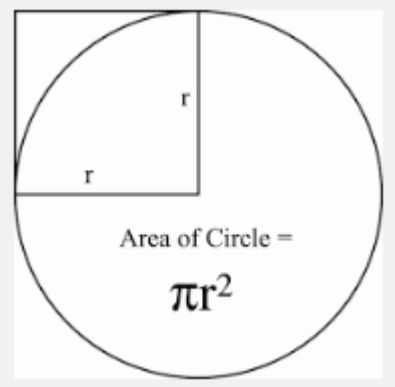
Week 12
Term 2
2022

HAWKER COLLEGE
Engage | Inspire | Achieve

EM1
Measurement

Goals



Goals for this week:

Area measure

- 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)
- calculate areas of circles

Theoretical Components

Resources:
PDF file - Week 12 Notes and Exercises
YouTube Videos: Linked in the PDF File

Knowledge Checklist

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

Order

1. Read through the notes and examples
2. Work through the exercises
3. Complete the Portfolio Task
4. Complete the reflection at the end of the booklet
5. Come and see your teacher and make sure you are up to date.

Practical Components

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

Remember to regularly check Google Classroom for messages.

Portfolio Task

Complete the task at the end of the brief and submit your weekly work for checking. 😊

QFO

Quiz/Forum/Other

WEEK 12 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	$1\ mm^2 = 1\ mm \times 1\ mm$
square centimetres	cm^2	$1\ cm^2 = 1\ cm \times 1\ cm$
square metres	m^2	$1\ m^2 = 1\ m \times 1\ m$
square kilometres	km^2	$1\ km^2 = 1\ km \times 1\ km$

