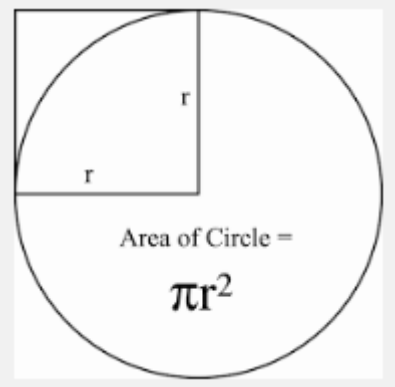
Week 13
Term 2
2020

HAWKER COLLEGE
Engage | Inspire | Achieve

EM1 Learning Brief:
Measurement

Goals



Weekly 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)

Theoretical Components

Resources:

PDF file - Week 11 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

Order

1. Work through the Week 13 notes and watch and videos or solutions posted by your teacher
2. Complete the Exercises
3. Do any mathspace.co task by the due date
4. Complete the Portfolio Task and submit on Google Classroom by the due date
5. Do any Google Forms required by the due date
6. Email your teacher if you have any questions or specific concerns and join the Google Meets as invited

Practical Components

There are 5 Exercises in this week's booklet. Read any notes and worked examples before you begin.

It is not necessary to print the booklet as you can record your answers on the Google document that will be uploaded.

A weekly Google form (Quiz) and mathspace.co task(s) **may** also both be used to check your engagement and progress each week.

Remember to check regularly Google Classrooms and mathspace.co

No mathspace.co tasks assigned for this week.

Portfolio Task

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

	Knowledge, Comprehension and Application				
CRITERIA	**EXPECTATIONS**	**POSS**	**MULT**	**GIVEN**	**TOTAL**
Practical	Student completes practical work 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**
	Analysis, Synthesis and Evaluation	**SUB TOTAL**			**/10**
Written Communication	Student responses clearly demonstrate evidence of logical and comprehensive processes and thought.	**4**	**-**		**/4**
Evidence of Working	Student submitted task effectively uses the material learned in class to describe and complete the assigned task.	**4**	**-**		**/4**
	Submission Guidelines	**SUB TOTAL**			**/8**
Timeliness	Student submits the assignment by the set deadline. See scoring guidelines for specific details.	**2**	**-**		**/2**
		SUB TOTAL			**/2**
				FINAL	**/20**

WEEK 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	$1\ mm^2 = 1\ mm \times 1mm$
square centimetres	cm^2	$1\ cm^2 = 1\ cm \times 1cm$
square metres	m^2	$1\ m^2 = 1\ m \times 1m$
square kilometres	km^2	$1\ km^2 = 1\ km \times 1km$

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 cm = 10 mm.

1 cm = 10 mm

Thus $1\ cm^2$ is equal to 10 mm × 10 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 cm^2 = 2 × 100

= 200 mm^2

b) 13.5 km^2 = ×

= m^2

c) 8.2 m^2 = ×

= cm^2

d) 0.005 m^2 = ×

= cm^2

e) 640 mm^2 = ÷

= cm^2

f) 50 cm^2 = ÷

= m^2

g) 80000 cm^2 = m^2

h) 200 mm^2 = cm^2

i) 15 km^2 = m^2

j) 9.1 m^2 = cm^2

Calculating Area

The formula for finding the area of a rectangle is:

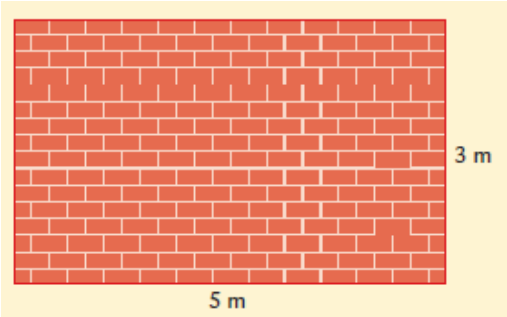
$$A = L \times W$$

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 × width

$$A = L \times W$$

$$= 5 \times 3$$

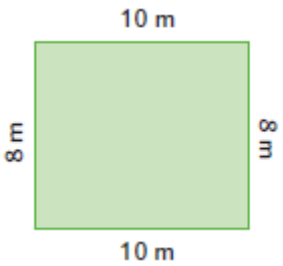
$$= 15 \text{ m}^2$$

b) Each litre covers 4 m^2. To cover 240 m^2, Martin will need 240 ÷ 4 = 60 L of render.

