

Developing Conceptual Understanding of Number

Set J: Perimeter and Area

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Perimeter and Area 1

Vocabulary

- perimeter
- area
- centimetres
- right angle

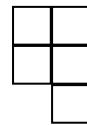
Notes

- In this set, students are encouraged to conceptually understand the terms “perimeter” and “area” rather than relying on formulas.
- Perimeter should include linear units such as millimetres, centimetres, metres, etc. If the unit of measure is unknown, students should get in the habit of including the word “units”.
- Area should include square units such as mm^2 , cm^2 , m^2 , etc. If the unit of measure is unknown, students should get in the habit of including either the words “square units” or the symbols “ u^2 ”.

Answers

1. a) 5 small squares could be in Figure 4.

A possible Figure 4 is:



b) 8 units

c) 4 square units

2. a) 24 cm

b) 22 cm

3. a) P = 2 units

Q = 3 units

b) P = 2 units

Q = 5 units

Perimeter and Area 1

1. Use the pattern in the figures on the right to help answer the questions.



Figure 1

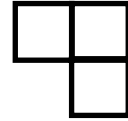


Figure 2

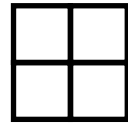


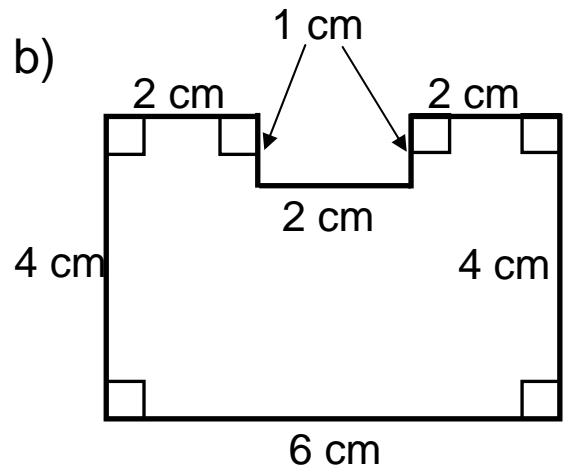
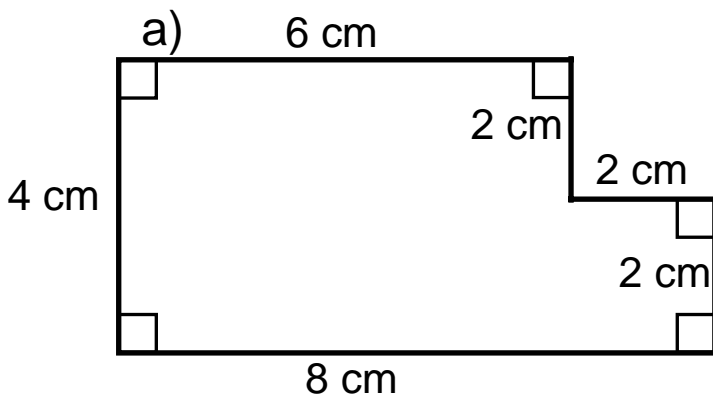
Figure 3

a) How many small squares would be in Figure 4? Draw a Figure 4.

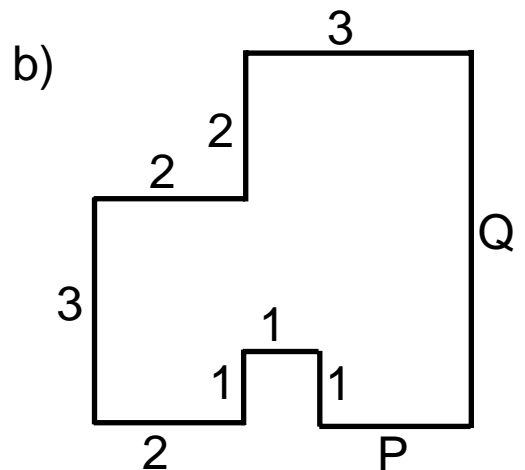
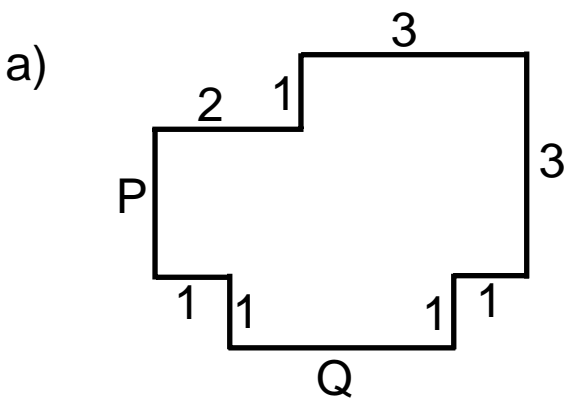
b) What is the perimeter of Figure 2?

c) What is the area of Figure 3?

