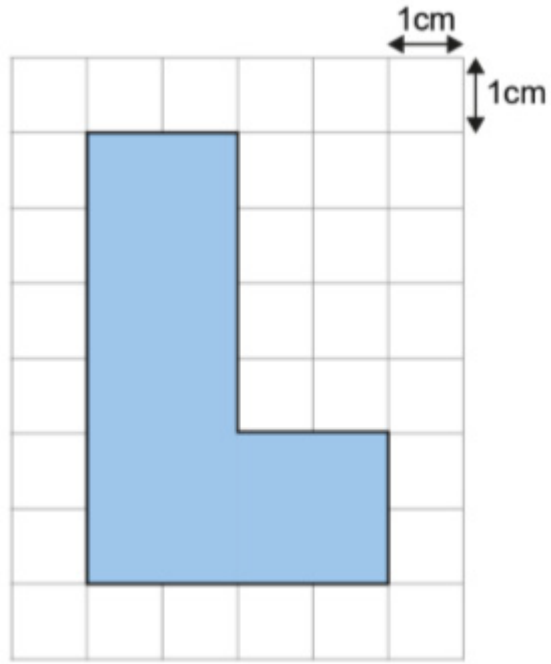
1. Sarah draws a rhombus with a perimeter of **36cm**.

What is the length of each side?

cm

1 mark

2.



***Not** drawn to scale.*

What is the perimeter of this shape?

cm

1 mark

3. Pupils must be able to identify regular polygons, and reason why a given polygon is regular.

Language focus

"This is a regular polygon, because all of the sides are the same length, and all of the interior angles are equal."

Pupils often define a regular polygon as having equal side-lengths and neglect to mention the angles – it is important that pupils consider both sides and angles when assessing and describing whether a polygon is regular. Pupils should examine and discuss a wide range of irregular shapes, including examples with equal angles, but unequal side-lengths (shape **d** below), examples with equal angles, but unequal interior angles and unequal side-lengths (shape **c** below), and examples with equal side-lengths, but unequal angles (shape **e** below).

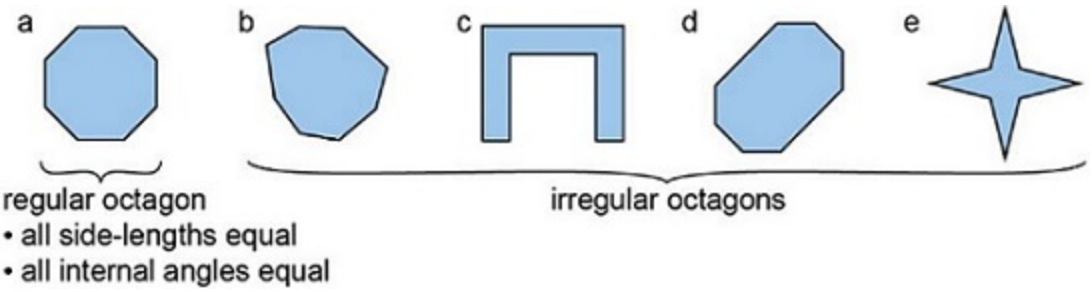
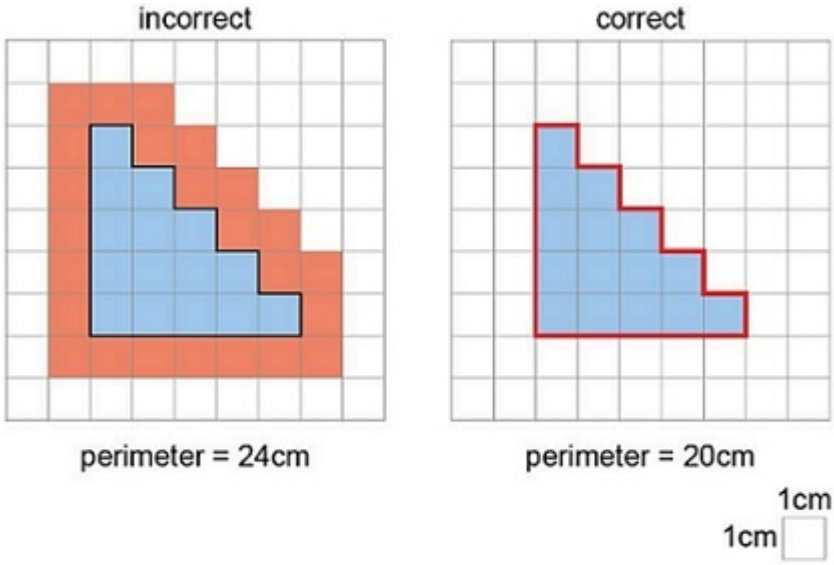


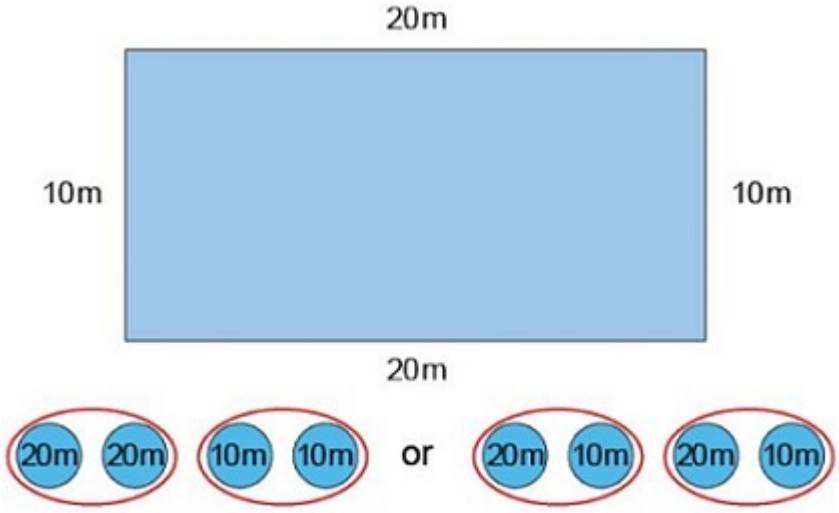
Figure 1 : a regular octagon and 4 irregular octagons

Pupils can make different polygons with equal length geo-strips to explore regular shapes and irregular shapes with equal side-lengths but unequal angles. Pupils should compare angles using informal language, and begin to discuss whether angles are smaller than a right angle (acute), larger than a right angle but smaller than a ‘straight line’ (180°) (obtuse), or larger than a ‘straight line’ (180°) (reflex) in preparation for measuring angles with a protractor in year 5.

Pupils should also learn that equilateral triangles are regular triangles, and that squares are regular quadrilaterals.

Pupils need to understand perimeter as the total distance around the outside of a shape, and be able to measure or calculate the perimeter of shapes with straight sides. Pupils should be able to measure side-lengths in centimetres or metres, as appropriate, using skills developed from year 1 onwards. They should use an appropriate strategy to find the perimeter of a given polygon, according to the property of the shape.

Shape type	Strategy for calculating the perimeter
rectilinear shapes on centimetre-square-grids	count the number of centimetre lines around the shape  **Figure 2 : incorrect and correct methods for finding the perimeter of a rectilinear shape on a square grid** *Drawn to scale*.
polygons with equal side-lengths	use multiplication: perimeter = side-length × number of sides
polygons with unequal side-lengths	use addition: perimeter = sum of the side-lengths

Shape type	Strategy for calculating the perimeter
rectangles	use doubling and addition: perimeter = 2 × (length + width) or perimeter = (2 × length) + (2 × width)  Figure 3 : strategies for calculating the perimeter of a rectangle *Drawn to scale*.

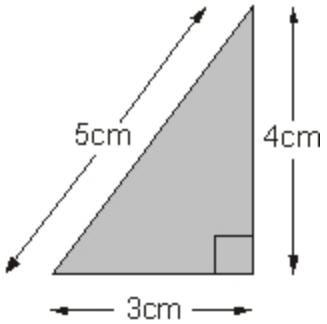
As well as working with ‘small’ shapes in the classroom, pupils should gain experience working with larger shapes, such as calculating the perimeter of a rectilinear area drawn on the playground in metres.

