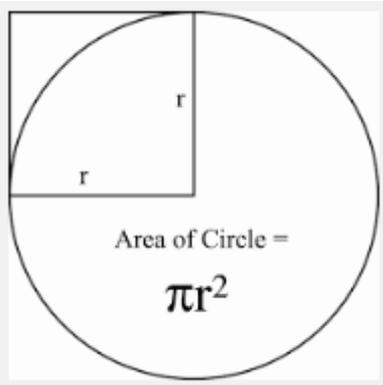


Goals



Learning Goals:

- use metric units of area, their abbreviations, conversions between them, and appropriate choices of units (EMA21)
- estimate the areas of different shapes (EMA01)
- convert between metric units of area and other area units (EMA22)
- calculate areas of rectangles and triangle (EMA23)
- use metric units of mass, their abbreviations, conversions between them, and appropriate choices of units (EMA24)
- estimate the mass of different objects (EMA25)

Theoretical components

Resources:

PDF file - Week 12 and 13 Notes and Exercises and Mathspace.co

Knowledge Checklist

- Estimating area
- Using metric measures of area
- Converting between units of area
- Other units of area
- Calculations involving area
- Units of mass
- Estimating mass
- Converting between units of mass

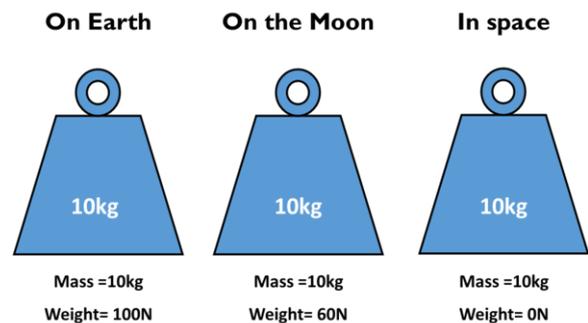
Order

1. Work through the Week 12/13 notes and watch any videos or solutions posted by your teacher
2. Complete the Exercises
3. Complete the Portfolio Task and submit by the due date

Practical components

There are 7 Exercises in this booklet. Read any notes and worked examples before you begin.

Remember to regularly check Google Classrooms for messages.



Portfolio Task

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

WEEK 12 AND 13 NOTES AND EXERCISES

AREA

The space found inside a shape is said to be the area of the shape. Just as perimeter is measured in linear units, area is measured in square units.

Common units of area are;

square millimetres mm^2 $1 \text{ mm}^2 = 1 \text{ mm} \times 1 \text{ mm}$

square centimetres cm^2 $1 \text{ cm}^2 = 1 \text{ cm} \times 1 \text{ cm}$

square metres m^2 $1 \text{ m}^2 = 1 \text{ m} \times 1 \text{ m}$

square kilometres km^2 $1 \text{ km}^2 = 1 \text{ km} \times 1 \text{ km}$

Estimating Area

Just as we can estimate length, we need to be able to estimate area. You would only use mm^2 for very small areas and km^2 for very large areas.

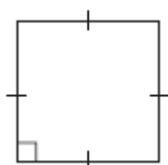
Exercise 1

Which unit of measurement (mm^2 , cm^2 , m^2 , km^2) would you use to give the area of each of these?

- | | | |
|-------------------|---------------------------|------------------------|
| a) Window | b) A4 sheet of paper | c) Postcard |
| d) Postage stamp | e) Floor of the classroom | f) Your thumbnail |
| g) Football field | h) Australia | i) Surface of the moon |

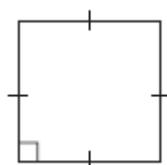
Converting Units

A square with an area of 1 cm^2 is a square with sides 1 cm long. Remember $1 \text{ cm} = 10 \text{ mm}$.