2. What is the perimeter, in centimetres, for each figure below?



3. In each diagram, all angles are right angles. Find the missing lengths for P and Q.



Perimeter and Area 2

Vocabulary

- dimensions

Notes

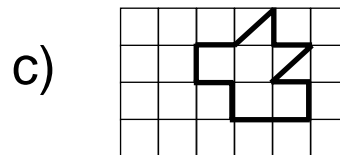
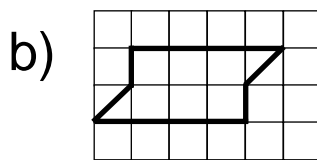
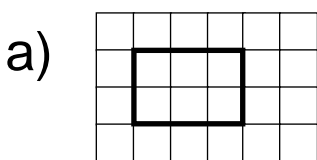
- For #1, students should note that the given unit is “squares”.

Answers

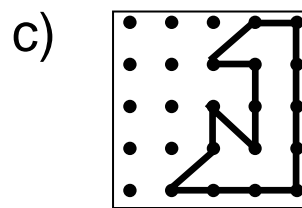
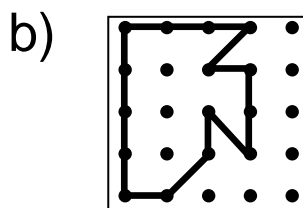
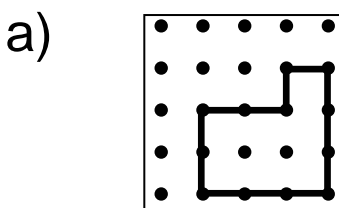
- a) 6 squares
 - b) 7 squares
 - c) 5 squares
- a) 7 squares
 - b) 9.5 squares
 - c) 6.5 squares
- a) Possible Answers:
 - Shape B has the greatest area as it is a full circle. Shapes A and C look like they have a similar diameter with pieces removed
 - ...
 - b) Possible Answers:
 - Lay a grid on top of Shape A and count the units.
 - Find the area of half the figure and double it.
 - Find the area of one “finger” and multiply by 7.
 - ...
- a) 9 units by 4 units
 - b) 7 units by 6 units

Perimeter and Area 2

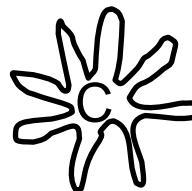
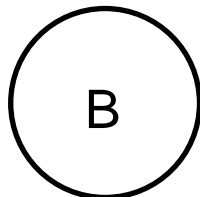
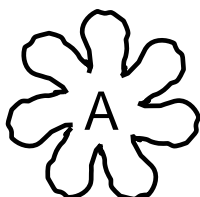
1. Find the area, in small squares, for each figure:



2. Find the area, by counting all the unit squares and half squares, for each figure:



3. Consider the following diagrams.



- a) Which shape has the greatest area? Why?
b) How could you find the area of figure A?

4. Give the dimensions of a rectangle satisfying the following conditions.

- a) area = 36 square units; length of one side = 9 units.
b) area = 42 square units; length of one side = 7 units.

Perimeter and Area 3

Vocabulary

Notes

- Students could have graph paper to aid in answering these questions.

Answers

1. Tim is correct.
Possible Explanations:
 - A square with each side equal to 3 units has a perimeter of 12 units and an area of 9 square units. But a rectangle with dimensions 2 units by 4 units would have a perimeter of 12 units and would only have an area of 8 square units.

- Using diagrams:



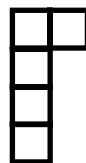
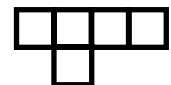
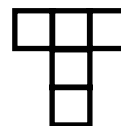
$$P = 8 \text{ units}$$
$$A = 4 \text{ u}^2$$



$$P = 8 \text{ units}$$
$$A = 3 \text{ u}^2$$

- ...

2. Possible Answers:



Perimeter and Area 3

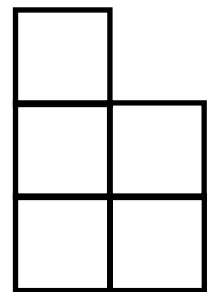
1. Two Middle Grades mathematics students are arguing.