Making connections

Pupils must be fluent in multiplication table facts (**4NF–1**) to efficiently calculate the perimeter of polygons with equal side-lengths. They must also be able to apply appropriate strategies for adding more than 2 numbers to calculate the perimeter of irregular polygons.

4. **Making shapes**

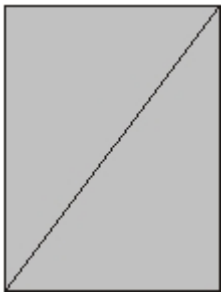
I have some triangular tiles like this:



Not drawn accurately

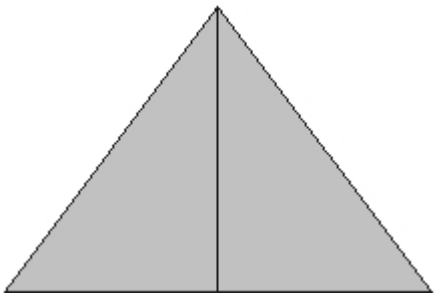
I use two of these tiles to make different shapes.

For each shape, work out its **perimeter**.



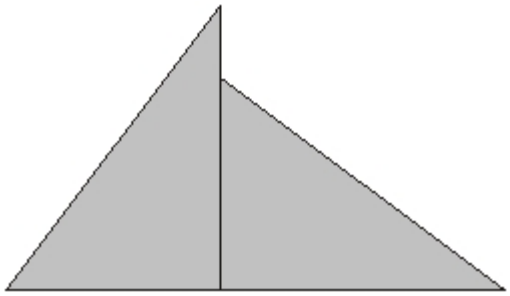
The perimeter of the rectangle is: ____ cm

1 mark



The perimeter of the isosceles triangle is: ____ cm

1 mark

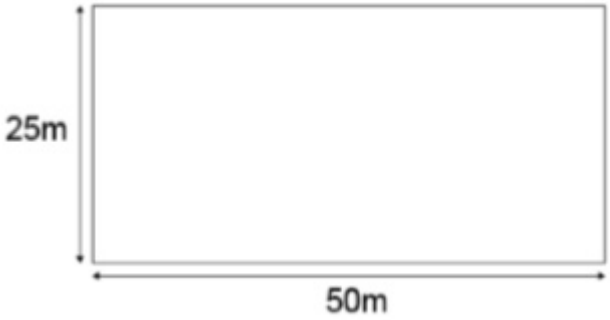


The perimeter of the quadrilateral is: cm

1 mark

5. Here is a plan of a school playground.

The Head wants to put a fence around the perimeter.



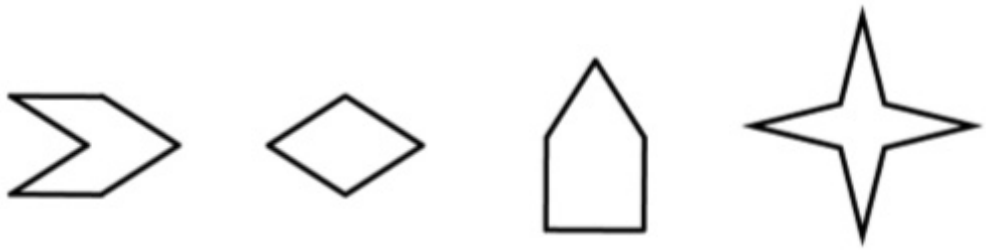
***Not** drawn to scale.*

How many metres of fencing is needed?

m

1 mark

6. Taro uses some **8cm** sticks to make these shapes.



A B C D

***Not** drawn to scale.*

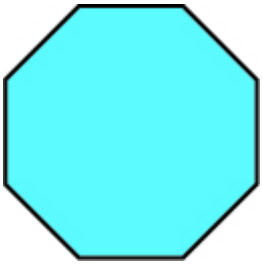
Name each shape and find its perimeter.

Complete the table.

Shape	Name of shape	Perimeter
Shape A		
Shape B		
Shape C		
Shape D		

2 marks

7. A regular octagon has a perimeter of **72cm**.

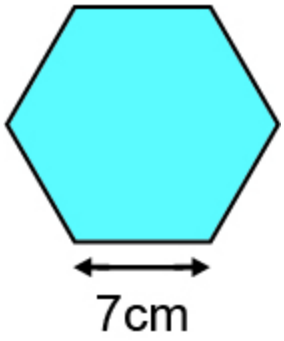


What is the length of each of the sides?

. cm

1 mark

8. A regular hexagon has sides of **7cm**.

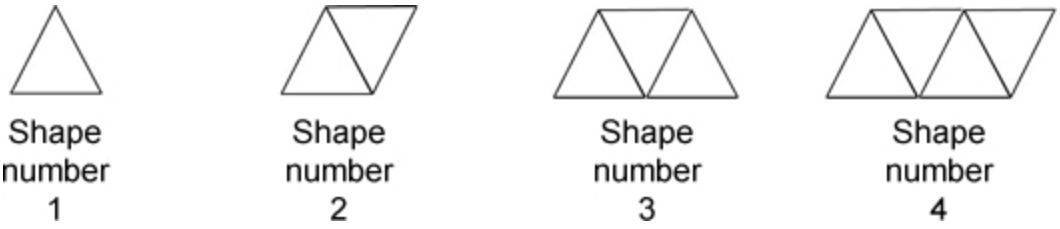


What is its perimeter?

cm

1 mark

9. Jo places equilateral triangles in straight lines to make this sequence.



(a) Which word below describes **shape number 3**? Put a ring round it.

parallelogram rhombus pentagon trapezium

1 mark

(b) Look at the table below.

Shape number	Perimeter
1	3cm
2	4cm
3	5cm
4	6cm

Jo makes **shape number 15**

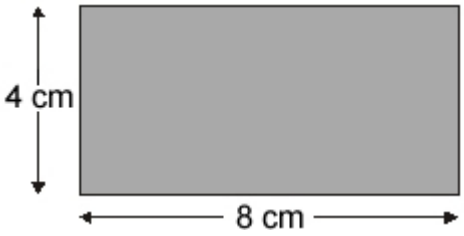
What is the **perimeter** of shape number 15?

cm

1 mark

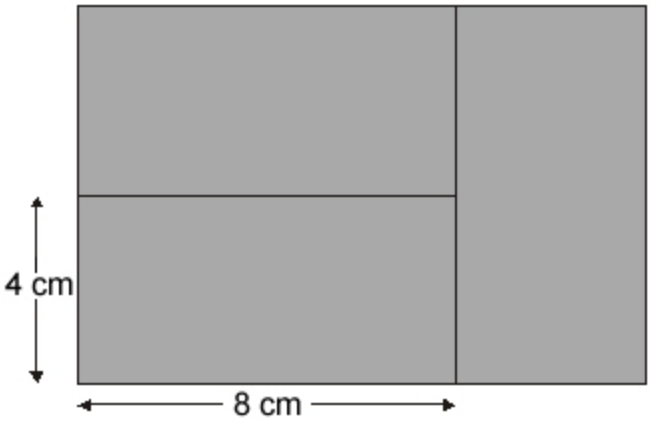
10. **Block of three**

A rectangle measures 4 centimetres by 8 centimetres.



