She now has to cut it. Lin's lawn mower has a width of 40 cm .
 How far will Lin walk if she mows all the lawn in her yard?

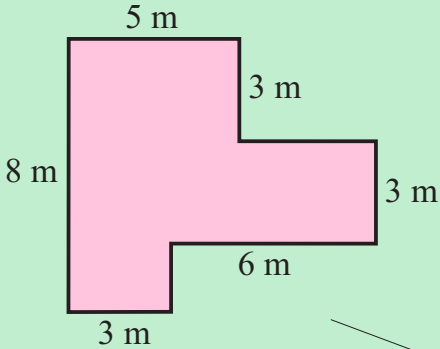


5. The perimeter of a paddock is 300 metres .
 The length of the paddock is 30 metres longer than the width.
 What is the area of the paddock?
6. (a) List the dimensions (whole numbers only) of all the rectangles that can be formed having perimeters of 16 metres .
 (b) Find the area of each of these rectangles.
 (c) What are the dimensions of the rectangle with the largest area?
 (d) What is the name given to this type of rectangle?
 (e) Use this information to find the area of the largest rectangle that could be formed having a perimeter of 40 metres .
7. A small area of bush land is in the shape of a rectangle that is 300 metres long and 200 metres wide.
 A community group wants to increase the size of the bush land to encourage the native animal and bird life. Each year, for three years, they plant trees and increase the length and width of the bush land by 50 metres .
- (a) What is the area of the bush land before the tree planting began?
 (b) What is the area of the bush land at the end of the first year of tree planting?
 (c) What is the increase in the area of the bush land in the first year?
 (d) By how much did the area of the bush land increase in the three years of tree planting?

Composite Shapes

Find the area of the shaded region in each of the following shapes.

Example 1



To find the area of this shape:

Step 1 - Find all the unknown lengths.

Step 2 - Divide the shape into squares and/or rectangles.

Step 3 - Find the area of all these and add them to find the total area.

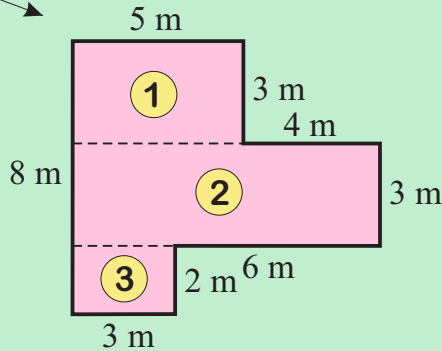
$$\text{Area 1} = 5 \times 3 = 15 \text{ m}^2$$

$$\text{Area 2} = 9 \times 3 = 27 \text{ m}^2$$

$$\text{Area 3} = 3 \times 2 = 6 \text{ m}^2$$

$$\text{Total area} = 15 + 27 + 6$$

$$\text{Total area} = 48 \text{ m}^2$$



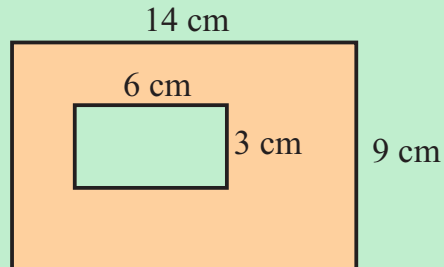
Example 2

The area of the shaded region is equal to the area of the larger rectangle minus the area of the smaller rectangle.

$$\text{Area} = (14 \times 9) - (6 \times 3)$$

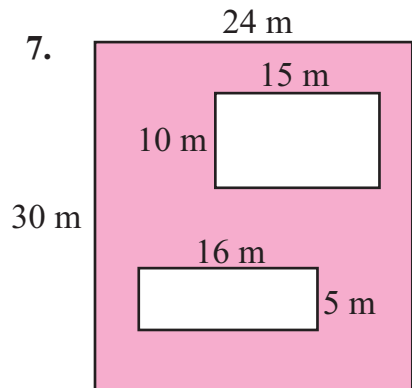
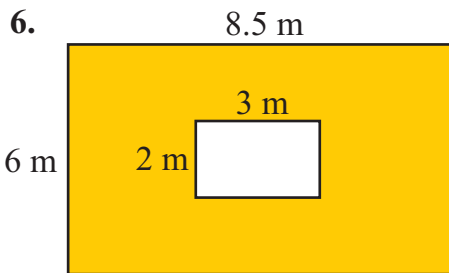
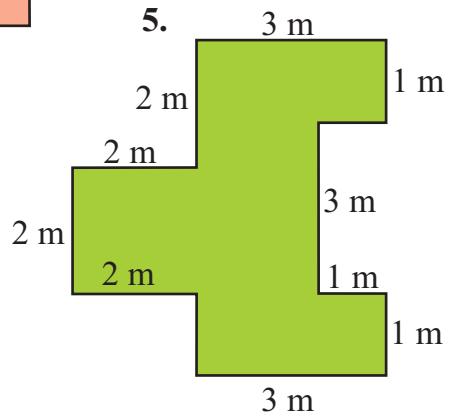
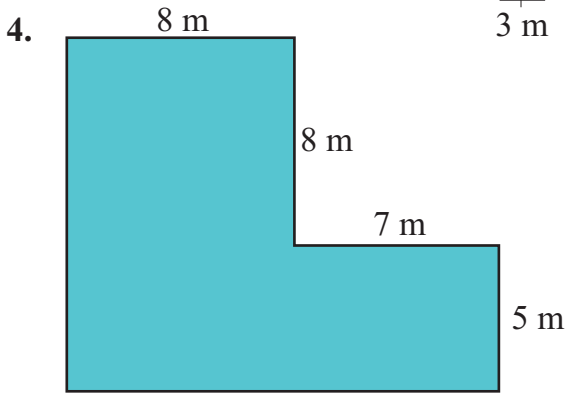
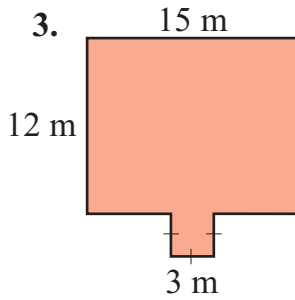
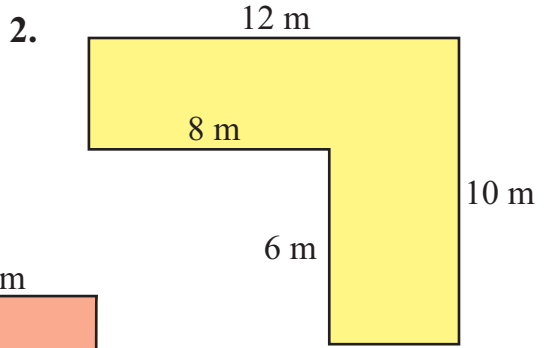
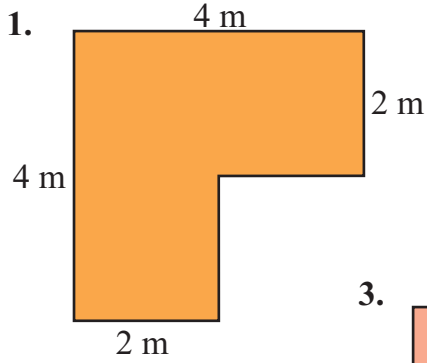
$$= 126 - 18$$

$$\text{Area} = 108 \text{ cm}^2$$



EXERCISE 12E

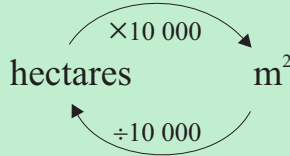
Find the area of each of the shaded regions below.