Jan says, “If I have two shapes with the same perimeter, then these shapes must have the same area.”

Tim says, “I disagree. If two shapes have the same perimeter, then they can have different areas.”

Use examples to show who is correct.

-
2. Consider the shape on the right.
It has an area of 5 square units and a perimeter of 10 units.



Draw 3 other shapes each with an area of 5 square units and a perimeter greater than 10 units.

Perimeter and Area 4

Vocabulary

- interval

Notes

Answers

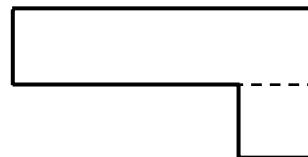
1. a) 14 cm
b) 16 cm

2. a) 9 cm^2
b) 12 cm^2

3. 44 cm

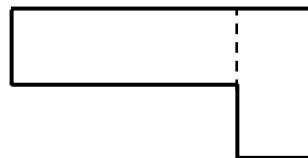
4. Possible Answers:

- Split the figure into two rectangles in the following ways:



$$(4 \times 1) + (1 \times 1) = 5$$

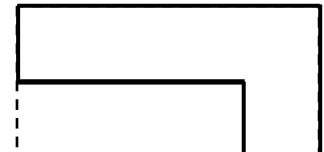
\therefore Area is 5 cm^2



$$(3 \times 1) + (2 \times 1) = 5$$

\therefore Area is 5 cm^2

- Create a 1 cm by 1 cm grid and lay it over top of the figure. Count the squares. There would be 5 squares so the area is 5 cm^2 .
- Complete the rectangle as shown below. Find its area (8) and remove or subtract the amount added (3). Area is $8 - 3 = 5 \text{ cm}^2$.

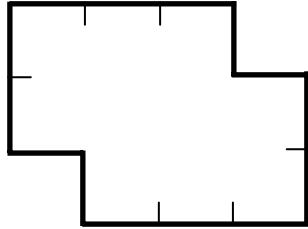


- ...

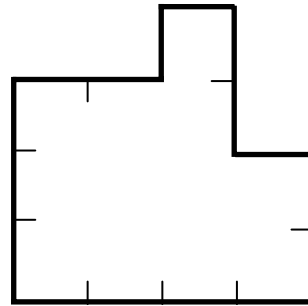
Perimeter and Area 4

1. Find the perimeter of the following shapes if each marked interval is 1 centimetre.

a)

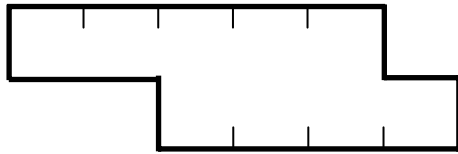


b)

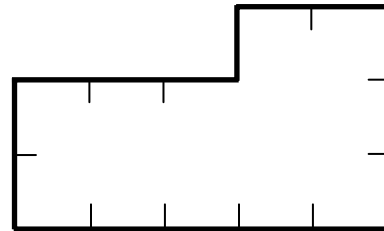


2. Find the area of the following shapes if each marked interval is 1 centimetre.

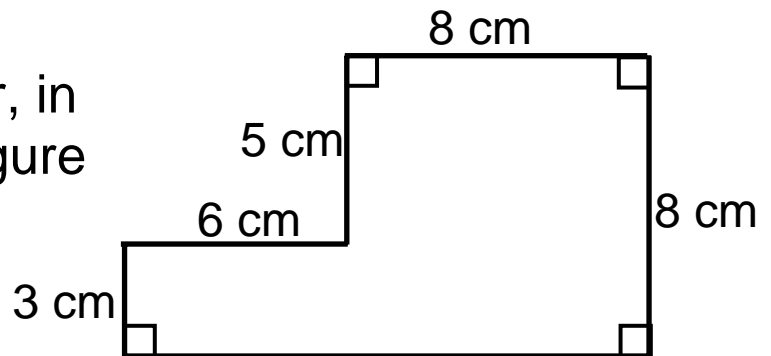
a)



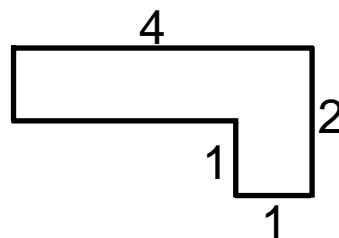
b)



3. What is the perimeter, in centimetres, of the figure on the right?



4. Show two different ways to find the area for the shape drawn below. All angles are right angles. All measurements are in centimetres.