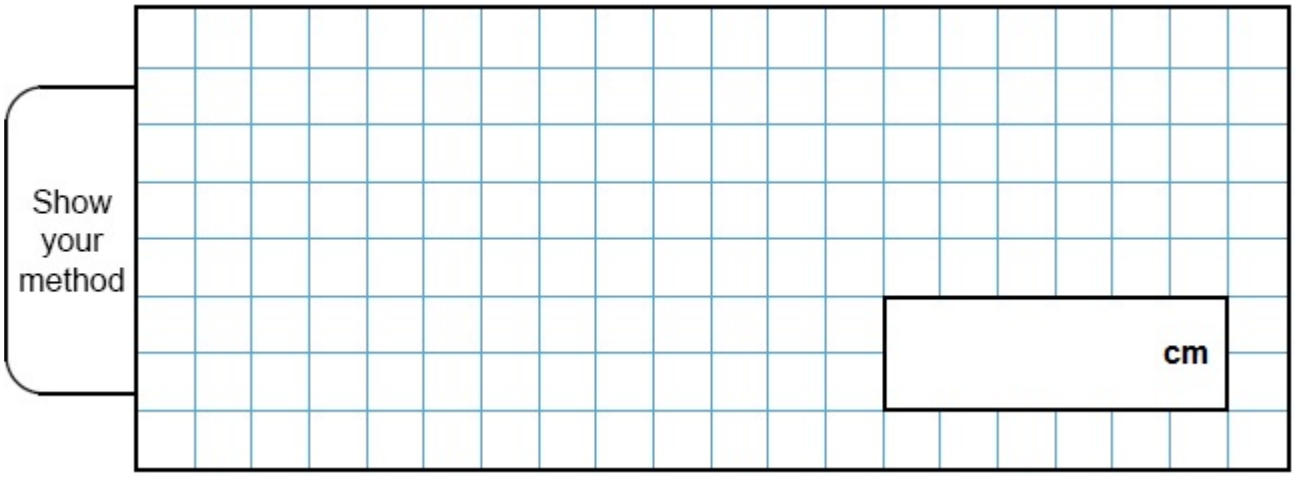
Not drawn accurately

Kelly uses three of these rectangles to make a larger rectangle.



Not drawn accurately

Work out the distance around the outside of this larger rectangle.



2 marks

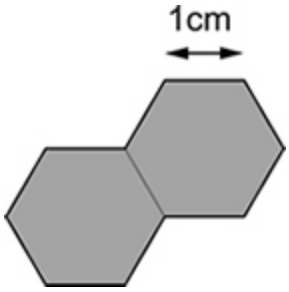
11. **Hexagon tiles**

All the hexagons in this question are the same size.

Each side of a hexagon is **1cm** long.

(a) I put **two hexagons** together to make this shape.

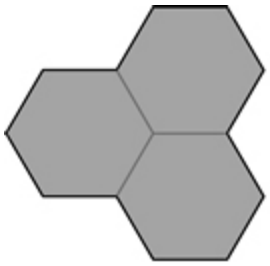
What is the **perimeter** of the shape?



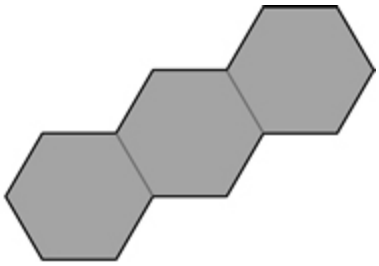
cm

1 mark

(b) I put three hexagons together to make different shapes.



Shape **A**



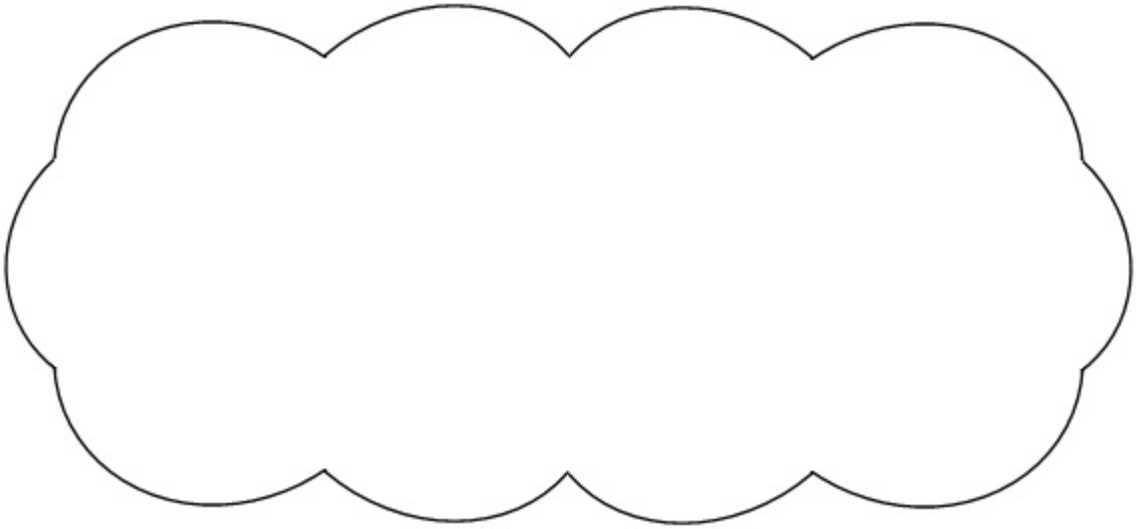
Shape **B**

Which shape has the **smaller** perimeter?

Tick (✓) the correct box.

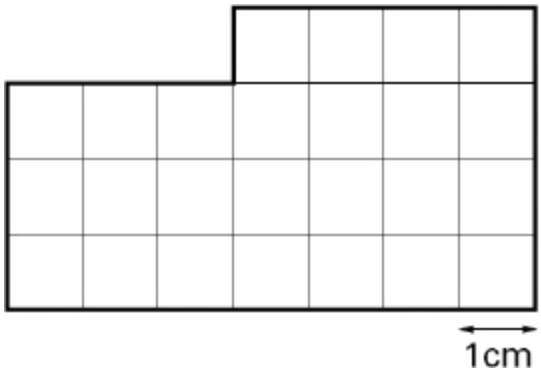
☐ A ☐ B ☐ Both the same

Explain how you know.



1 mark

12. Here is a shape divided into centimetre squares.



Actual size

What is the **perimeter** of the shape?

cm

1 mark

13. The following quadrilaterals all have **a perimeter of 32 cm**.

Here is a table to show the length of each side.

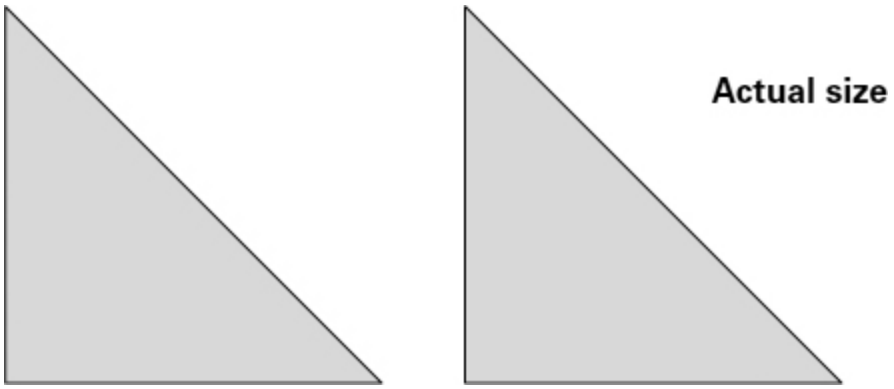
Complete the table.

One quadrilateral is done for you.

	Side lengths			
square	8 cm	8 cm	8 cm	8 cm
rectangle	3 cm			
rhombus	8 cm			
kite	12 cm			

2 marks

14. These two triangles are the same.



Jade fits them together to make a **square**.

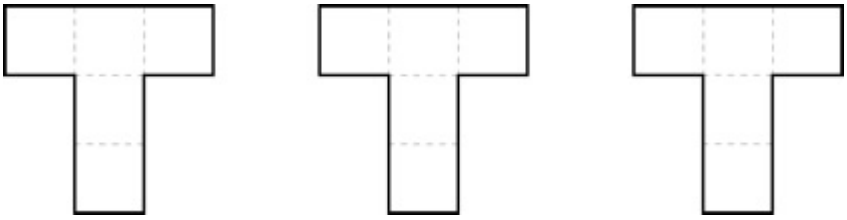
What is the total length around all the sides of the **square**?

cm

1 mark

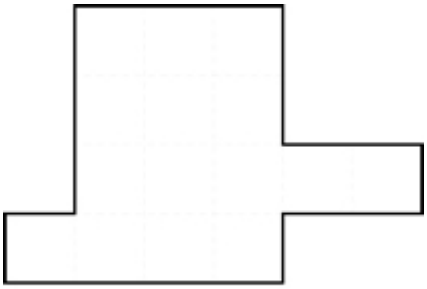
15. **T-shapes**

Here are three T-shapes drawn on centimetre square grids.



(a) The three T-shapes fit together to make shape A.

Show the three T-shapes on the diagram below.



shape A

1 mark

(b) What is the **total area** of shape A?