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

Q1. 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

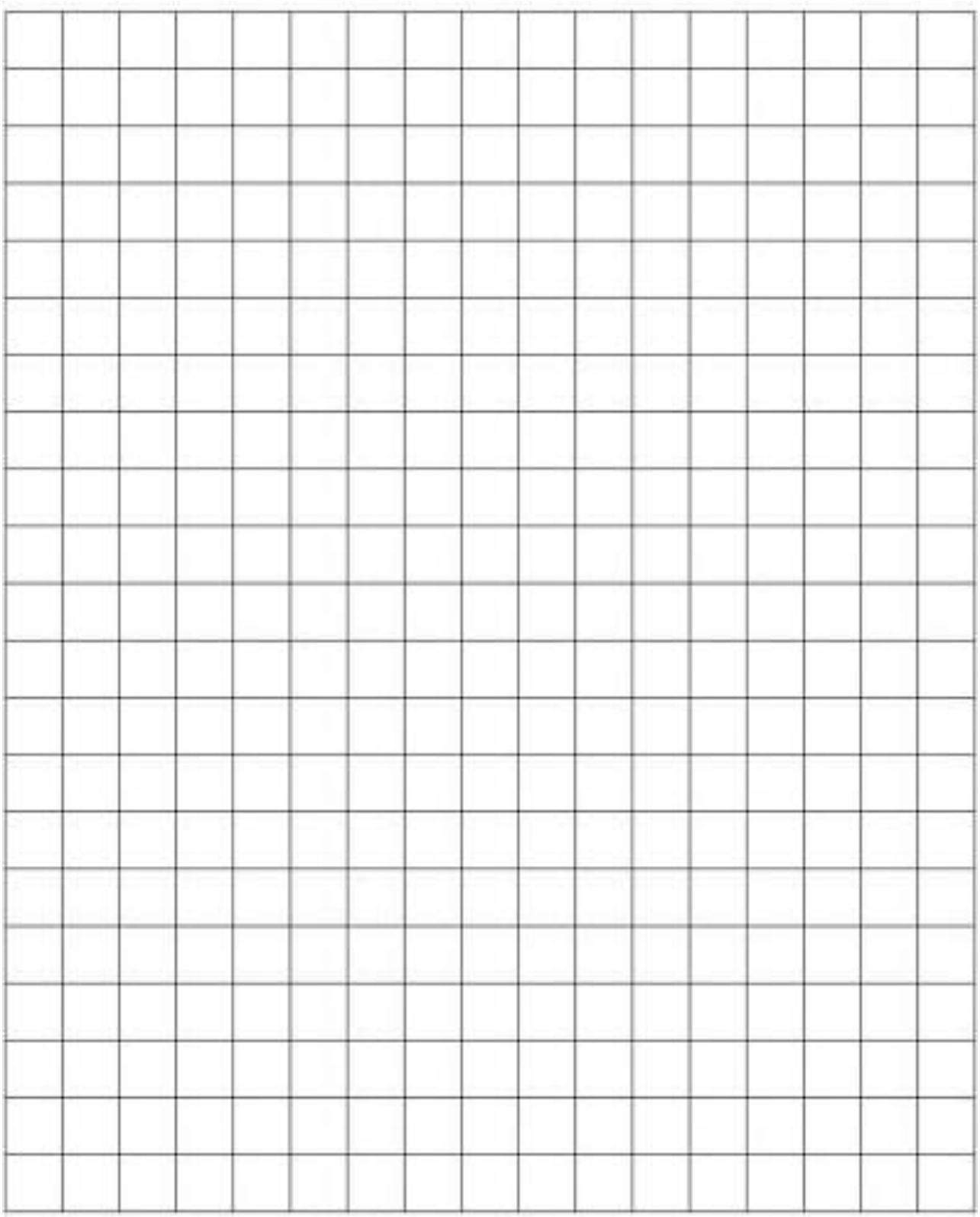
f) Your thumbnail

g) Football field

h) Australia

i) Surface of the moon

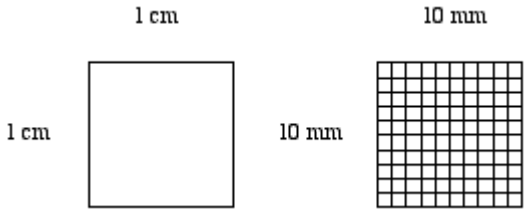
Q2. On the 1cm grid below draw an outline of your hand and estimate the area of your hand by counting the squares.



Area of your hand is approximately = cm^2

CONVERTING UNITS

A square with an area of 1 cm^2 is a square with sides 1 cm long. *Remember 1 cm = 10 mm.*



Thus 1 cm^2 is equal to 10 mm × 10 mm which gives 100 mm^2

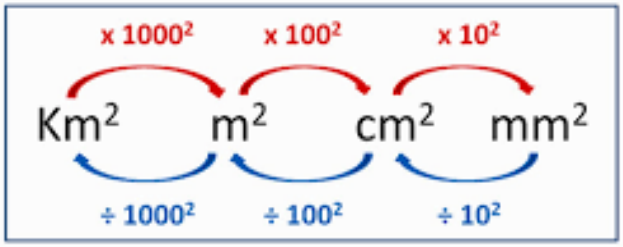
Conversion Table

Larger to smaller

cm^2 to mm^2	multiply by 100	ie 10 × 10
m^2 to cm^2	multiply by 10,000	ie 100 × 100
km^2 to m^2	multiply by 1,000,000	ie 1000 × 1000

Smaller to larger

mm^2 to cm^2	divide by 100
cm^2 to m^2	divide by 10,000
m^2 to km^2	divide by 1,000,000



EXERCISE 2

Q1. 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

CALCULATING AREA

The formula for finding the area of a rectangle is:

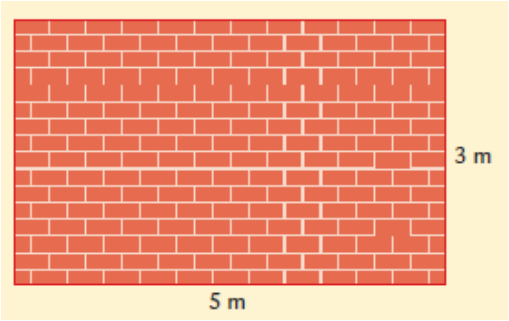
$$A = L \times W$$

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

$A = L \times W$

$= 5 \times 3$

$= 15\ m^2$

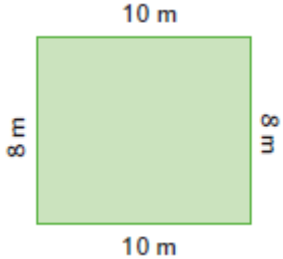
b) Each litre covers 4 m^2.

To cover 240 m^2, Martin will need $240 \div 4 = 60$ L of render.