1 cm

=



10 mm

Thus 1 cm^2 is equal to $10 \text{ mm} \times 10 \text{ mm}$ which gives 100 mm^2

Conversion Table

Larger to smaller

cm^2 to mm^2	multiply by 100	ie 10×10
m^2 to cm^2	multiply by 10000	ie 100×100
km^2 to m^2	multiply by 1000000	ie 1000×1000

Smaller to larger

mm^2 to cm^2	divide by 100
cm^2 to m^2	divide by 10000
m^2 to km^2	divide by 1000000

Exercise 2

Convert these units.

a) $2 \text{ cm}^2 = 2 \times 100$
 $= 200 \text{ mm}^2$

b) $13.5 \text{ km}^2 = \quad \times$
 $= \quad \text{m}^2$

c) $8.2 \text{ m}^2 = \quad \times$
 $= \quad \text{cm}^2$

d) $0.005 \text{ m}^2 = \quad \times$
 $= \quad \text{cm}^2$

e) $640 \text{ mm}^2 = \quad \div$
 $= \quad \text{cm}^2$

f) $50 \text{ cm}^2 = \quad \div$
 $= \quad \text{m}^2$

g) $80000 \text{ cm}^2 = \quad \text{m}^2$

h) $200 \text{ mm}^2 = \quad \text{cm}^2$

i) $15 \text{ km}^2 = \quad \text{m}^2$

j) $9.1 \text{ m}^2 = \quad \text{cm}^2$

Calculating Area

The formula for finding the area of a rectangle is:

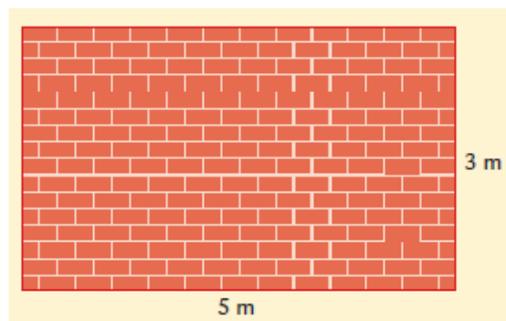
$$A = L \times W$$

Where L is the length and W is the width (although H for width is sometimes used).

Example

Martin is going to put cement render on the exterior walls of his house.

a) Calculate the area of this wall.



b) Martin needs to cover 240 m^2 with the render. One litre of render will cover 4 m^2 . What quantity of render will he need?

Solution

a) Area of rectangle = length \times width

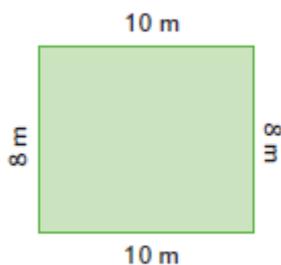
$$\begin{aligned} A &= L \times W \\ &= 5 \times 3 \\ &= 15 \text{ m}^2 \end{aligned}$$

b) Each litre covers 4 m^2 . To cover 240 m^2 , Martin will need $240 \div 4 = 60 \text{ L}$ of render.

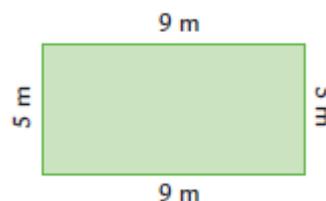
Exercise 3

Use the formula $A = L \times W$ to find the area of these rectangles.

a)

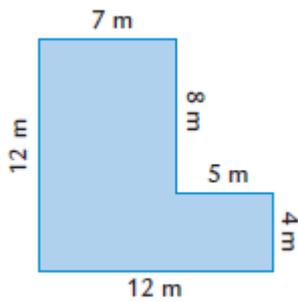


b)

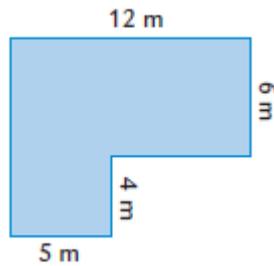


Q2. Calculate the area of these shapes by cutting them into two pieces.

a)



b)

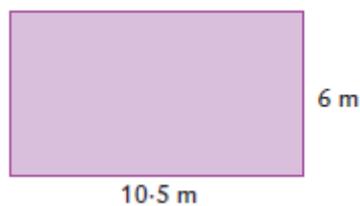


3. The dining room in Nicole's home unit is very small. To make it look larger she is going to cover one wall with mirror tiles. The wall she is going to cover is 3 m high and 2.5 m long.

a) What is the area of the wall?

b) The mirror tiles Nicole plans to use cost \$48 per square metre. Calculate the total cost for the mirror tiles.