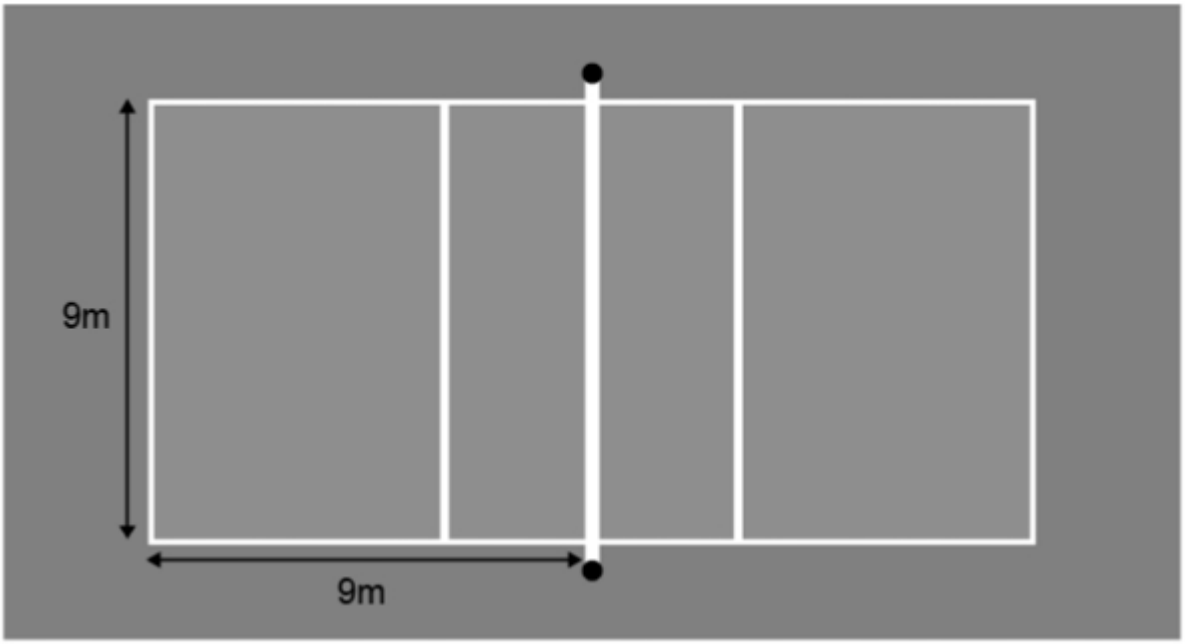
cm²

1 mark

16. **Task**: Estimate the area of your classroom floor.

1 mark

17. Each half of a volleyball court is a 9m × 9m square.



What is the total area of a volleyball court?

m²

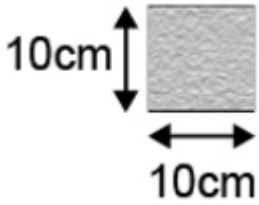
1 mark

18. Draw a rectangle with an area of 12cm^2 on this square-centimetre grid.

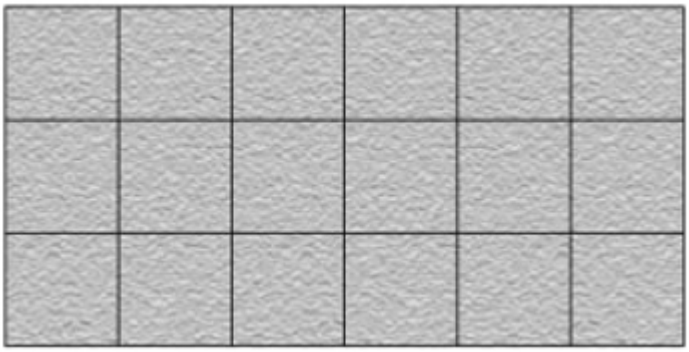
1 mark

19. Leila is putting some tiles on the wall behind her kitchen sink.

Each tile is square, with sides equal to **10cm**.



Here is the area she has tiled so far.



a. What is the area Leila has tiled so far?

cm^2

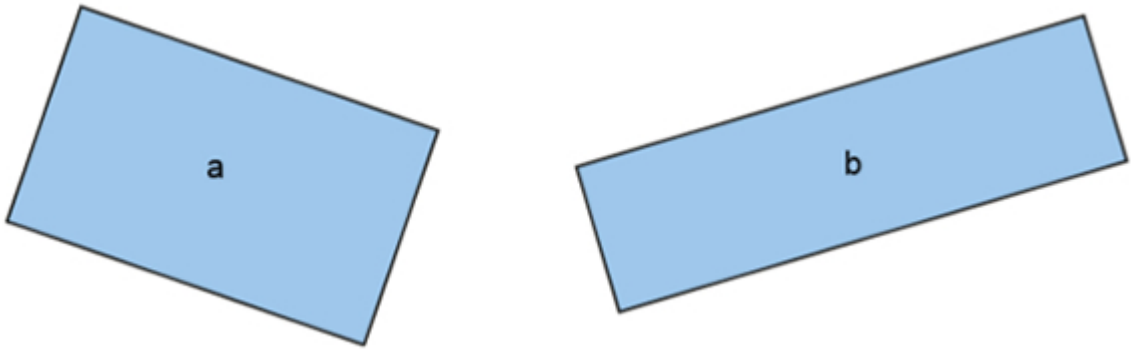
1 mark

b. Leila adds one more row of tiles on top of these ones.
What is the total area she will have tiled?

cm^2

1 mark

20. Find the area of each of these rectangles.



a = cm^2

1 mark

b = cm^2

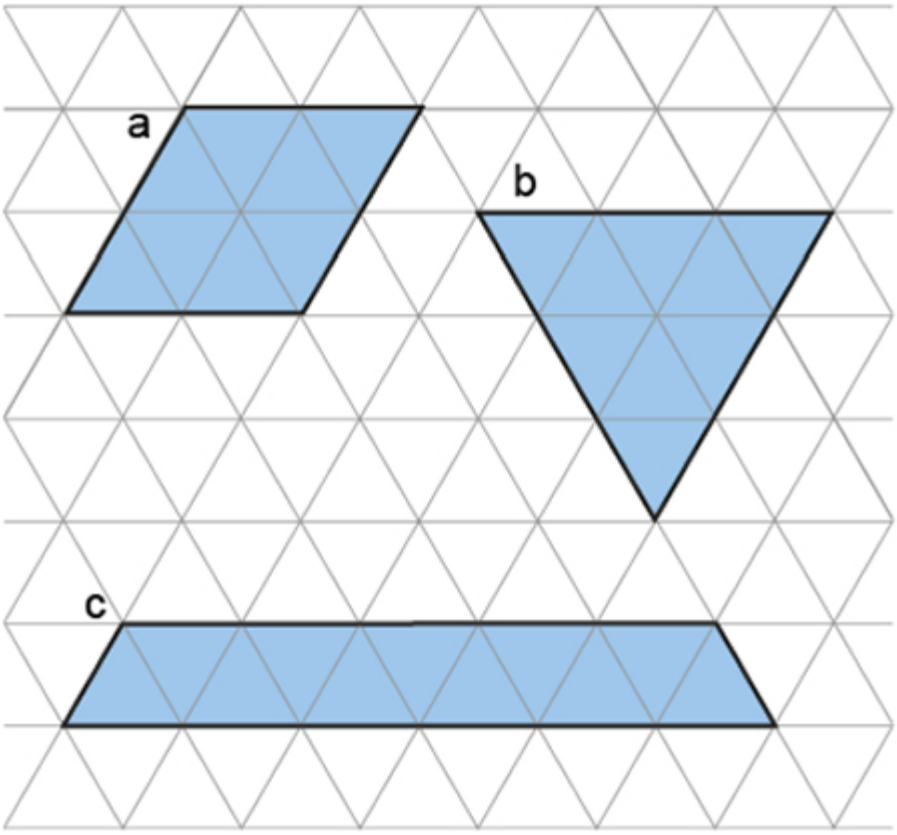
1 mark

21. Draw a hexagon with an area of $12cm^2$ on this square-centimetre grid.

1 mark

22. Here are three shapes on a triangular grid.

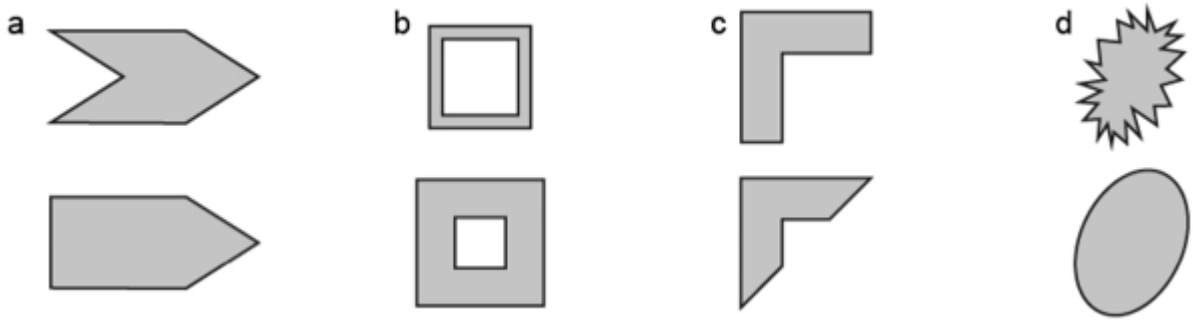
Put the shapes in order from smallest to largest according to their area.



Smallest

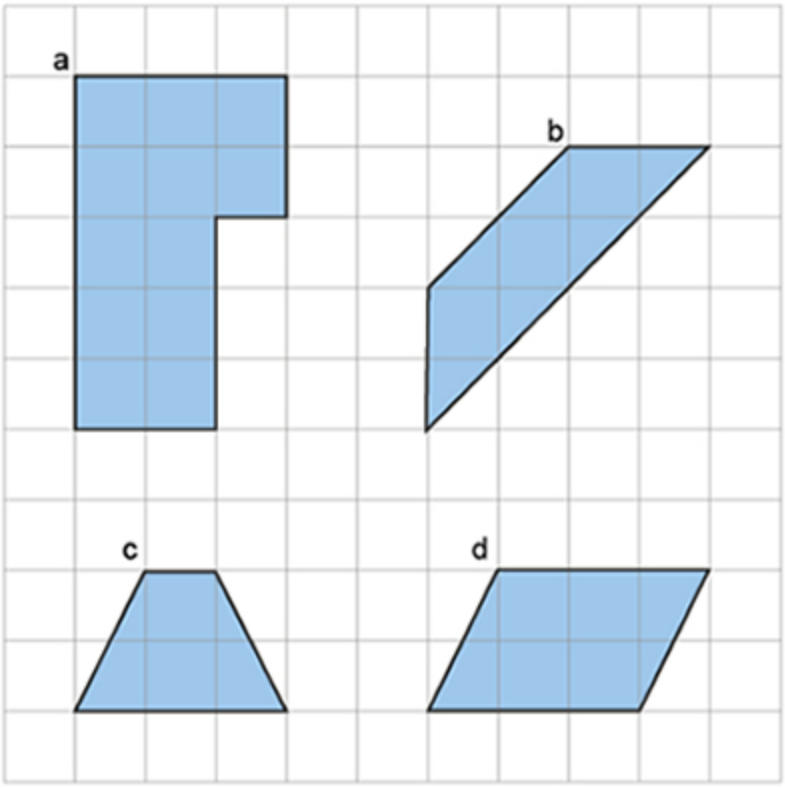
1 mark

23. For each pair of shapes, tick the shape with the larger shaded area.



2 marks

24. Find the area of these shapes drawn on a square-centimetre grid.



a = ____ cm^2

b = ____ cm^2

c = ____ cm^2

d = ____ cm^2

2 marks

25. Pupils need to know that the area of a shape is the space within a shape. When there is a clear visual difference, pupils should be able to compare the area of shapes without making a quantitative evaluation of each area. For example, pupils can see that the circle has a larger area than the decagon.

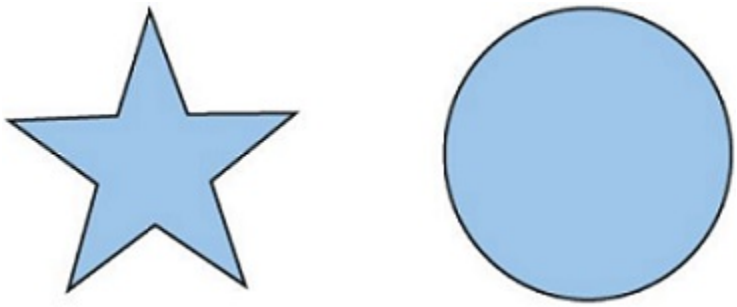


Figure 1 : a decagon and a circle with a clear visual difference in area

Pupils should learn that, when there is not a clear visual difference between areas, a common unit can be used to quantify the areas and enable comparison. They should understand that any unit can be used, but that the square centimetre (cm^2) is the standard unit of measure for area that they will use most frequently. Pupils should gain a sense of the size of a square centimetre, and the notation used, before they begin to quantify other areas using this unit.

Figure 2 : a square centimetre

Pupils need to be able to find the area of shapes drawn on square-centimetre grids by counting squares, including shapes for which some of the area is made up of half squares. They should understand that different shapes can have the same area.

Figure 3 : a rectangle, square and triangle with equal areas

Drawn to actual size.

Pupils should then learn that the area of a rectangle can be calculated by multiplying the length by the width. They should learn why this is the case by examining rectangles drawn on square-centimetre grids, and understand that the factors can be written in either order: the area of the rectangle below is equal to 4 rows of 5 square centimetres, or 5 columns of 4 square centimetres. This should build on pupils understanding of the grouping structure of multiplication and array representations.

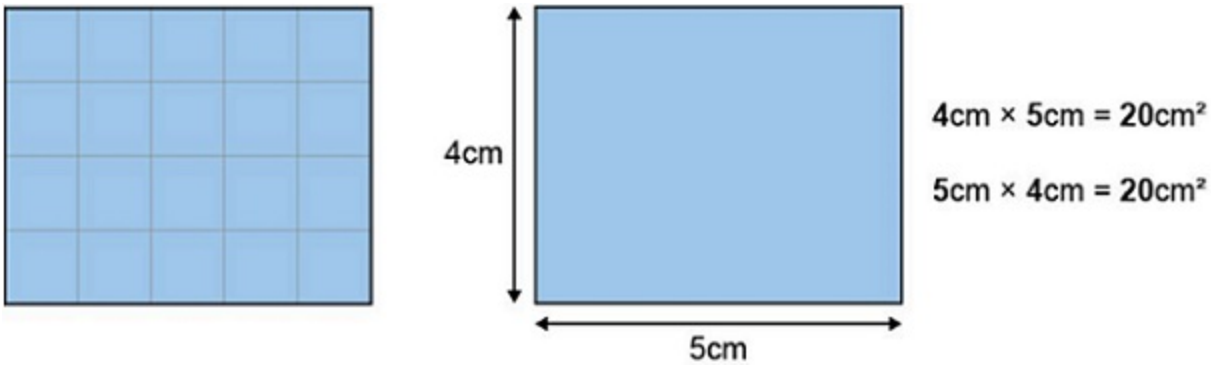


Figure 4 : the area of a rectangle can be calculated by multiplying the length by the width

Drawn to actual size.

Language focus

"To find the area of a rectangle, multiply the length by the width."

Pupils should learn that the area of larger shapes and spaces, such as the floor or ceiling of the classroom, or the playground, is expressed in square metres (m^2). Pupils should experience working with large spaces directly, as well as drawings representing them.

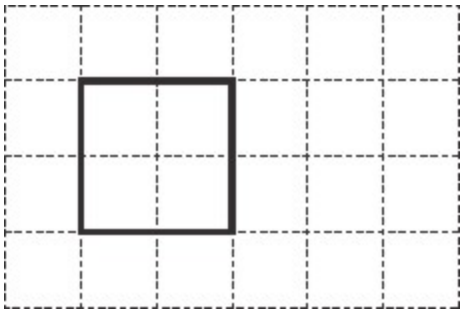
Making connections

Pupils must be able to multiply two numbers together in order to calculate the area of a rectangle, including:

- known multiplication facts within the multiplication tables (**5NF–1**) (for example, to calculate the area of a 9cm by 4cm rectangle)
- scaling known multiplication facts by 10 or 100 (**3NF–3** , **4NF–3** and **5NF–2**) (for example, to calculate the area of a 0.2m × 3m rectangle or a 20m × 3m rectangle)
- other mental or written methods (for example, to calculate the area of a 15cm × 8cm rectangle)

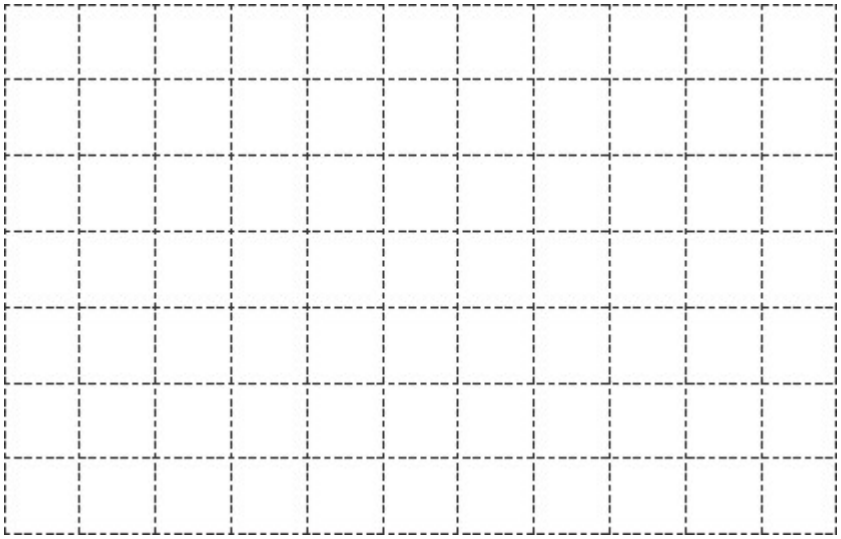
26. Ling drew this **square**.

It has **4** small squares inside.



Look at the grid below.

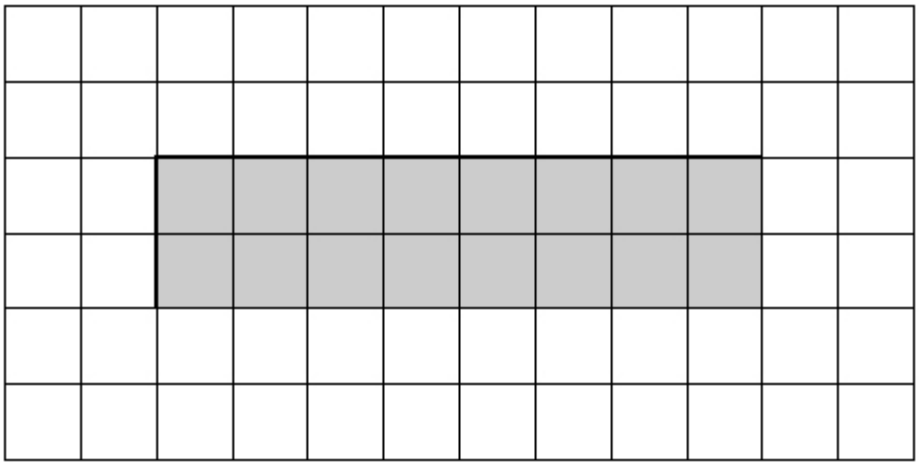
Draw a **square** on it which has **16** small squares inside.



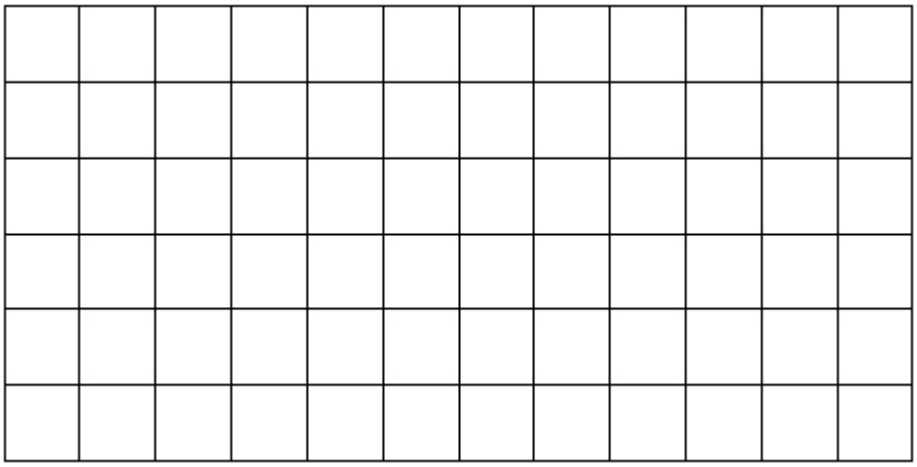
1 mark

27. **Thinking shapes**

The diagram shows a rectangle, drawn on a square grid.

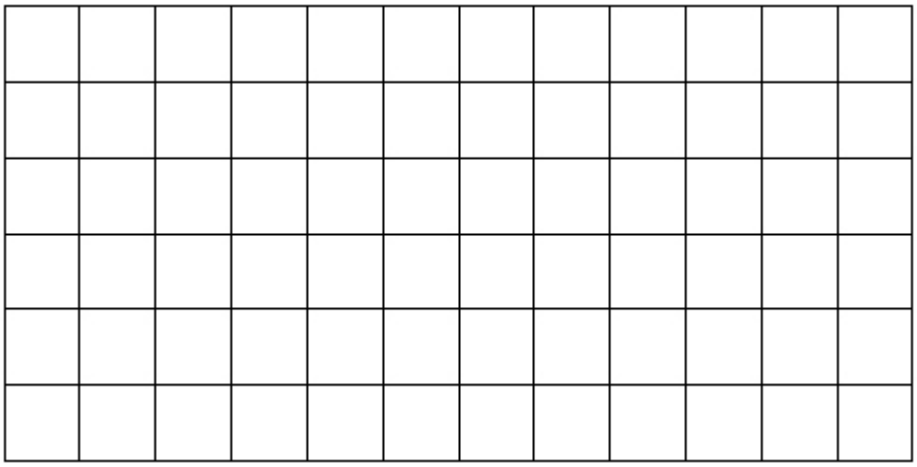


(a) Draw a **square** that has the **same area** as the rectangle.



1 mark

(b) Draw a **square** that has the **same perimeter** as the rectangle.

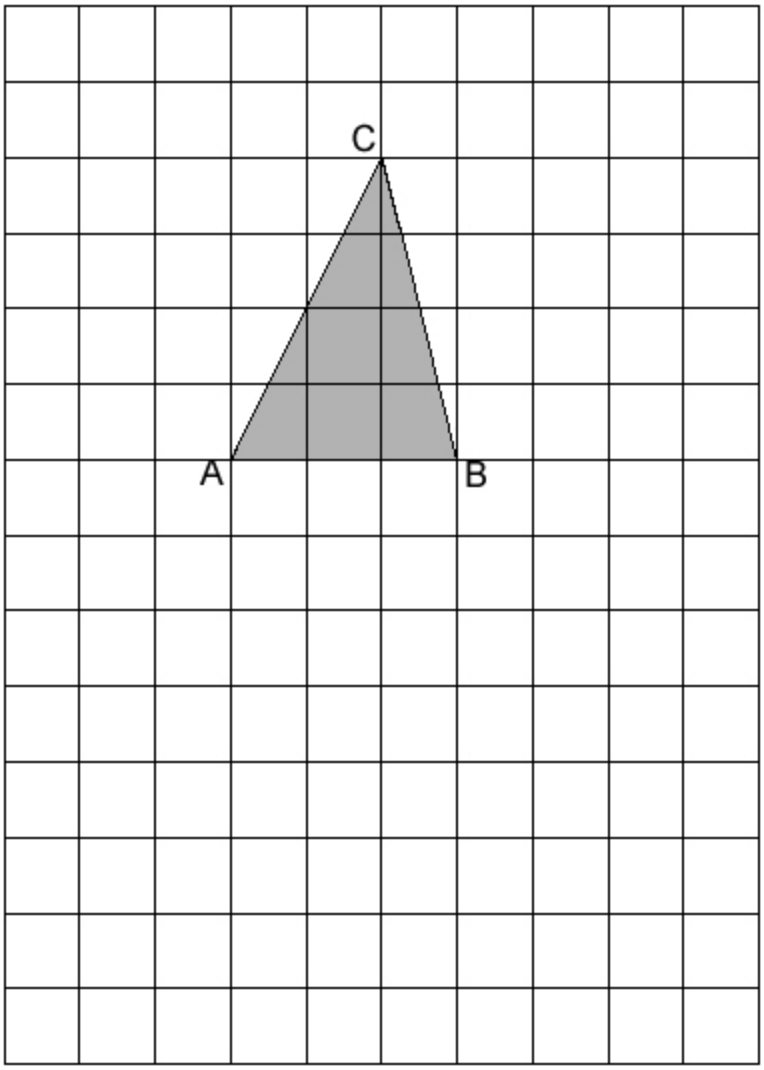


1 mark

28. **Areas**

Triangle ABC is drawn on a square grid.

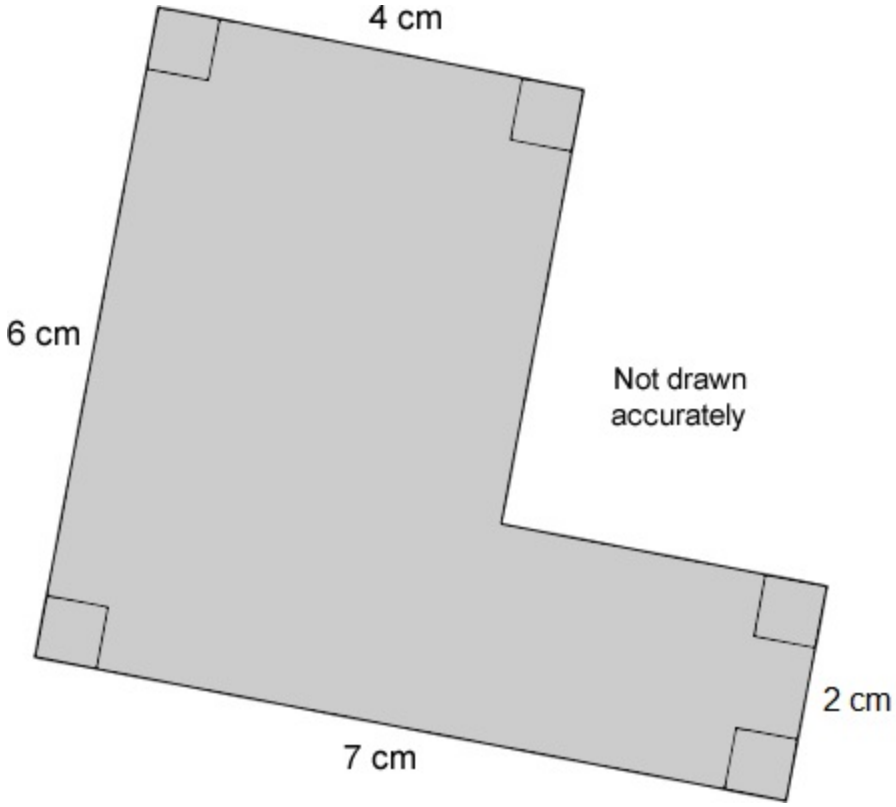
On the grid, draw a **rectangle** that has the **same area** as triangle ABC.



1 mark

29. **L-shape**

What is the area of this L-shape?



Show your method

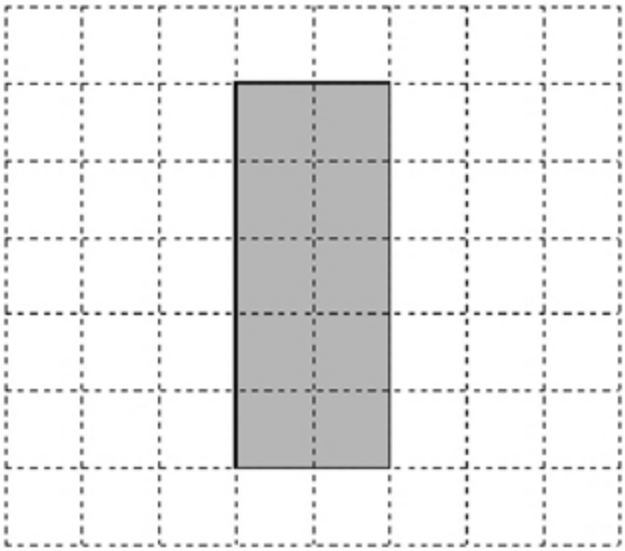
cm²

2 marks

30. **Trapezium**

The grids in this question are centimetre square grids.

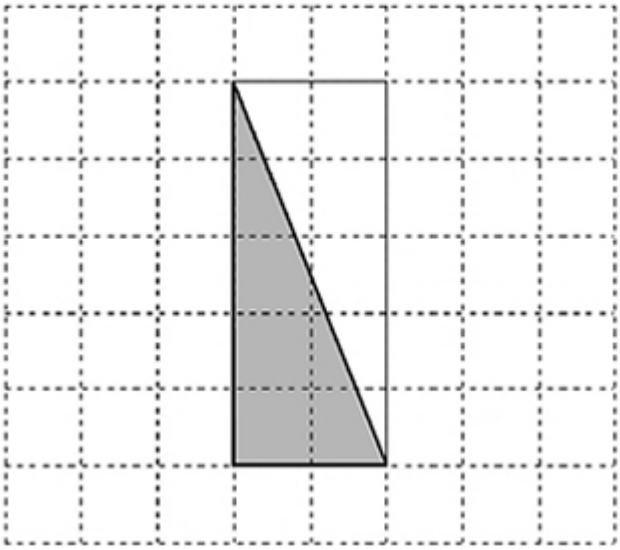
(a) What is the **area** of this shaded rectangle?



cm²

1 mark

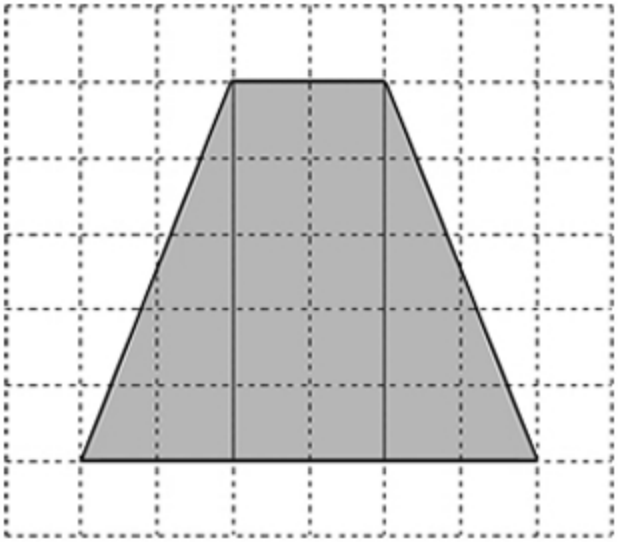
(b) What is the **area** of this shaded triangle?



cm²

1 mark

(c) What is the **area** of this shaded trapezium?