EXERCISE 3

Q1. Use the formula A = L × W to find the area of these rectangles.

a)



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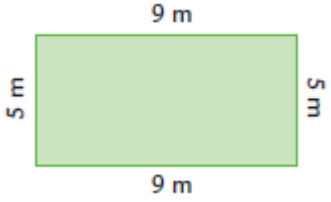
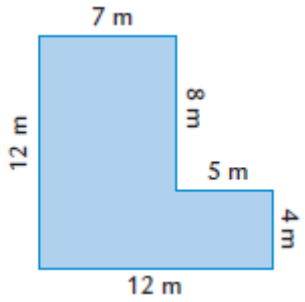


Q2. Calculate the area of these shapes by cutting them into two pieces.

a)



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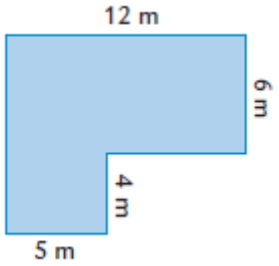


Q3. The dining room in Nicole's home unit is very small. To make it look larger she is going to cover one wall with mirror tiles. The wall she is going to cover is 3 m high and 2·5 m long.

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.

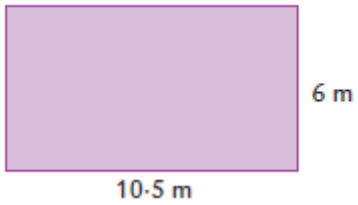
Q4. Holly designs and makes beautiful stained-glass windows and lamps. Her window prices depend on the size of the window and the type of pattern the customer chooses.

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?

Q5. 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

$$L = A \times r$$

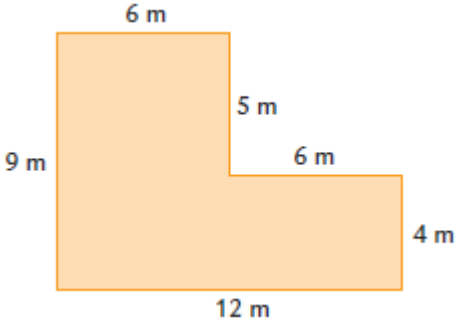
where L = litres, A = area of the roof in square metres and r = rainfall in millimetres. During a storm, 12 mm of rain fell on the roof. How many litres of water did Don collect?

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.

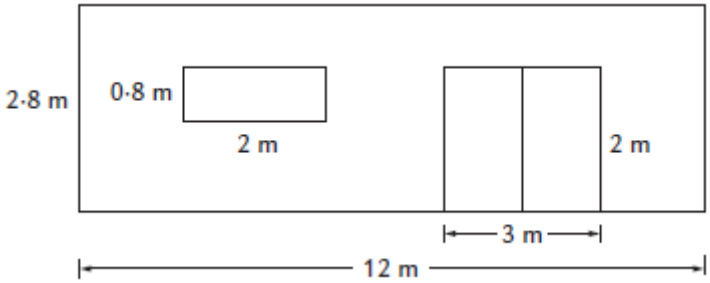
a) What is the floor area of this house?



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?



TRIANGLES

The formula for the area of a triangle is:

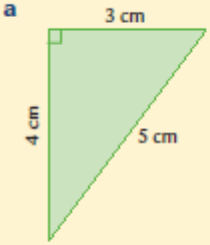
$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height} \qquad \text{or} \qquad \boldsymbol{A = \frac{1}{2}bh}$$

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

Example

What is the area of each of these triangles?

a



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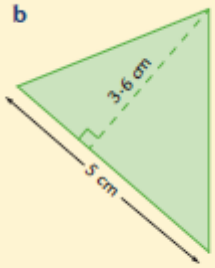


Solution

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°.

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

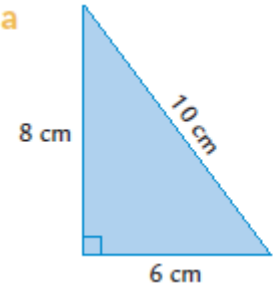
b The base is 5 cm and the height is 3·6 cm. The base and the height meet at 90°.

$$A = \frac{1}{2} \times 5 \times 3{\cdot}6 \text{ cm}^2$$
$$= 9 \text{ cm}^2$$

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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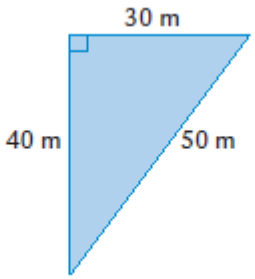

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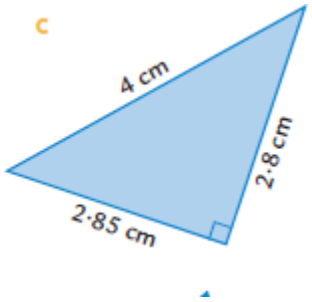

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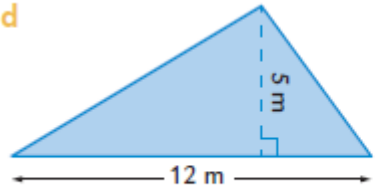

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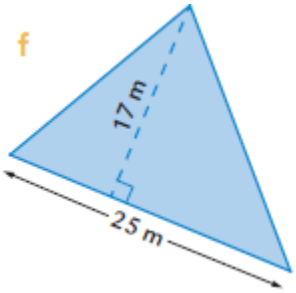
f



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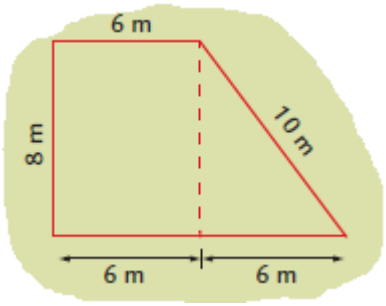
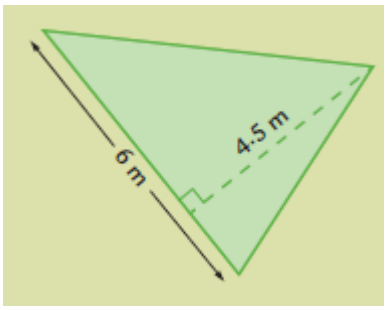


Q2. Alice wants to install sails over her children's play area to protect them from the sun. She plans to have three overlapping sails, each with a base of 4·5 m and a height of 6·2 m. Calculate the total area of the sails.

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:

$$A = \pi \times r^2$$ (which is the same as π × r × 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.

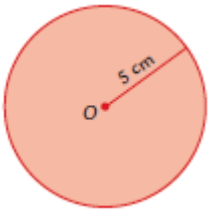
Solution

The diameter is 12 m.
Radius = 12 ÷ 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

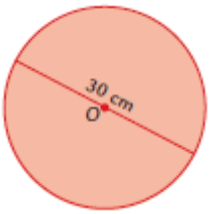
EXERCISE 5

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

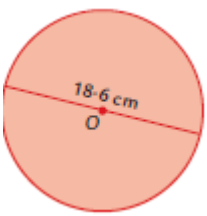
a)



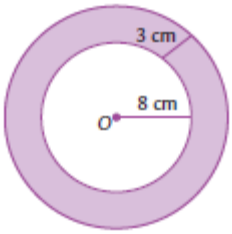
b)



c)



Q2. 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.

WEEK 12 PORTFOLIO TASK

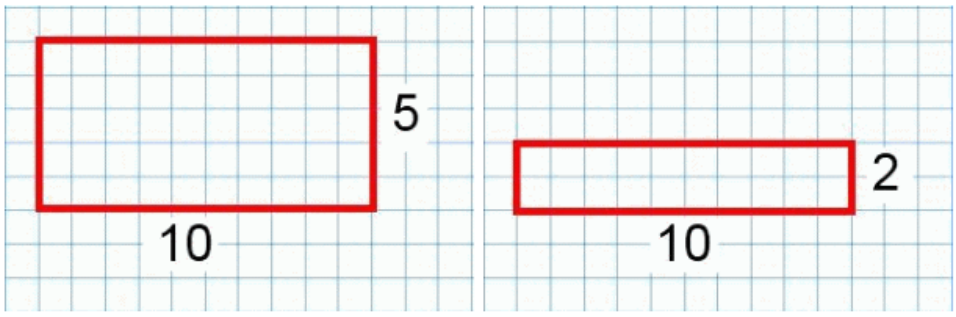
Question 1

Watch this video: 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.

MARKING RUBRIC

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**
Communication and Reasoning	Student responses are accurate and appropriate in presentation of mathematical ideas in different contexts, with clear and logical working out shown.	**4**	**-**		**/4**
Knowledge and Application	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 and portfolio task 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?