Q4. The diagram shows the flat roof of Don's house. He collects rainwater from the roof to use in his garden.



a) What is the area of the roof?

b) To calculate the number of litres of water he collects from his roof when it rains, Don uses the formula

$$L = A \times r$$

where L = litres, A = area of the roof in square metres and r = rainfall in millimetres. During a storm, 12 mm of rain fell on the roof. How many litres of water did Don collect?

Q5. Holly designs and makes beautiful stained-glass windows and lamps. Her window prices depend on the size of the window and the type of pattern the customer chooses.

Holly's stained glass window charges

Type of pattern	Cost per square metre
Simple geometric pattern	\$425
Basic modern pattern	\$720
Ornate or complicated pattern	\$930

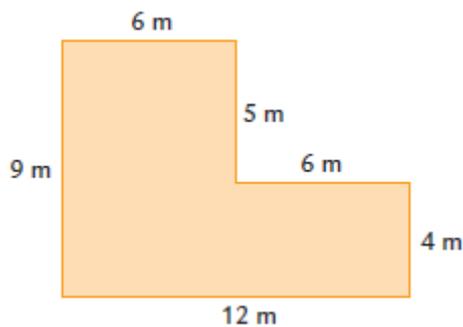
How much will Holly charge to make a stained-glass window 2.5 m wide by 1.4 m high in a basic modern pattern?

Q6. Affordable Homes Company uses this formula to estimate the cost of building a new house:

$$C = f \times p$$

where C = estimated building cost, f = floor area and p = price per square metre.

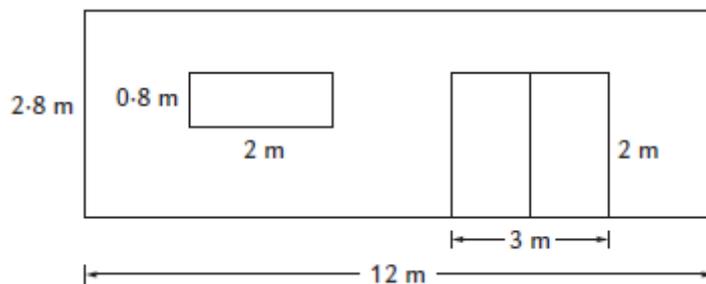
a) What is the floor area of this house?



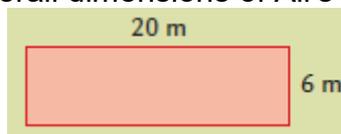
b) Use a cost of \$920 per square metre to estimate the cost of building this new house.

Q7. The dimensions of a family room are 7.2 m by 6.5 m. Sue wishes to carpet the family room at a cost of \$90 per m². How much will it cost?

Q8. The wall of a room has a window and sliding door. The wall is to be painted. A 4 L can of paint covers 10 m² and costs \$38.50 per can. How many cans of paint will be needed to give the wall two coats of paint, and what will be the cost?



Q10. The diagram shows the overall dimensions of Ali's house.



a) What is the floor area of Ali's house?

b) There are gutters on all sides of the roof of Ali's house. How many metres of guttering are there?