Perimeter and Area 5

Vocabulary

- rectangular regions

Notes

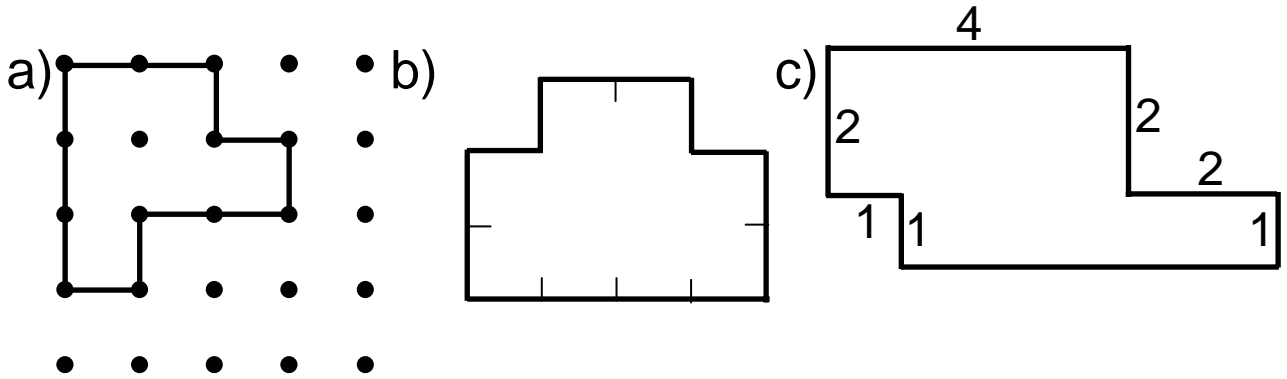
- For #2, students should be encouraged to use different ways to divide each figure.

Answers

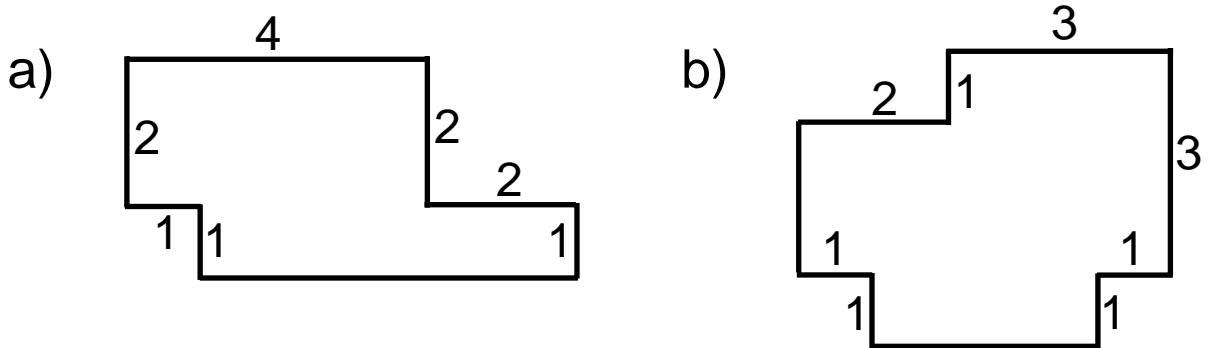
- a) 12 cm
 - b) 14 cm
 - c) 18 cm
- a) 13 square units
 - b) 16 square units
- a) C has the greatest perimeter.
Possible Explanations:
 - If I used a string to trace along each figure, I'd need more string for shape C as it curves in more times or has more "fingers".
 - ...
 - b) Possible Answers:
 - Take a piece of string and trace out the shape. Then measure the piece of string.
 - There are 8 approximately equal "fingers". If the perimeter of one "finger" was found using a ruler, then the answer could be approximated by multiplying by 8.
 - ...

Perimeter and Area 5

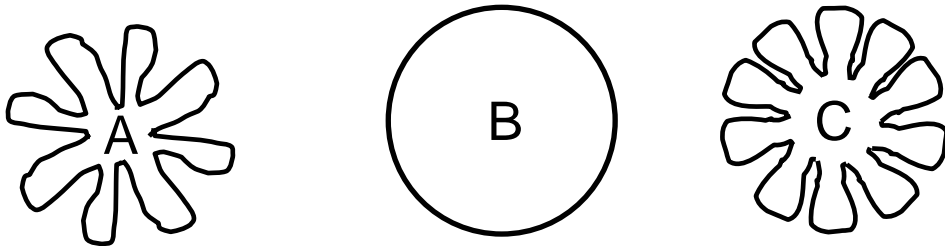
1. Find the perimeter of each shape if the interval is 1 centimetre or the measurement is in centimetres.