Exercise 3

Use the formula A = L × W to find the area of these rectangles.

a)



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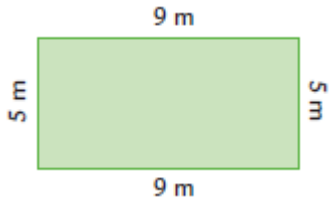
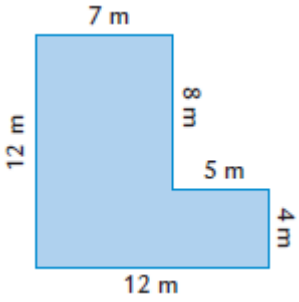


Q2. Calculate the area of these shapes by cutting them into two pieces.

a)



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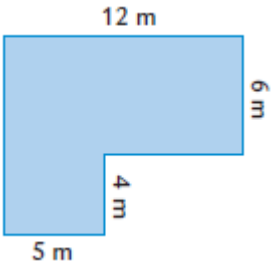


3. The dining room in Nicole's home unit is very small. To make it look larger she is going to cover one wall with mirror tiles. The wall she is going to cover is 3 m high and 2·5 m long.

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

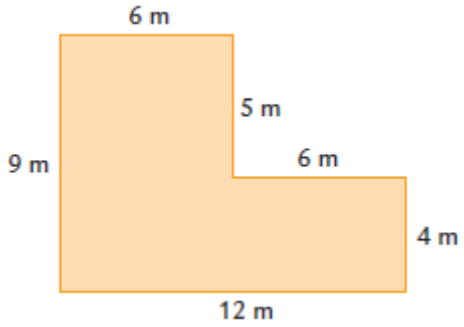
How much will Holly charge to make a stained-glass window 2·5 m wide by 1·4 m high in a basic modern pattern?

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.

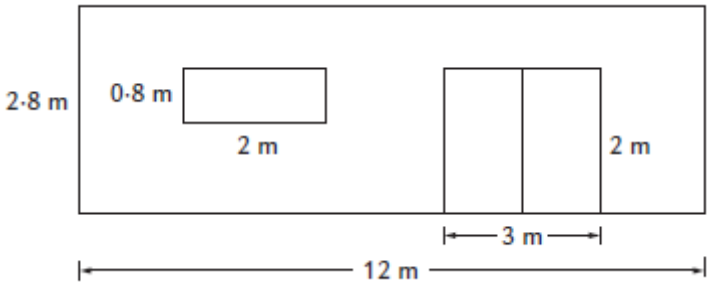
a) What is the floor area of this house?



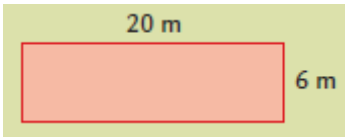
b) Use a cost of $920 per square metre to estimate the cost of building this new house.

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 m^2. 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:

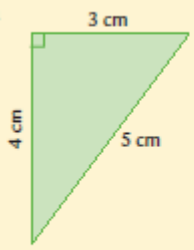
Area = $\frac{1}{2}$ × base × height or A = $\frac{1}{2}$bh

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

Example **Solution**

What is the area of each of these triangles?

a



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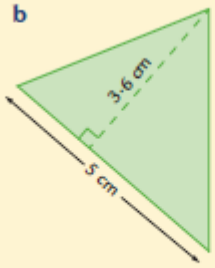


The formula is $A = \frac{1}{2}bh$.

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°.

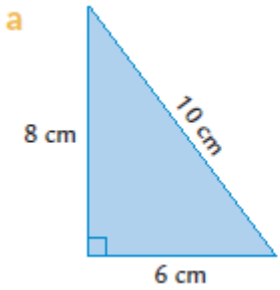
$A = \frac{1}{2} \times 5 \times 3{\cdot}6 \text{ cm}^2$

$= 9 \text{ cm}^2$

Exercise 4

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

a



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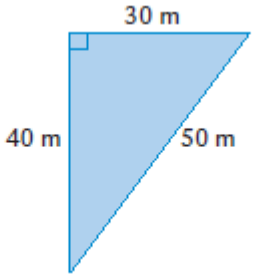

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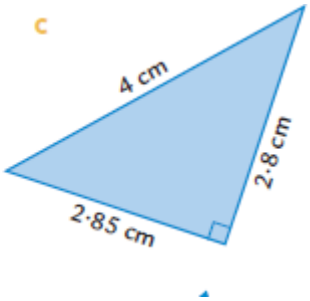