Hectares

EXERCISE 12F

$$1 \text{ hectare} = 10\,000 \text{ m}^2$$

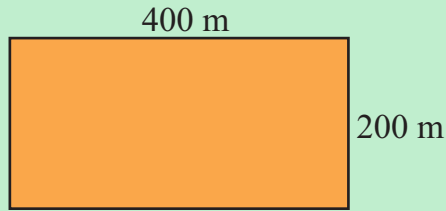


Examples

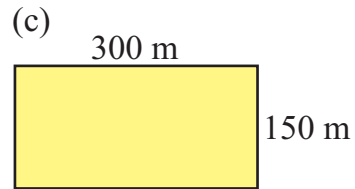
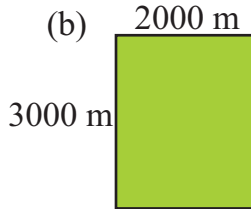
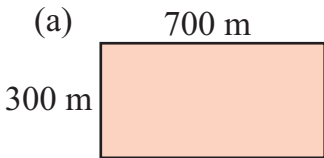
1. Change $400\,000 \text{ m}^2$ to hectares. $400\,000 \div 10\,000 = \mathbf{40 \text{ hectares}}$
2. How many m^2 are in 0.5 hectares? $0.5 \times 10\,000 = \mathbf{5000 \text{ m}^2}$

3. Find the area, in hectares, of the shape shown.

$$\begin{aligned} \text{Area} &= 400 \times 200 \\ &= 80\,000 \text{ m}^2 \\ &= \mathbf{8 \text{ hectares}} \end{aligned}$$



1. Find the area, in hectares, of the following shapes.



2. Change the following areas to m^2 .

(a) 6 hectares (b) 15 hectares (c) 5.75 hectares (d) 0.3 hectares

3. Dulte owned a block of land that was 4 hectares. Find the length of this block of land if it is 100 metres wide.

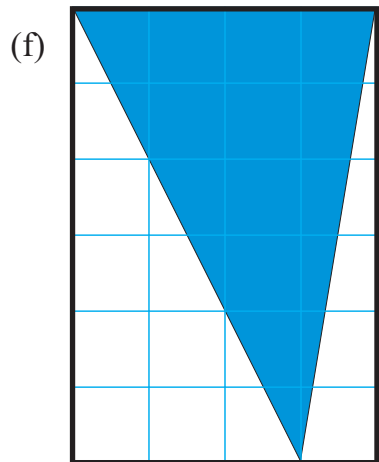
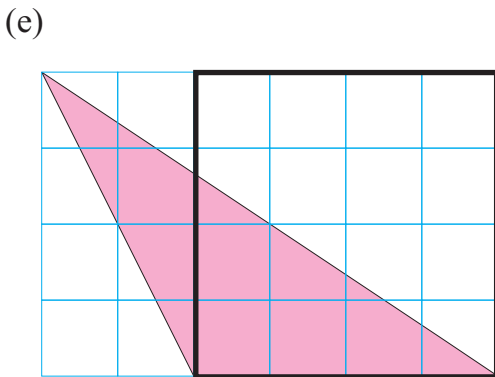
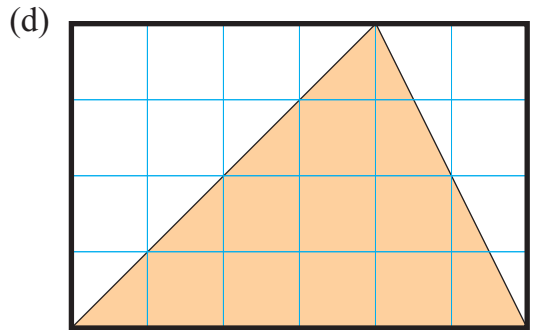
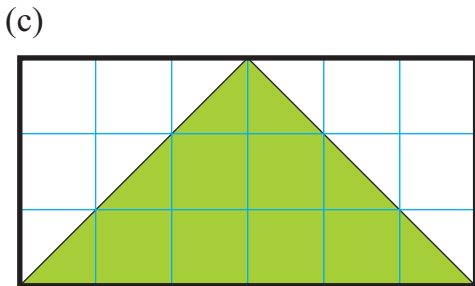
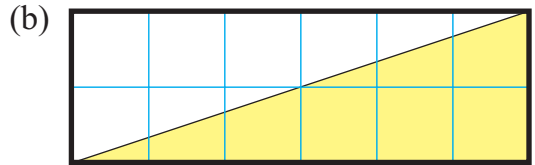
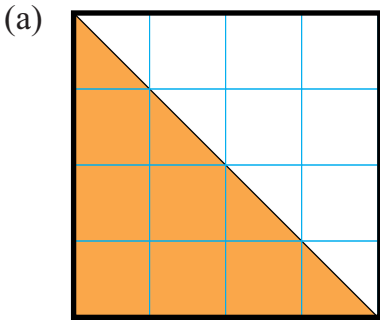
4. Cameron worked on a cattle farm in Queensland that was 5 km long and 4 km wide. How many hectares is this farm?

5. A *square* property is 1764 hectares. Find the side length of the property.

Triangles

EXERCISE 12G

1. Use the 1 cm square grids in each of the following diagrams to:
- find the area of the rectangle indicated with the dark line.
 - find the area of the shaded triangle.

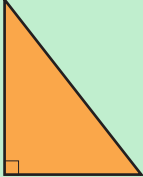


2. Is there any relationship between the area of the rectangle and the area of the triangle in each diagram? If there is, state this relationship.

3. Find the area of each of the following triangles.

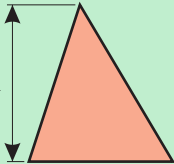
Examples

$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$



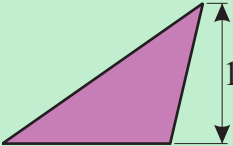
6 m
4 m

Area = $\frac{1}{2} \times 4 \times 6$
= **12 m²**



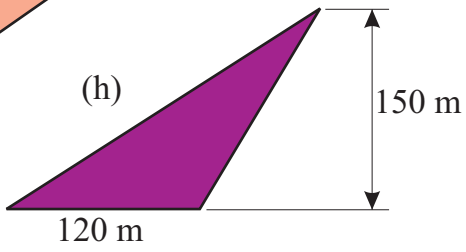
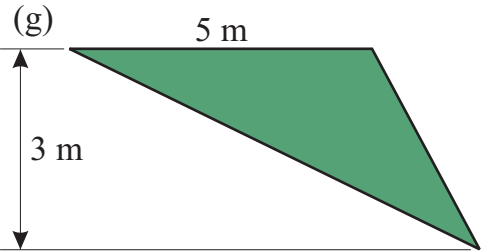
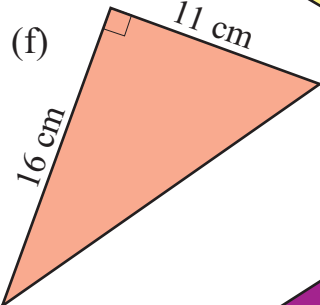
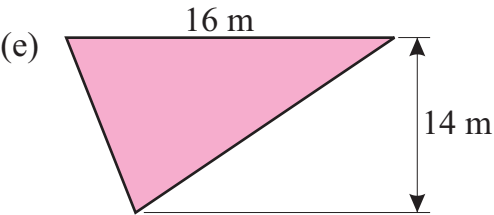
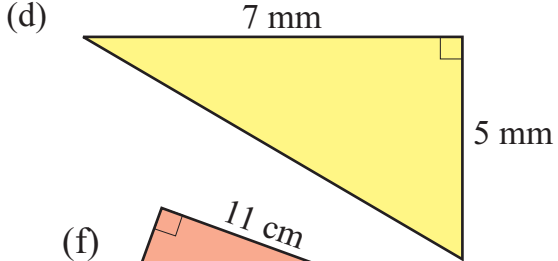
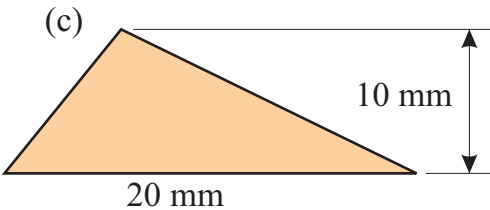
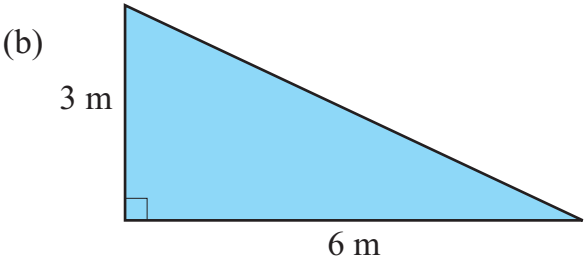
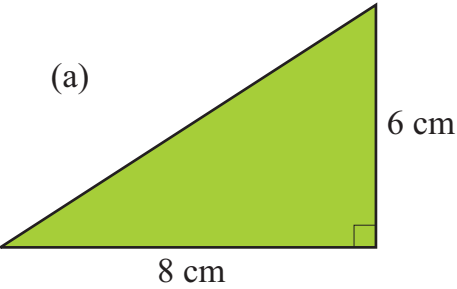
12 cm
10 cm

Area = $\frac{1}{2} \times 10 \times 12$
= **60 cm²**



15 mm
20 mm

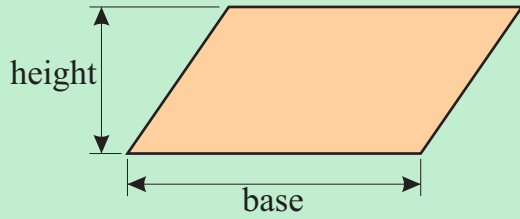
Area = $\frac{1}{2} \times 20 \times 15$
= **150 mm²**



Parallelograms

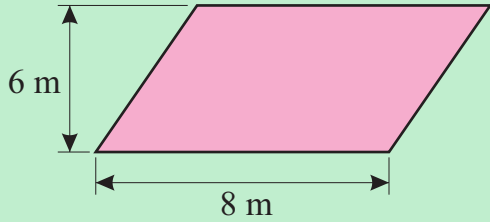
EXERCISE 12H

Area of a parallelogram = base \times height



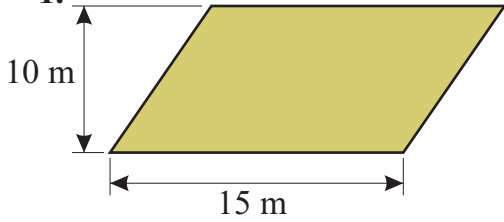
Example

$$\begin{aligned} \text{Area} &= 8 \times 6 \\ &= 48 \text{ m}^2 \end{aligned}$$

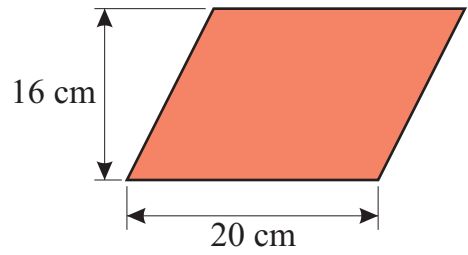


Find the area of each of the following parallelograms.

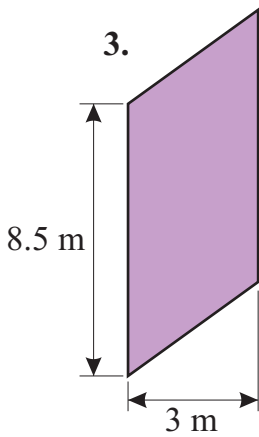
1.



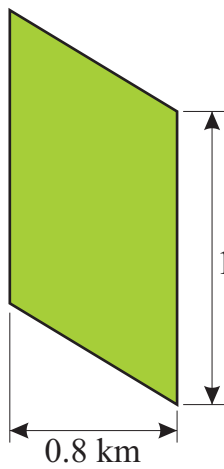
2.



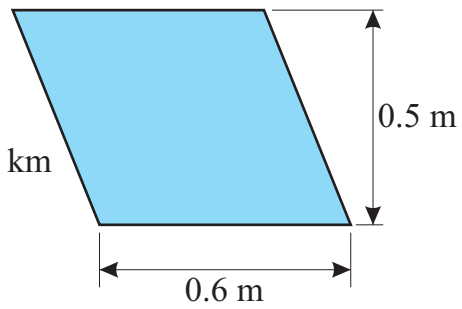
3.



4.



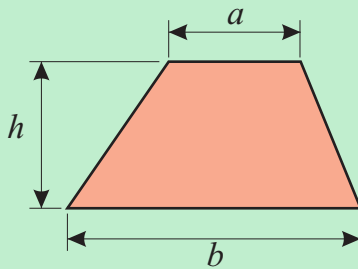
5.



Trapeziums

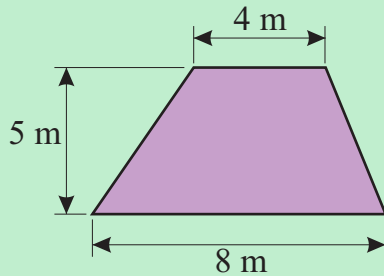
EXERCISE 12I

$$\text{Area of a trapezium} = \frac{1}{2} (a + b) \times h$$

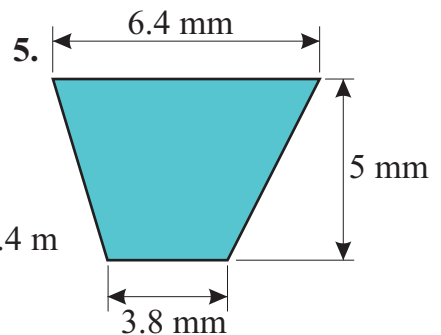
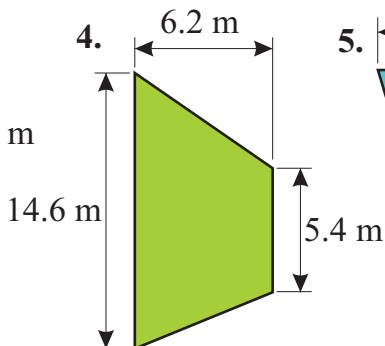
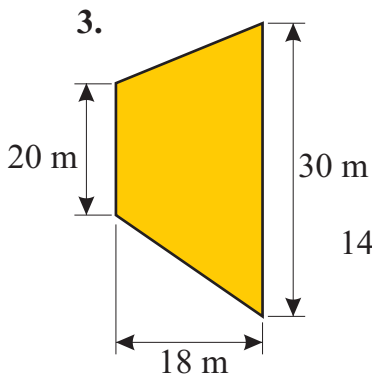
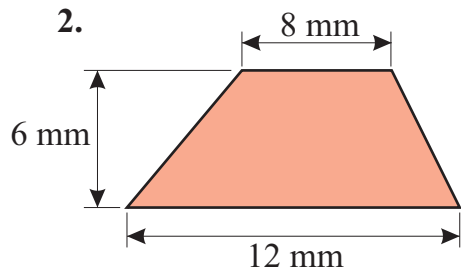
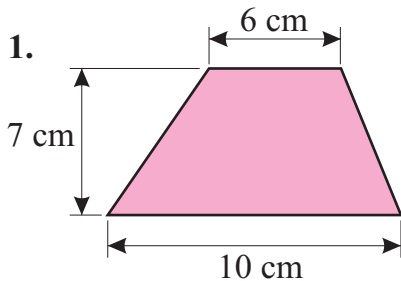


Example

$$\begin{aligned} \text{Area} &= \frac{1}{2} (4 + 8) \times 5 \\ &= \frac{1}{2} \times 12 \times 5 \\ &= 6 \times 5 \\ &= 30 \text{ m}^2 \end{aligned}$$



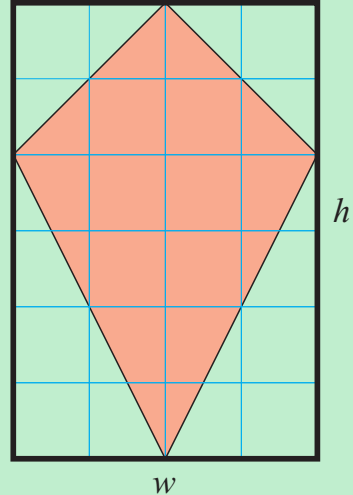
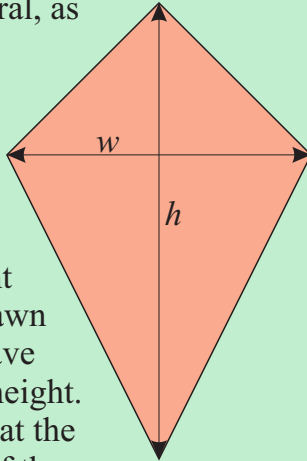
Find the area of each of the following trapeziums.



Kites

EXERCISE 12J

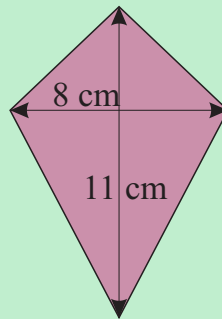
A kite is a quadrilateral, as shown here, that has diagonals that are perpendicular and is symmetrical about one diagonal. If the kite has a width of w and height of h the rectangle drawn about the kite will have the same width and height. It can also be seen that the area of the kite is half the area of the rectangle.



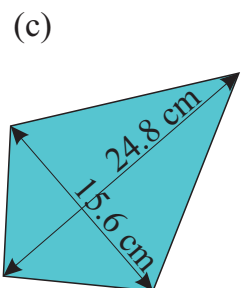
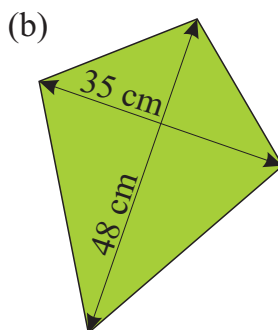
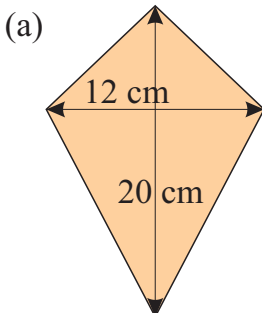
$$\text{Area of a kite} = \frac{1}{2} (w \times h)$$

Example

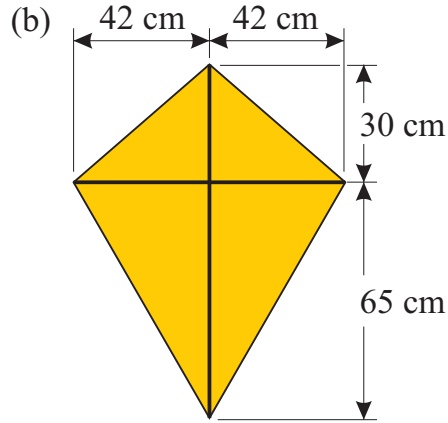
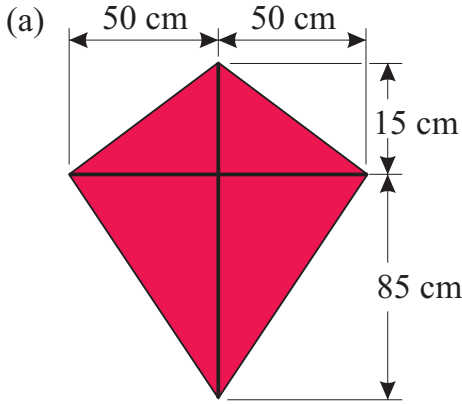
$$\begin{aligned} \text{Area} &= \frac{1}{2} (8 \times 11) \\ &= \frac{1}{2} \text{ of } 88 \\ &= \mathbf{44 \text{ cm}^2} \end{aligned}$$



1. Find the area of each of the following kites.

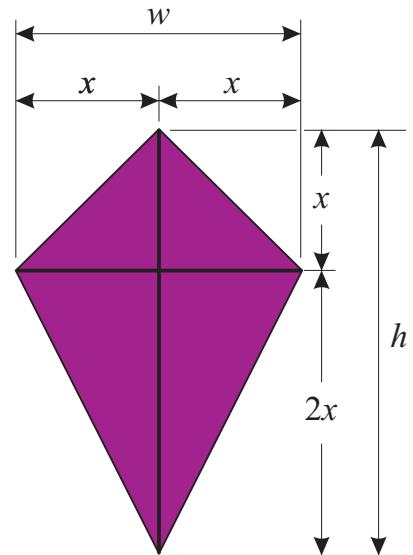


2. Shaun wants to make a kite to fly. He found the dimensions of two different kites and these are shown here. What is the area of each of these kites?

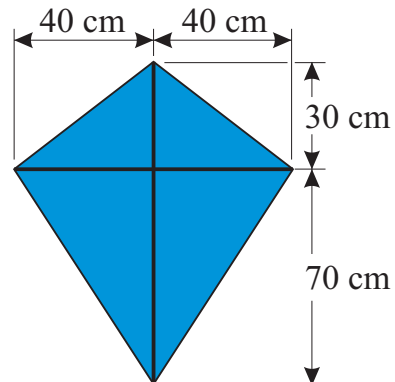


3. Jorga found the following plans to make a kite.

- (a) If Jorga wanted to make a kite that had a width (w) of 60 cm, find:
- the height (h) of the kite.
 - the area of the kite.
- (b) If Jorga wanted to make a kite that had a height (h) of 1.2 metres, find:
- the width (w) of the kite.
 - the area of the kite.



4. Marlee wanted to make the kite shown here. He wanted to make it without wasting material. Describe how he could make this kite without wasting any material by cutting pieces out from one piece of material. Show clearly the size of the piece of material.

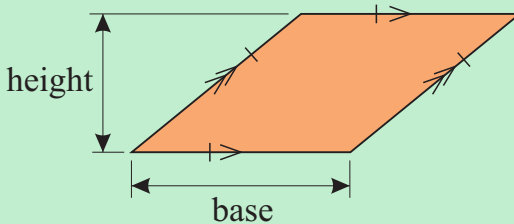


Rhombuses

A rhombus is a parallelogram that has all four sides of equal length. There are two ways to calculate the area of a rhombus depending on which dimensions are given.

Method 1

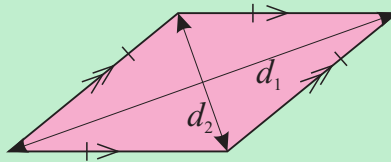
If the base length and height are given, the area can be calculated the same way as for a parallelogram.



$$\text{Area of a rhombus} = \text{base} \times \text{height}$$

Method 2

If the length of the diagonals are given, the area can be calculated the same way as for a kite. This is because the diagonals of a rhombus are perpendicular as for a kite.



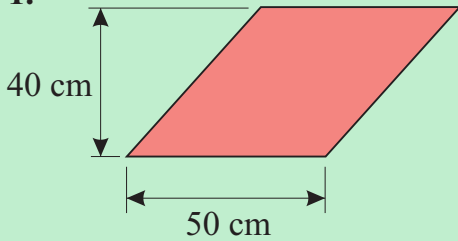
$$\text{Area of a rhombus} = \frac{1}{2} (d_1 \times d_2)$$

EXERCISE 12K

Examples

Find the area of each of the following rhombuses.

1.

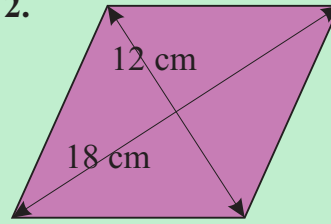


In this example the base and height are known so the following formula for area is used:

$$\text{Area of a rhombus} = \text{base} \times \text{height}$$

$$\begin{aligned} \text{Area} &= 50 \times 40 \\ &= \mathbf{2000 \text{ cm}^2} \end{aligned}$$

2.



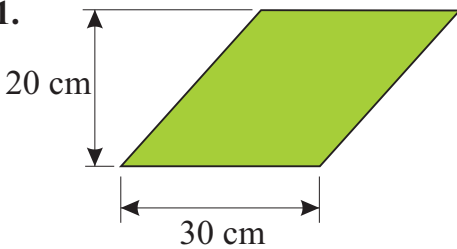
In this example the length of the two diagonals are known so the following formula for area is used:

$$\text{Area of a rhombus} = \frac{1}{2} (d_1 \times d_2)$$

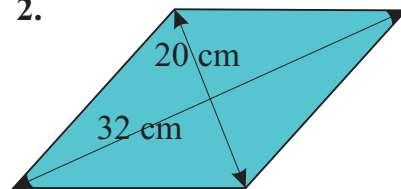
$$\begin{aligned} \text{Area} &= \frac{1}{2} (18 \times 12) \\ &= \frac{1}{2} \text{ of } 216 \\ &= \mathbf{108 \text{ cm}^2} \end{aligned}$$

Find the area of each of the following rhombuses.

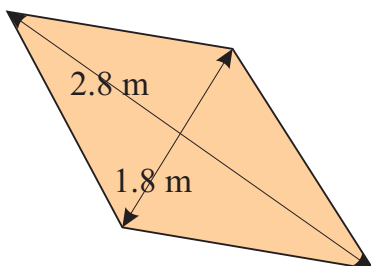
1.



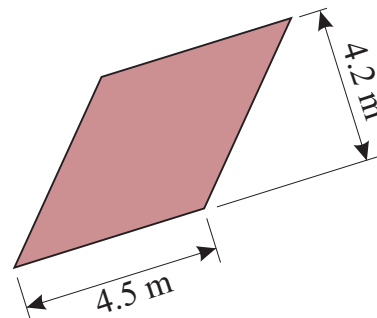
2.



3.



4.



Circles

ACTIVITY

Step 1 Using a compass, or otherwise, draw a circle of known radius on a 1 cm grid.

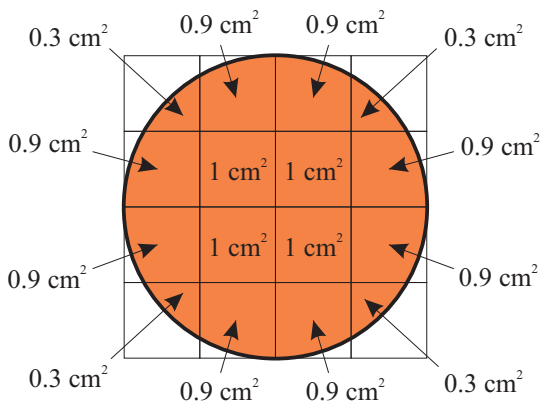
In the example shown here the circle has a radius of 2 cm.

Step 2 Find an approximate area of the circle by adding all the 1 cm² squares and parts of squares.

Note: estimate the area of the sections that are not complete squares.

In this example the approximate area of the circle is:

$$\begin{aligned} \text{approximate area} &= 0.3 + 0.9 + 0.9 + 0.3 + 0.9 + 0.9 + 0.3 + \\ &0.9 + 0.9 + 0.3 + 0.9 + 0.9 + 1 + 1 + 1 + 1 \\ &= 12.4 \text{ cm}^2 \end{aligned}$$



Step 3 Copy and complete this table for different radii. The example of $R = 2$ cm is shown.

R	R^2	A	$\frac{A}{R^2}$
2	4	12.4	3.1

Step 5 What do you notice about the value of $\left(\frac{A}{R^2}\right)$?

Step 6 What should be the value of $\left(\frac{A}{R^2}\right)$ correct to five decimal places?

Step 7 What is the symbol given to this?

Step 8 Complete these equations using this symbol:

$$\frac{A}{R^2} = \square$$

$$A = \square \times R^2$$

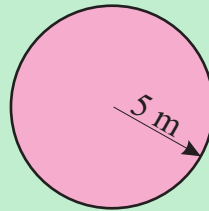
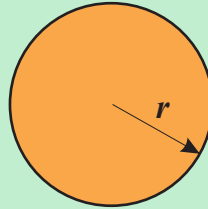
EXERCISE 12L

*Area of a circle = $\pi \times r^2$
(where r = the radius)*

$$A = \pi r^2$$

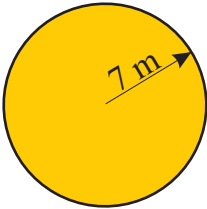
Example

$$\begin{aligned} \text{Area} &= \pi r^2 \\ &= \pi \times 5^2 \\ &= \pi \times 25 \\ &= \mathbf{78.5 \text{ m}^2} \text{ (1 dec. place)} \end{aligned}$$

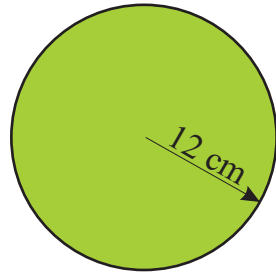


Find the area of each of the following circles.
Give answers to one decimal place.

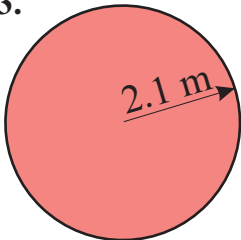
1.



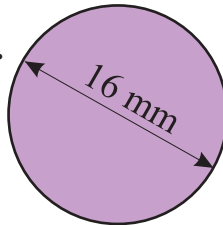
2.



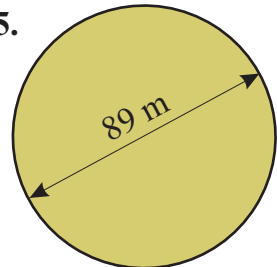
3.



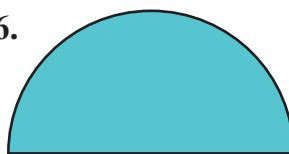
4.



5.



6.



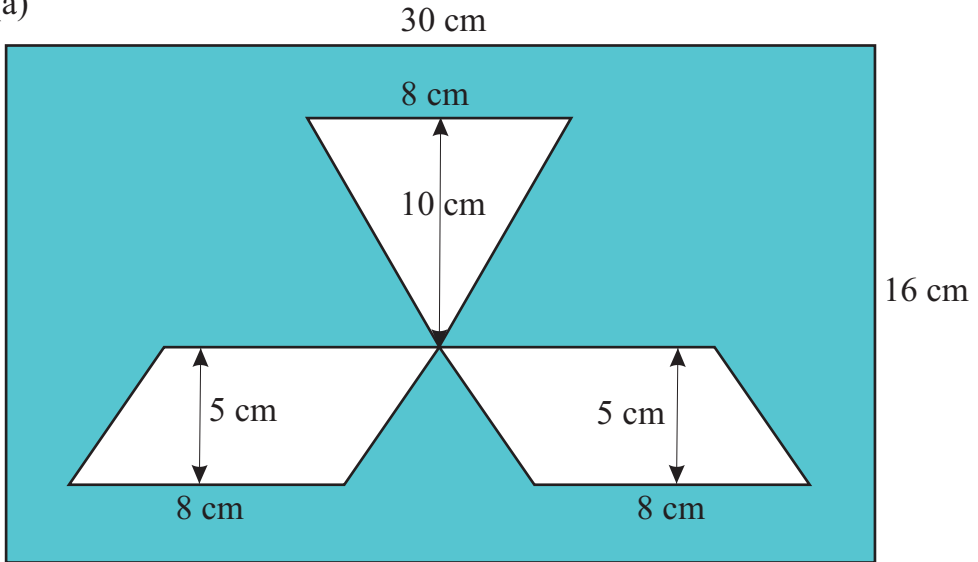
20 cm

Problems on Area

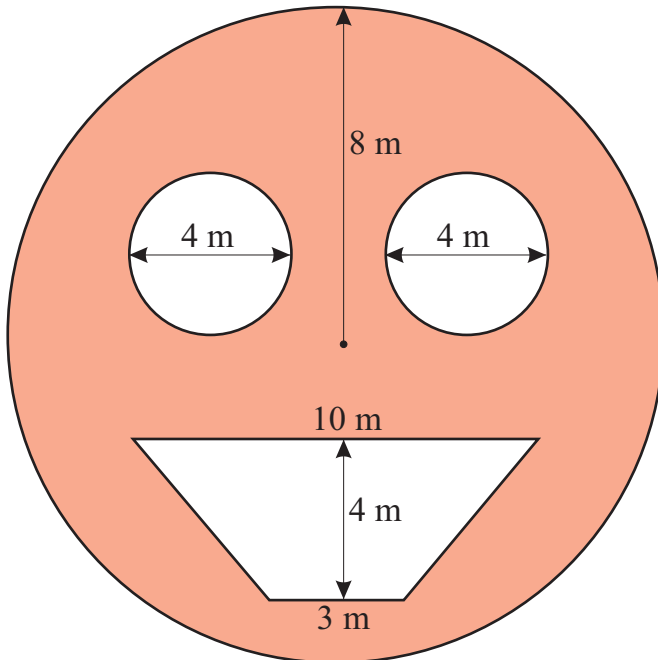
EXERCISE 12M

1. Find the area of the shaded regions below.

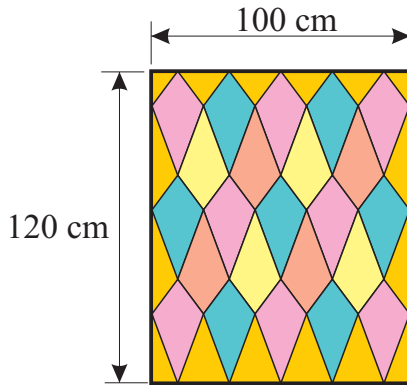
(a)



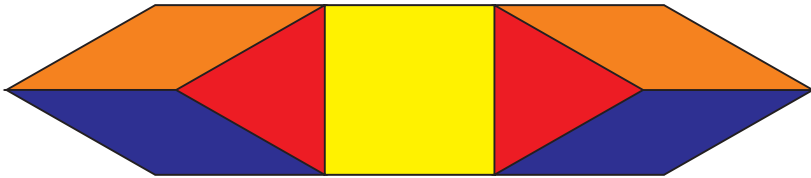
(b)



2. The pattern shown here is made with kites and triangles. What is the area of one of the kites?



3. A rhombus has an area of 3200 cm^2 . The height of the rhombus is half the base length. What is the height of the rhombus?
4. A rhombus has an area of 1200 cm^2 . One diagonal is 20 cm longer than the other. Find the lengths of the diagonals.
5. The symmetric drawing below is made of a square, two triangles and four rhombuses. The side length of each rhombus is the same as the side length of the square. The area of the square is 1600 cm^2 .
- (a) What is the name given to the type of triangles?
- (b) What is the area of each of the rhombuses?



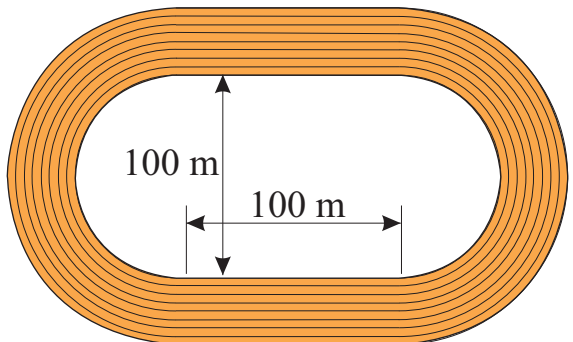
6. Saffy used mosaic tiles to decorate items of furniture. The mosaic tiles she used were *square* with side length of 20 mm. How many of these tiles would she need to decorate the following items?
- (a) A drink coaster that was 100 mm square.
- (b) A rectangular board that was 20 cm long and 10 cm wide.
- (c) A rectangular coffee table that was 1.5 m long and 50 cm wide.
- (d) A square piece of artwork that had an area of 1600 cm^2 .
- (e) A circular table that had a diameter of 80 cm. (Assume she can neatly break the tiles so there is no wasted tiles)
- (f) A wall in her bedroom that had an area of 6.5 m^2 .