2. Divide each figure into rectangular regions. Find the total area by adding the areas of the regions.



3. Consider the diagrams below.



- a) Which shape has the greatest perimeter? Why?
 b) Describe how to find the perimeter of shape A.

Perimeter and Area 6

Vocabulary

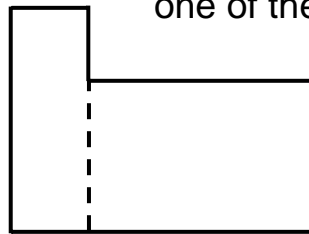
Notes

Answers

- a) 14 cm b) 22 cm
- a) 15 cm^2 b) 11 cm^2
- 44 cm

4. Possible Answers:

- Split the figure into two rectangles in one of the following ways:

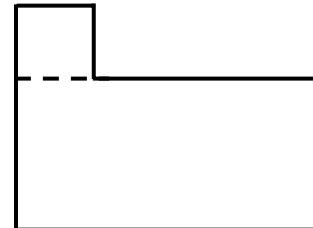


$$(1 \times 1) + (2 \times 3) = 9$$

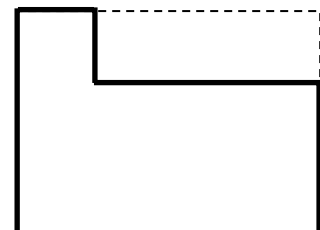
\therefore Area is 9 cm^2

$$(3 \times 1) + (2 \times 3) = 9$$

\therefore Area is 9 cm^2



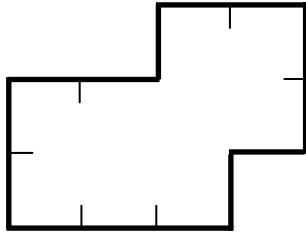
- Create a 1 cm by 1 cm grid and lay it over top of the figure. Count the squares. There would be 9 squares so the area is 9 cm^2 .
- Complete the rectangle as shown below. Find its area (12) and remove or subtract the amount added (3). Area is $12 - 3 = 9 \text{ cm}^2$.
- ...



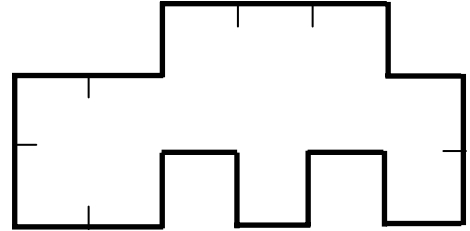
Perimeter and Area 6

1. Find the perimeter of the following shapes if each marked interval is 1 centimetre.

b)

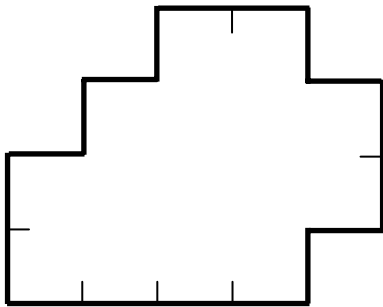


b)

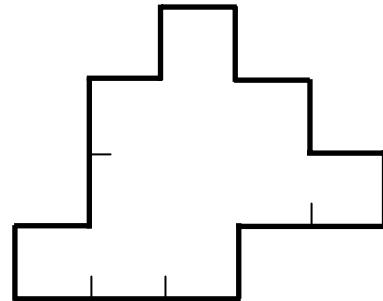


2. Find the area of the following shapes if each marked interval is 1 centimetre.

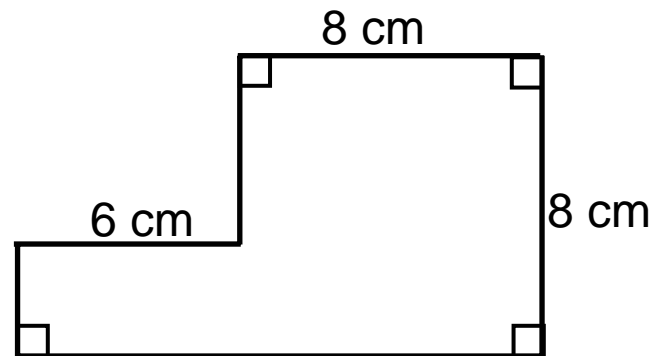
b)



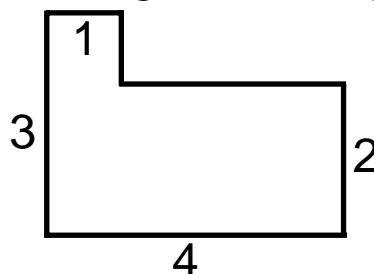
b)



3. What is the perimeter, in centimetres, of the figure on the right?



4. Show two different ways to find the area for the shape drawn below. All measurements are in centimetres. All angles are right angles.