Triangles

The formula for the area of a triangle is:

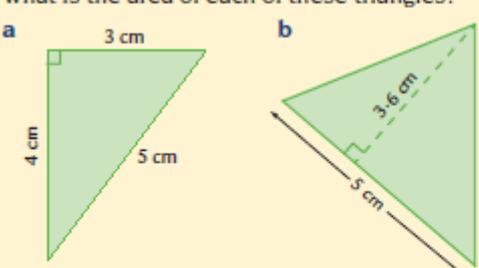
$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height} \quad \text{or} \quad A = \frac{1}{2}bh$$

The base and height are always at right angles to each other.

Example

Solution

What is the area of each of these triangles?



a The base is 4 cm and the height is 3 cm. The base and the height are at 90° .

$$A = \frac{1}{2} \times 4 \times 3 \text{ cm}^2 = 6 \text{ cm}^2$$

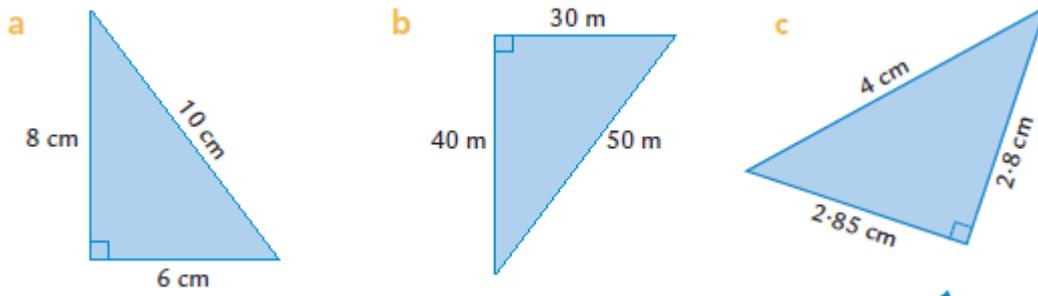
b The base is 5 cm and the height is 3.6 cm. The base and the height meet at 90° .

$$A = \frac{1}{2} \times 5 \times 3.6 \text{ cm}^2 = 9 \text{ cm}^2$$

The formula is $A = \frac{1}{2}bh$.

Exercise 4

Q1. Calculate the area of these triangles. Remember to use the two dimensions that are at right angles to each other.

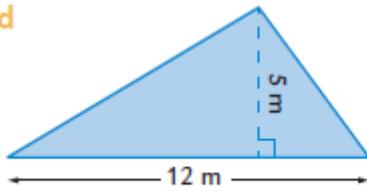


a 8 cm , 6 cm , 10 cm

b 30 m , 40 m , 50 m

c 4 cm , 2.85 cm , 2.8 cm

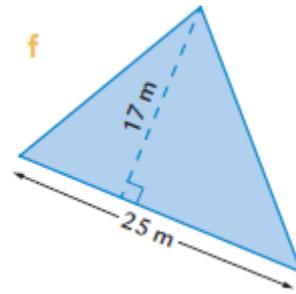
d



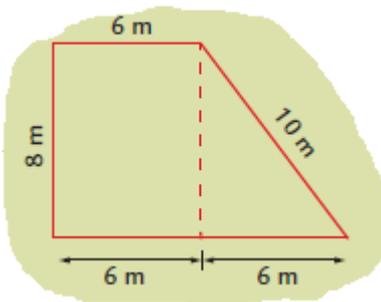
e



f

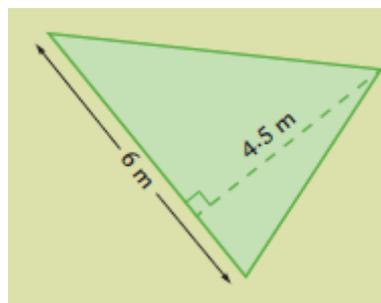


g



Q2. Alice wants to install sails over her children's play area to protect them from the sun. She plans to have three overlapping sails, each with a base of 4.5 m and a height of 6.2 m. Calculate the total area of the sails.

Q3. Patrick is going to paint his triangular deck. One litre of paint covers 12 m^2 .



a) What is the area of his deck?

b) Patrick is giving the deck two coats of paint. How many litres of paint will he need?