7. A piece of wire is in the shape of a circle with radius 10 cm. What length of wire would be needed to form a square that has the same area as the circle? Give answer to one decimal place.
8. A farmer is harvesting all the wheat from his farm. The farm is 64 hectares and is in the shape of a square. He is using a harvester that is 20 metres across and can travel at an average speed of 100 metres per minute.
- What are the dimensions of the farm?
 - How long would it take the harvester to travel the length of the farm?
 - How many times will the farmer need to drive the harvester the length of the farm to harvest all the wheat?
 - How long will it take to harvest all the wheat?
9. Cheryl is a photographer. She has a photo that is $16\text{ cm} \times 8\text{ cm}$ that she wants to enlarge to be twice as long and twice as wide.
- What is area of the original photo?
 - What is the difference between the area of the enlarged photo and the area of the original photo?
 - How many copies of the original photo would have the same area as the enlarged photo?

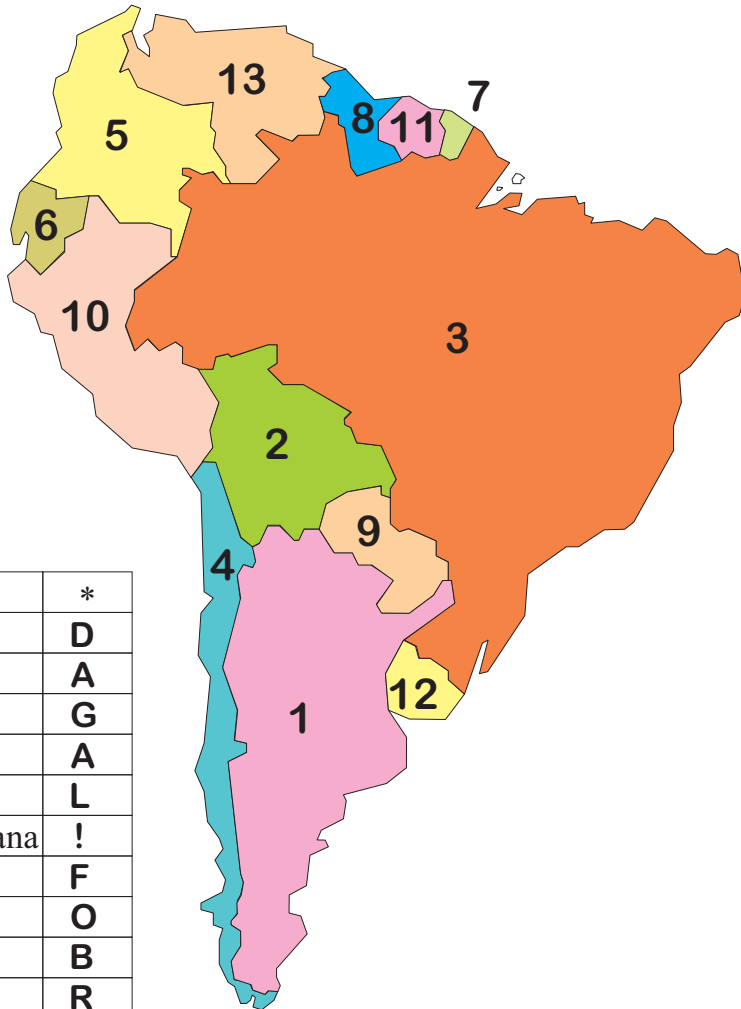


10. Rodney was given the task of painting all the lanes around an athletics field. The dimensions of the field are shown here and there are 8 lanes that are 1 metre wide.



- What is the area to be painted?
Give answer to the nearest m^2 .
- If each litre of paint covers 10 m^2 , how many litres of paint will Rodney need?

11. A map of South America is shown below. There are 13 countries in South America and these are all coloured and listed alphabetically.



1. Argentina	*
2. Bolivia	D
3. Brazil	A
4. Chile	G
5. Colombia	A
6. Ecuador	L
7. French Guiana	!
8. Guyana	F
9. Paraguay	O
10. Peru	B
11. Suriname	R
12. Uruguay	E
13. Venezuela	*

By comparing the sizes of the countries, arrange them in order from the largest to the smallest.

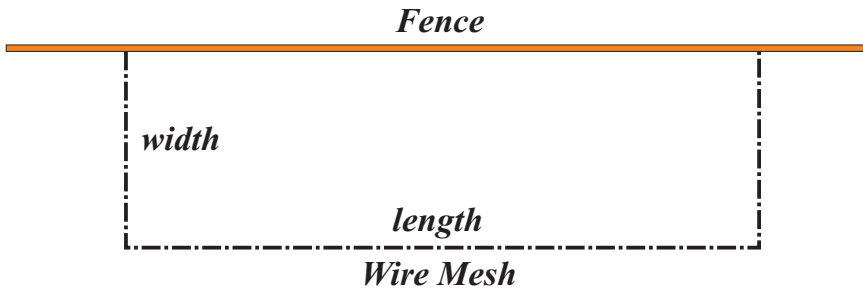
With the countries arranged in the correct order, match the letters next to the countries to spell the answer to this riddle.

What goes putt-putt-putt-putt-putt?

PROBLEM SOLVING

1. Xanda owned a **square** block of land that had an area of 4 hectares. He wanted to divide the block into eight equal rectangular blocks to sell.
 - (a) Describe two ways he could divide the land into eight equal rectangular blocks.
 - (b) What would be the dimensions of each small block in each of these two subdivisions?

2. Hilda wants to build a pen for her rabbits in the backyard. She buys 12 metres of wire mesh that she is going to use as a border. Hilda decides to use the fence in the backyard as one side of the pen and the wire mesh to make the other three sides of the rectangular pen.



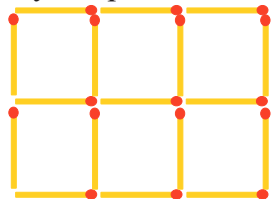
- (a) Guess which values for the length and width would give the largest area of the rabbit pen.
- (b) Copy and complete the table below showing all the possible values for the length and width (use only whole numbers) if all of the wire mesh is used. Calculate the area for each.



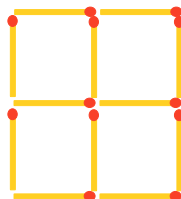
<i>Length (m)</i>	<i>Width (m)</i>	<i>Area (m²)</i>

PUZZLES

1. Remove 6 matches to leave exactly 2 squares.

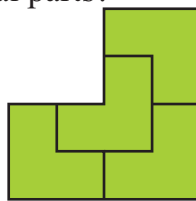
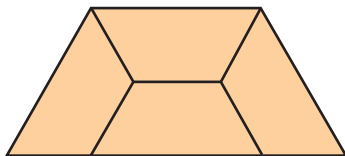


2. (a) Rearrange 4 matches to make exactly 3 squares.
(b) Rearrange 2 matches to make exactly 7 squares.

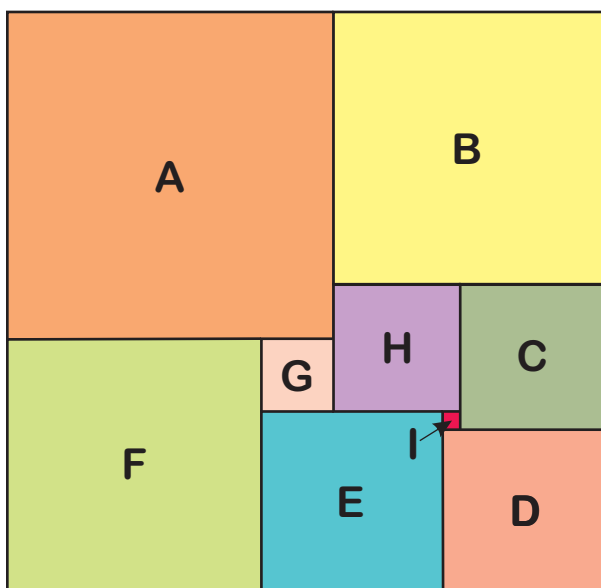


3. (a) Form 2 equilateral triangles using 7 matches.
(b) Form 4 equilateral triangles using 9 matches.
(c) Form 5 equilateral triangles using 9 matches.
(d) Form 8 equilateral triangles using 6 matches.
(e) Form 4 equilateral triangles using 6 matches.

4. Each of the shapes below are divided into 4 identical parts.
Can you divide a *square* into 5 identical parts?

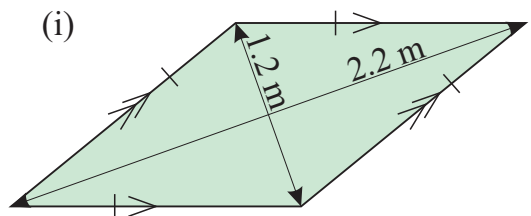
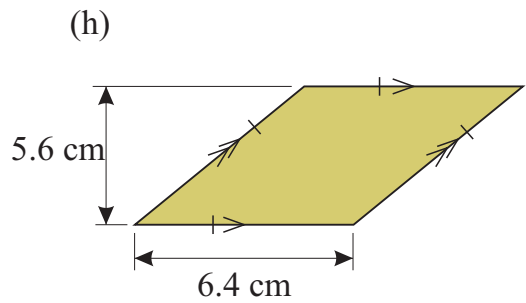
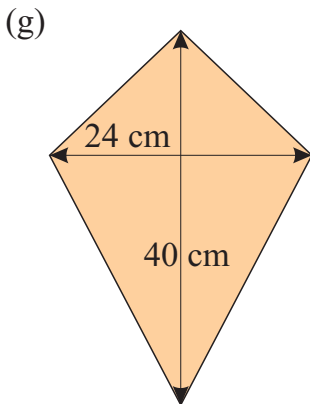
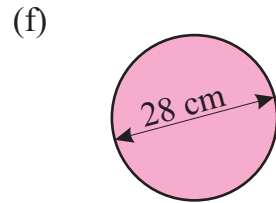
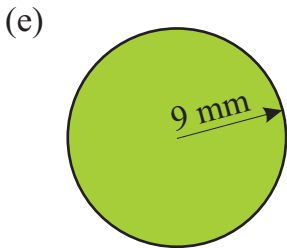
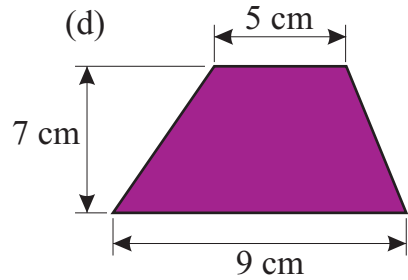
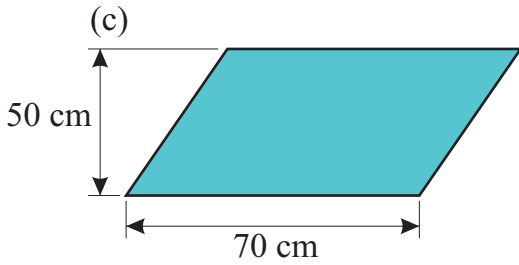
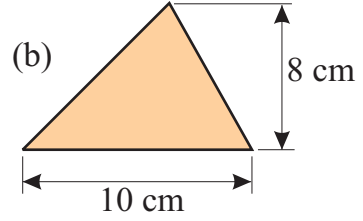
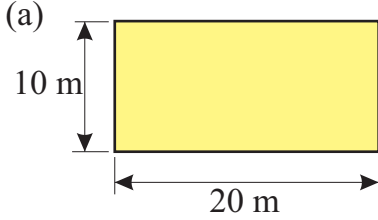


5. All sections of this shape are squares.
The area of **C** = 64 cm^2
The area of **D** = 81 cm^2
(a) Find the area of all of the other squares.
(b) Is the total shape a square?



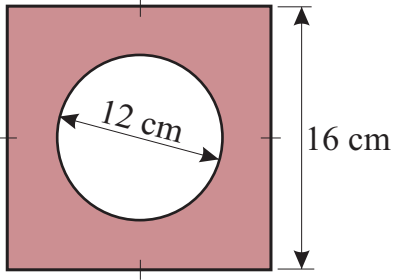
CHAPTER REVIEW

1. Find the areas of the shapes below.

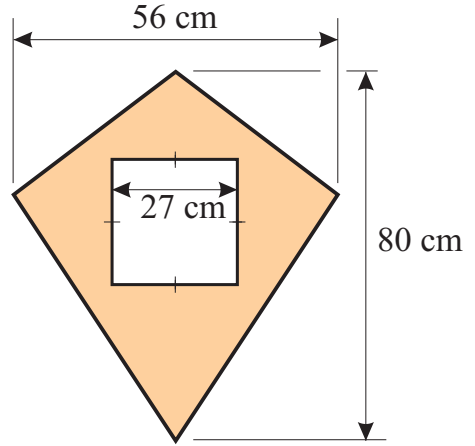


2. Find the area of the shaded regions below.

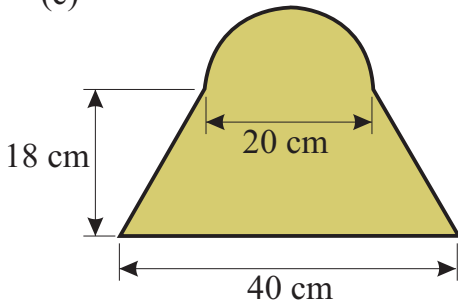
(a)



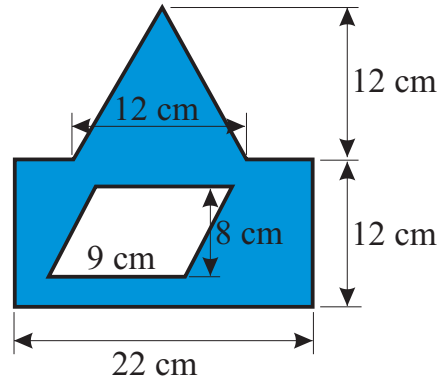
(b)



(c)



(d)



3. Find the area of a $0.5 \text{ m} \times 0.2 \text{ m}$ rectangle giving the answer in:

(a) m^2 (b) cm^2 (c) mm^2

4. A farm is in the shape of a rectangle and is 2.5 km long and 3 km wide. Find the area of the farm in hectares.