Perimeter and Area 7

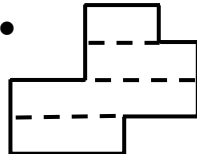
Vocabulary

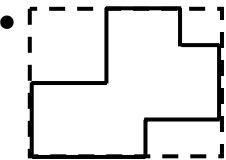
Notes

Answers

1. a) 14 cm b) 22 cm
c) 18 cm

2. Possible Answers:

•  $(2 \times 1) + (3 \times 1) + (5 \times 1) + (3 \times 1) = 13$ square units

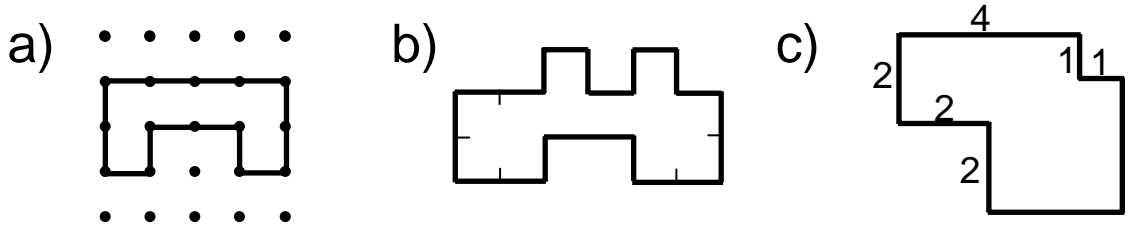
•  $(5 \times 4) - (1 \times 1) - (2 \times 1) - (2 \times 2) = 13$ square units

• ...

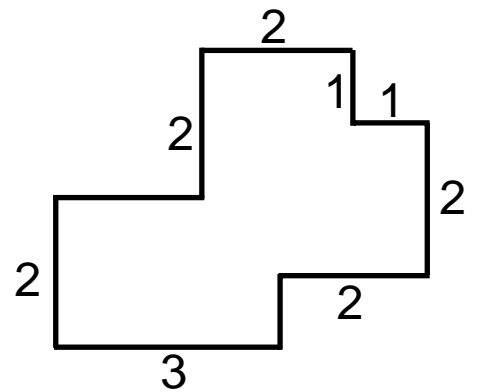
3. a) Shape C has the largest perimeter
Possible Explanations:
- If I used a string to trace along each figure, I'd need more string for shape C as it curves more times or has more prongs/fingers.
 - ...
- b) Possible Answers:
- Take a piece of string and trace out shape C. Then measure the piece of string.
 - There are 10 approximately equal "fingers". If the perimeter of one "finger" was found using a ruler, then the answer could be approximated by multiplying by 10.
 - ...

Perimeter and Area 7

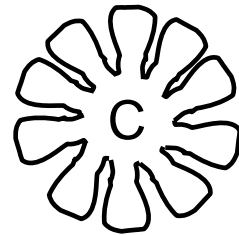
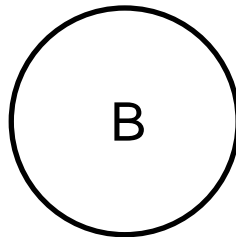
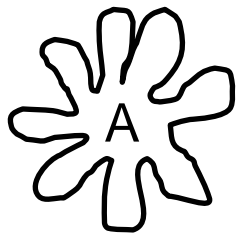
1. Find the perimeter of each shape if the interval is 1 centimetre or the measurement is in centimetres.



2. There are two basic ways to find the area of irregular rectangular shapes. One way is to divide the shape into rectangular regions and then to add the areas of the regions. The other way is to draw a rectangle which just encloses the irregular rectangular shape and then to subtract areas not in the original shape. Find the area of the shape on the right using each method described above.



4. Consider the diagrams.



- c) Which shape has the greatest perimeter? Why?
 d) Describe two ways to find the perimeter of shape C.