Area of a Circle

The formula for the area of a circle is:

$$A = \pi \times r^2 \quad (\text{which is the same as } \pi \times r \times r)$$

Example

The Lightning Ridge mineral water baths are circular. The diameter of the baths is 12 m. Calculate the area of the top of the water, correct to the nearest square metre.

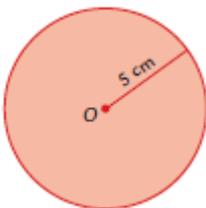
Solution

$$\begin{aligned} \text{The diameter is } 12 \text{ m.} \\ \text{Radius} &= 12 \div 2 \text{ m} \\ &= 6 \text{ m} \\ \text{Area} &= \pi \times r^2 \\ &= \pi \times 6^2 = \pi \times 36 \text{ m}^2 \\ &= 113 \text{ m}^2 \text{ to the nearest m}^2 \end{aligned}$$

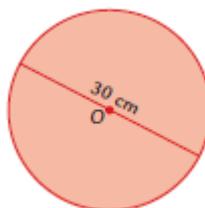
Exercise 5

Q1. Find the areas of these circles, correct to 1 decimal place.

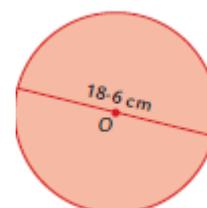
a)



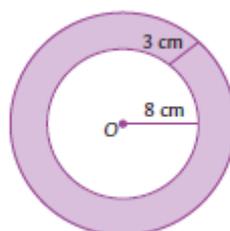
b)



c)



2. The shaded section in this figure is called an annulus.



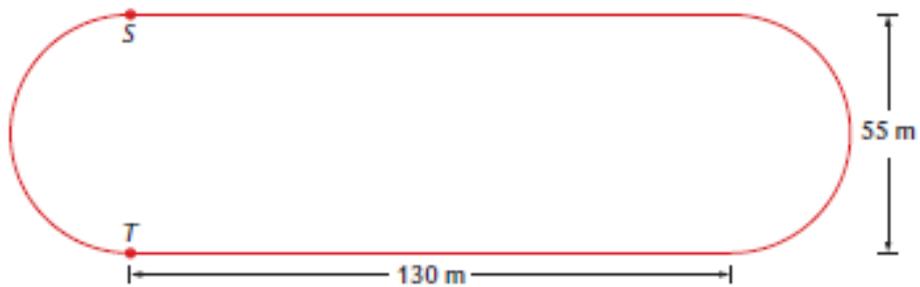
a) Calculate the area of the smaller circle, which has a radius of 8 cm. Answer correct to 1 decimal place.

b) What is the radius of the larger circle?

c) Calculate the area of the larger circle, correct to 1 decimal place.

d) Hence, find the size of the shaded area, correct to the nearest square centimetre.

Q3. Calculate the area of the shape below. The shape is a combination of a rectangle with a semicircle at each end. Hint: two semi-circles make a whole circle.



MEASURING MASS

In everyday language we talk about how much things weigh when we really mean mass. Weight depends on gravity and thus changes depending on how far you are from the centre of the Earth – you have much less weight on the moon, hence those giant ‘moon steps’. When Louise said she weighed 85 kg she should have said she has a mass of 85 kg.

Metric Units for Mass

In the metric system, the gram is the basic unit for mass and all other units are based on grams. This table shows the common mass units in the metric system.

Unit	Abbreviation	
milligram	mg	one-thousandth of a gram
gram	g	
kilogram	kg	1 kg is equivalent to 1000 g
tonne	t	1 tonne is equivalent to 1000 kg

Estimating Mass

This table shows some common items and their approximate mass.

Mass	Items with approximate mass
1 mg	A grain of sand A tiny insect like a sand-fly
2 g	A 5c coin
100 g	An iPhone without a case
1 kg	A litre of milk 5 medium sized oranges
50 kg	A Year 7 student
100 kg	A tall solid/muscular man

Exercise 6

Q1. Which unit of mass would be most appropriate for:

- a) a pencil b) your Maths folder c) a postage stamp
- d) a car e) your shoe f) a Big Mac
- g) a hair from your head h) a full bag of groceries i) a new born baby

Converting Units of Mass

Larger to smaller

t to kg multiply by 1000

kg to g multiply by 1000

g to mg multiply by 1000

Smaller to larger

mg to g divide by 1000

g to kg divide by 1000

kg to t divide by 1000

Exercise 7

Q1. Convert these units

a) 3kg	g
b) 12t	kg
c) 1500g	kg
d) 2400kg	t
e) 2.5g	mg
f) 500mg	g

Q2. A hospital pharmacist ordered 2000 tablets. Each tablet has a mass of 5 mg.

a) Calculate the total mass of the tablets in mg.

b) What is the total mass in grams?

Q3. Vitamin C powder contains $\frac{9}{10}$ ascorbic acid and $\frac{1}{10}$ calcium.

a) How many milligrams of calcium are in 40 milligrams of vitamin C?

b) How many milligrams of ascorbic acid are in 60 milligrams of vitamin C?

Q4. A standard house brick has a mass of 2.7 kg.

a) A pallet of standard house bricks contains 500 bricks. Calculate the mass of 1 pallet of normal house bricks. Express your answer in kilograms.

b) A truck has a load of 8 pallets of standard house bricks. Calculate the weight of the load in tonnes.

Q5. List three items whose mass you would measure in:

a) tonnes

b) kilograms

c) grams

d) milligrams

Q6. Germany has the highest rate of chocolate consumption in the world. The population of 83 million eat an average of 3.03 kg of chocolate each per year. How many tonnes of chocolate are eaten in Germany per year?

Question 1

Watch the video below:

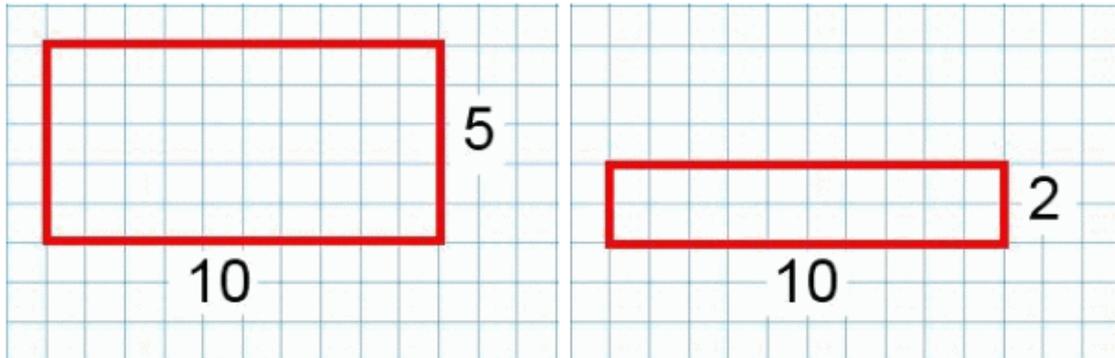
<https://nrich.maths.org/content/id/9691/Perimeter1.mp4>

How many other possible perimeters can you find, for a rectangle with an area of 24cm^2 ?

Write up your solutions:

Question 2

Charlie has been drawing rectangles:



The first rectangle has a perimeter of 30 units and an area of 50 square units.
The second rectangle has a perimeter of 24 units and an area of 20 square units.

Charlie wondered if he could find a rectangle, with a side of length 10 units, whose perimeter and area have the same numerical value.

Find a rectangle that satisfies this condition?

Note: Rectangles that satisfy this condition may have dimensions that are not whole numbers. Find more examples of such rectangles?

Write up your response:

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

Student Reflection:
 How did you go with this week's work?
 What was interesting?
 What did you find easy?
 What do you need to work on?