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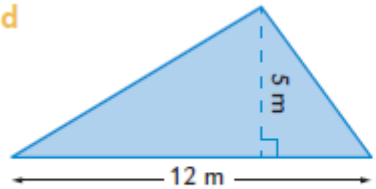

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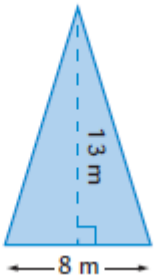

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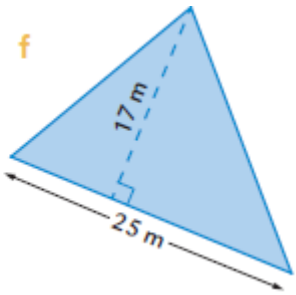

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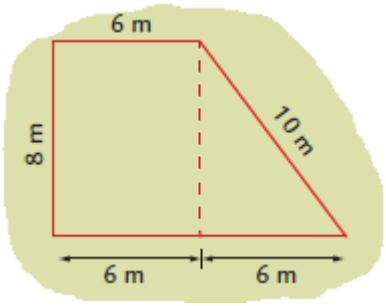
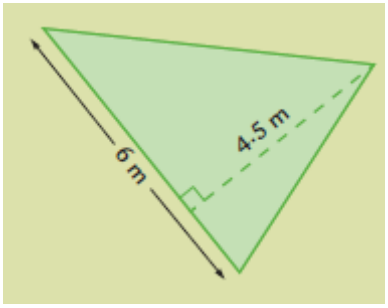


Q2. Alice wants to install sails over her children's play area to protect them from the sun. She plans to have three overlapping sails, each with a base of 4·5 m and a height of 6·2 m. Calculate the total area of the sails.

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:

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

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.

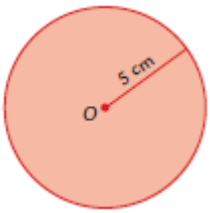
Solution

The diameter is 12 m.
Radius $= 12 \div 2$ m
$= 6$ m
Area $= \pi \times r^2$
$= \pi \times 6^2 = \pi \times 36$ m^2
$= 113$ m^2 to the nearest m^2

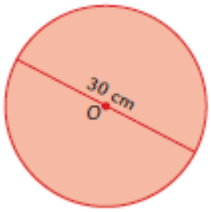
Exercise 5

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

a)



b)



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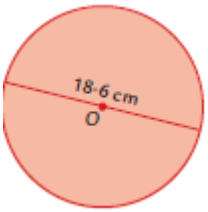
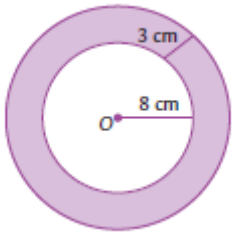


2. The shaded section in this figure is called an annulus.



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.

2020 EM1

PORTFOLIO TASK WEEK 13

Question 1

Watch the video below:

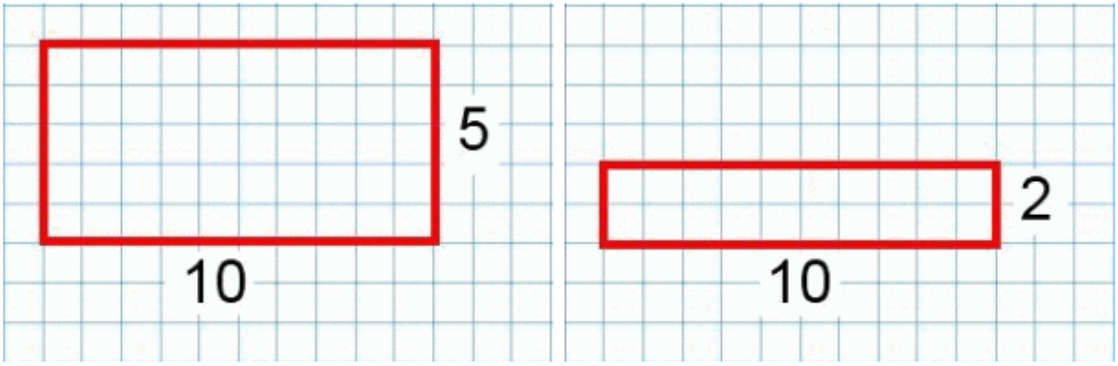
https://nrich.maths.org/content/id/9691/Perimeter1.mp4

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.

Can you find a rectangle that satisfies this condition?
Note: Rectangles that satisfy this condition may have dimensions that are not whole numbers. Can you find more examples of such rectangles?

Write up your response: