Areas and Volumes – 2D shapes

Level: Key stage 3

Dimension: Measures, Shape and Space
Module: Measures in 2-D shapes
Unit: Areas and Volumes (I)

Student ability: Average

Content Objectives:

After completing the activity, students should be able to find the area of an irregular shape by using the dividing method and/or the filling method.

Language Objectives:

After completing the activity, students should be able to

- recognise the English technical terms related to finding the areas of regular shapes and irregular shapes (e.g., *triangle, square, rectangle, parallelogram, trapezium, regular shapes, irregular shapes, area, figures, polygons, length, width, height, formula, formulae, divide into, filling method*);

- write in English the formulae for finding the areas of five regular shapes: triangle, square, rectangle, parallelogram and trapezium;

- understand the English expressions for explaining how to use the dividing method and the filling method to find the area of an irregular shape (e.g., *Being able to see the shapes within shapes is the key to calculating the area of irregular shapes*); and

- follow English instructions on solving problems concerning this topic and work on related problems written in English.

Prerequisite knowledge:

Students should have learned, through the medium of Chinese, how to use formulae to find the areas of triangles, squares, rectangles, parallelograms and trapeziums.

Time: one double lesson (80 minutes)

Procedure:

1. The teacher should teach the terms relating to the regular shapes in Part A (i).
2. Students should write down the formulae for areas and the teacher should check the answers with them.
3. Students should then complete Part A (ii). The teacher should discuss the answers with the students to make sure that they are familiar with the method for finding the areas of regular shapes.
4. The teacher should then ask the students to go through Part B (i) of the worksheet. The teacher can assign this task as a group discussion activity. He or she should encourage students to discuss the task in English and invite them to present their answers in English.
5. Students finish Part B (ii) by themselves.
6. The teacher should then ask the students to discuss their answers in groups of four.
7. The teacher should explain the problem in Part C and asks the students to discuss the solution to the problem in pairs.
8. The teacher should discuss the solutions to the problems suggested by the students and guide the students to understand how to find the area of irregular shapes.
9. The teacher should then asks the students to finish Part C (i) and discuss their answers in groups of four.
10. Finally, the teacher should discuss Part C (ii) with the students and ask them to comment on the methods used in finding the area of irregular shapes.

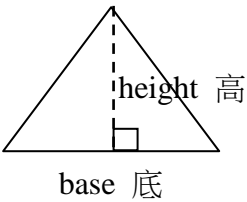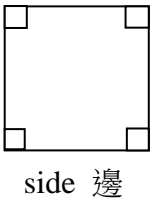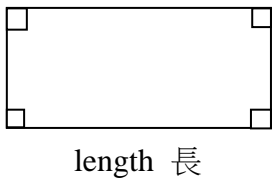
Explanatory Notes for Teachers:

1. This extended learning activity covers the topic of Area and Volume in the Form One Mathematics Curriculum. The topic is suggested to be taught in English. This should be possible as the topic involves basic concepts which are relatively easy to comprehend.
2. This activity consists of three sessions. Part A is a revision. Part B and C guide the students to master the ideas of finding the area of irregular shapes by dividing and filling methods.
3. Students are required to discuss their findings with others to enhance their communication skills in English.
4. Teachers may vary their involvement according to the abilities of the students.
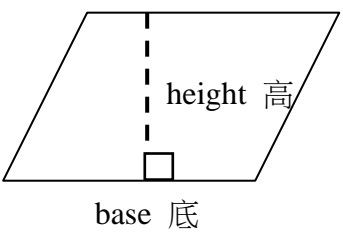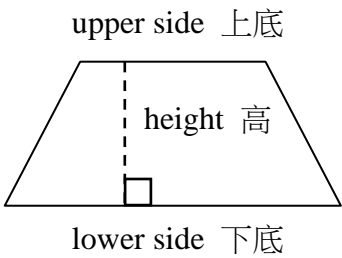
Name: _____ Class: _____ (   )

Title: Area and Volume

A) Revision of the regular shapes:

(i) Write down (in English) the formulae for finding the areas of the following shapes:
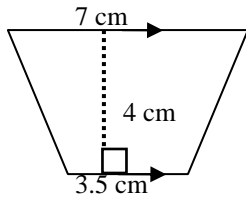
Triangle (三角形)	Square (正方形)	Rectangle (長方形)
height 高 base 底	side 邊	width 闊 length 長
Area =	Area =	Area =

Parallelogram (平行四邊形)	Trapezium (梯形)
height 高 base 底	upper side 上底 height 高 lower side 下底
Area =	Area =

ii)   Warm-up exercise:

Find the areas of the following figures:

1.

5.5 cm

4 cm

2.

4.5 cm

6 cm
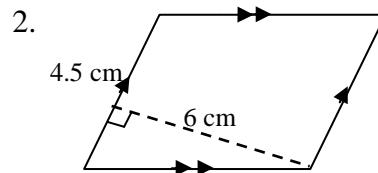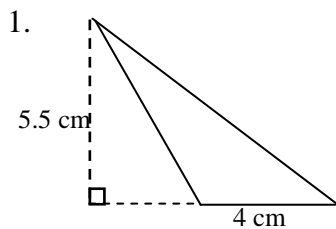
3.

4. Find the area of a rectangle with a length of 5 cm and a width of 3 cm.

B) Finding the Area of Irregular Shapes by Dividing:

We do not have formulae for calculating the areas of irregular figures directly. However, we may find the area of an irregular figure by dividing it into some regular figures.

For example, the pentagon on the left can be divided into a rectangle and a triangle by using the dotted line.
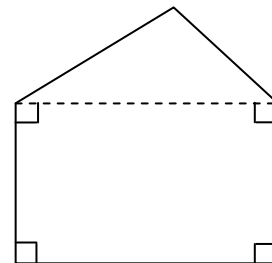
(i) Divide the following irregular shapes into regular shapes by adding straight line(s) and write down the regular shapes obtained.   There may be more than one possible answer.
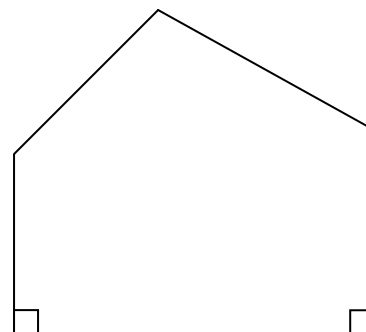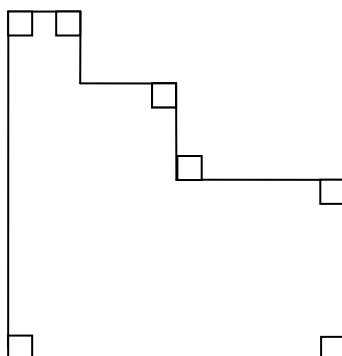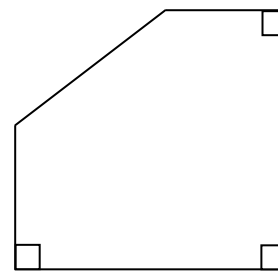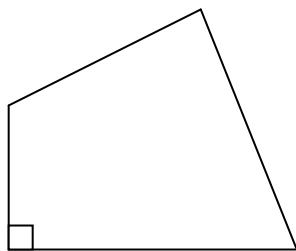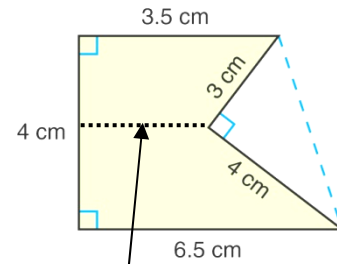
(ii)   Find the areas of the following figures by dividing them into regular shapes.

2 cm

3 cm

6 cm

5 cm

14 cm

8 cm

10 cm   6 cm

1 m

1 m

2 m   2 m

3 m

3 m

6 cm   8 cm

5 cm   5 cm

10 cm
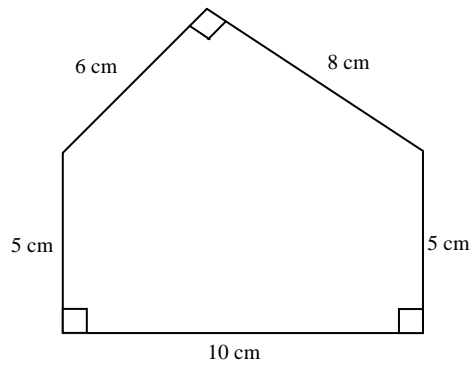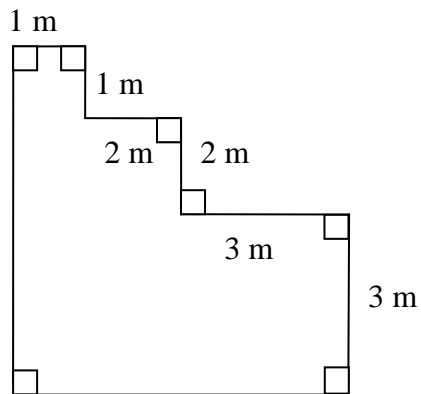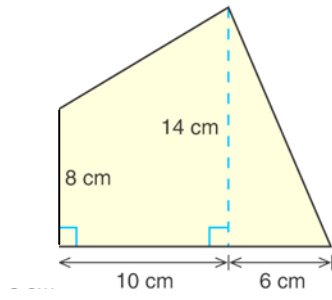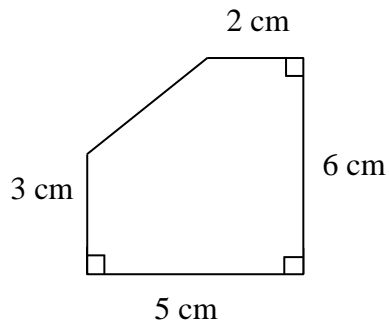
C) Finding the Area of irregular shapes by filling

In some situations, it is very difficult to find the area by dividing the irregular shape into the regular shapes. For example, for the figure on the right; the length of the dotted line segment is not given, and it is not easy to find. Therefore, it will be difficult to calculate the area of the figure by dividing the figure into two trapeziums.
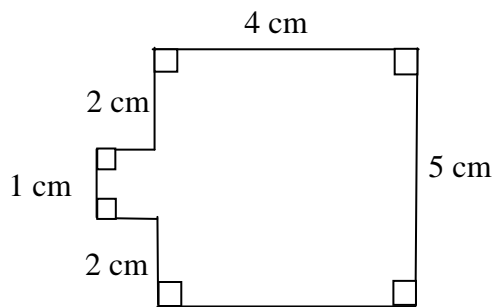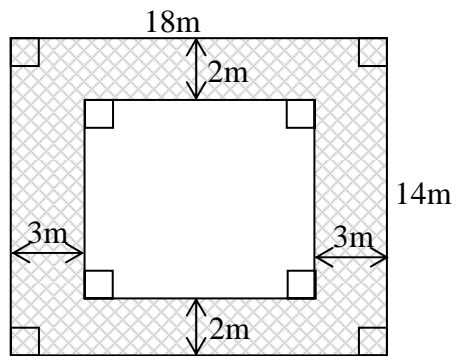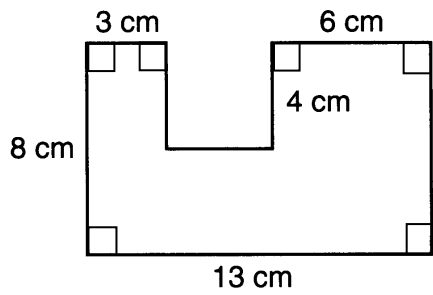
How can we find the area?

3.5 cm
3 cm
4 cm
4 cm
6.5 cm

The length of this line segment is not given!

(i) Find the areas of the polygons using the filling method.

5 cm
4 cm
4 cm
3 cm

3.5 cm
4 cm
3 cm
4 cm
6.5 cm
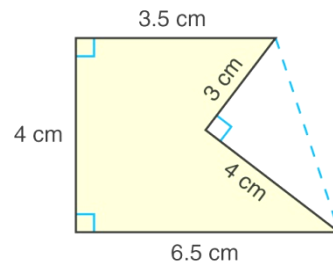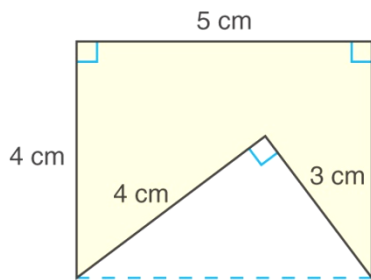
(ii) Which method would you use to calculate the areas of the following figures? Filling or Dividing? Find the areas using the method you choose.

Suggested answers:

A) i) $\frac{1}{2}$ x base x height   side x side   length x width

     base x height $\frac{1}{2}$ x height x (upper side + lower side)

A ii) 1. 22 cm^2 2. 27 cm^2 3. 21 cm^2 4. 15 cm^2

B i) any possible answer

B ii) 25.5 cm^2 152 cm^2 25 cm^2 74 cm^2

C i) 14 cm^2 14 cm^2

C ii) 88 cm^2 132 m^2 22 cm^2