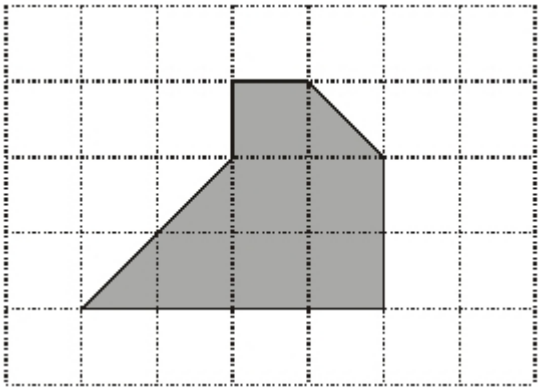


cm²

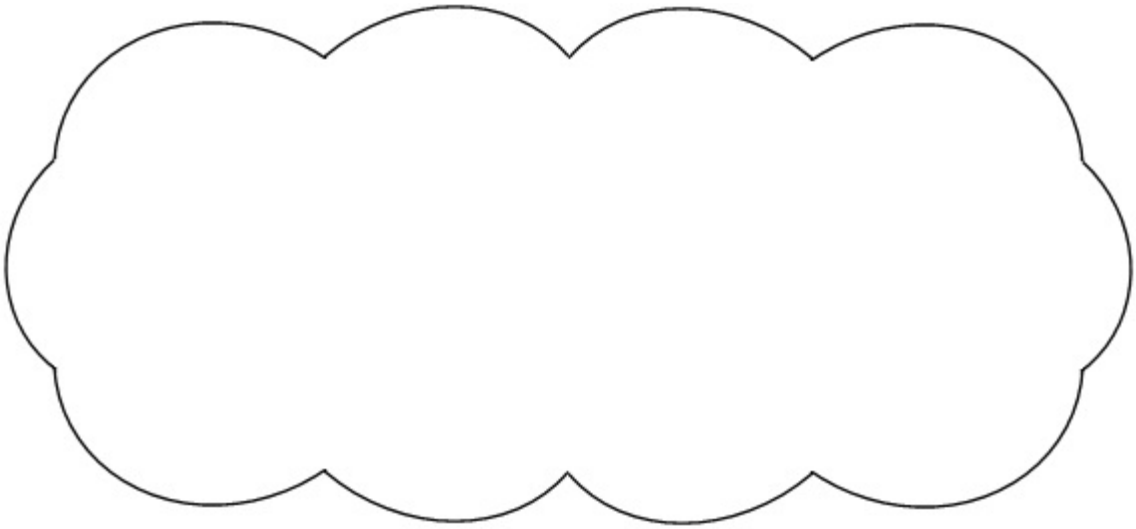
1 mark

31. **Area**

Look at the shaded shape on this centimetre square grid.



(a) Explain why the shape is a **hexagon**.



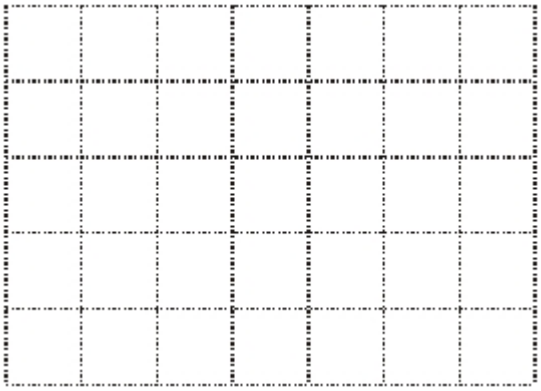
1 mark

(b) What is the **area** of the hexagon?

cm^2

1 mark

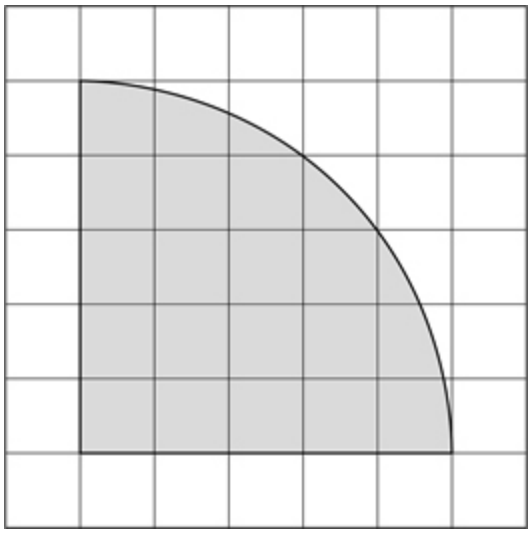
(c) On the centimetre square grid below, draw a **triangle** that has an area of **2 cm^2**.



1 mark

32. **Area**

This shape is drawn on a centimetre square grid.



Estimate the **area** of the shape.

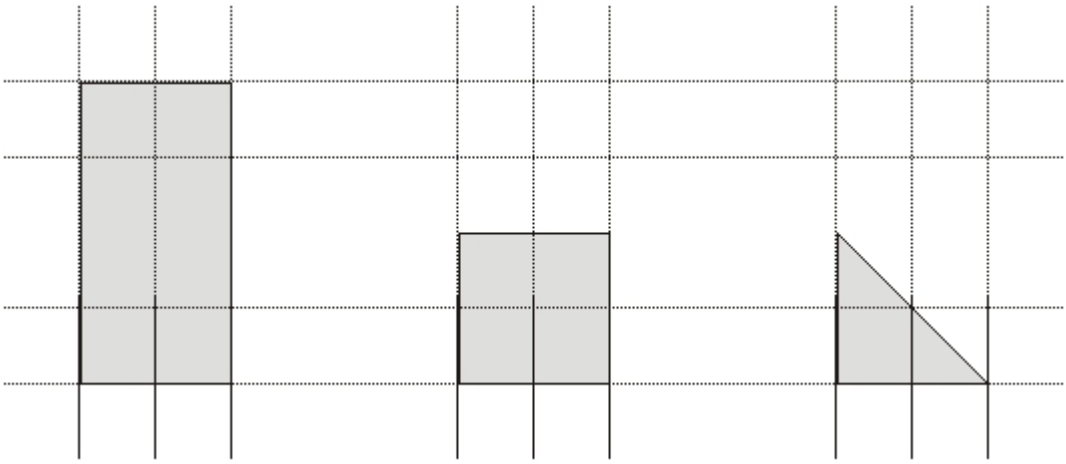
cm²

1 mark

33. **Areas**

The diagram shows three shapes drawn on a centimetre square grid.

The **area** of the rectangle is **8 cm²**.



(a) What is the area of the square?

cm²

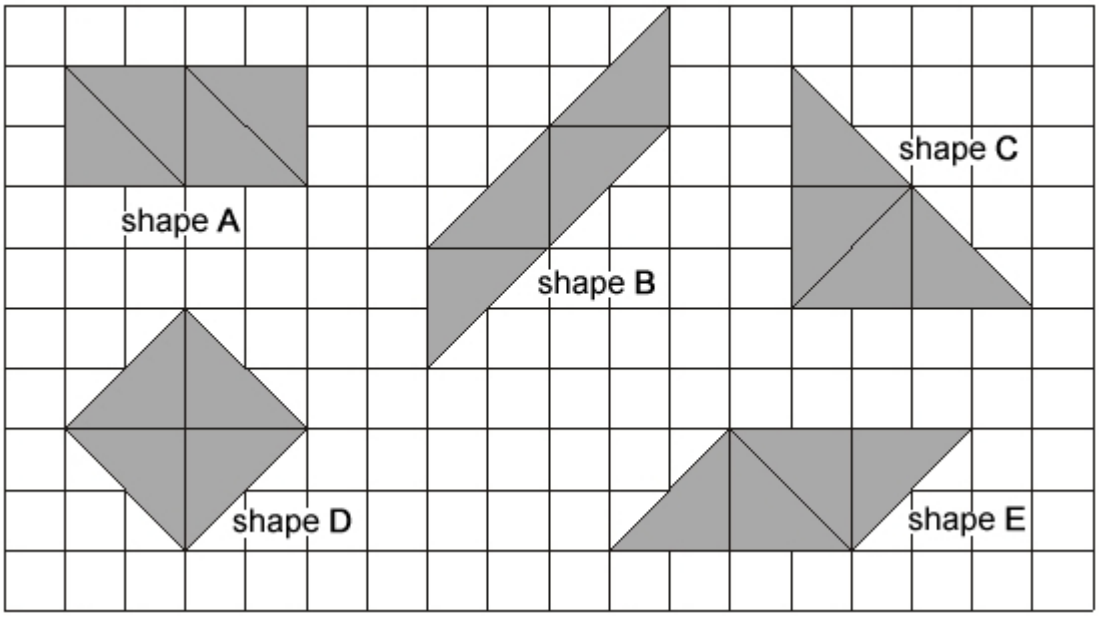
1 mark

(b) What is the area of the triangle?

cm²

1 mark

34. Joe makes different shapes using four tiles each time.
The square grid shows the different shapes he makes.



(a) Which shape is a **square**?
Write its letter.

shape

1 mark

(b) Which shape is **not** a **quadrilateral**?
Write its letter.

shape

1 mark

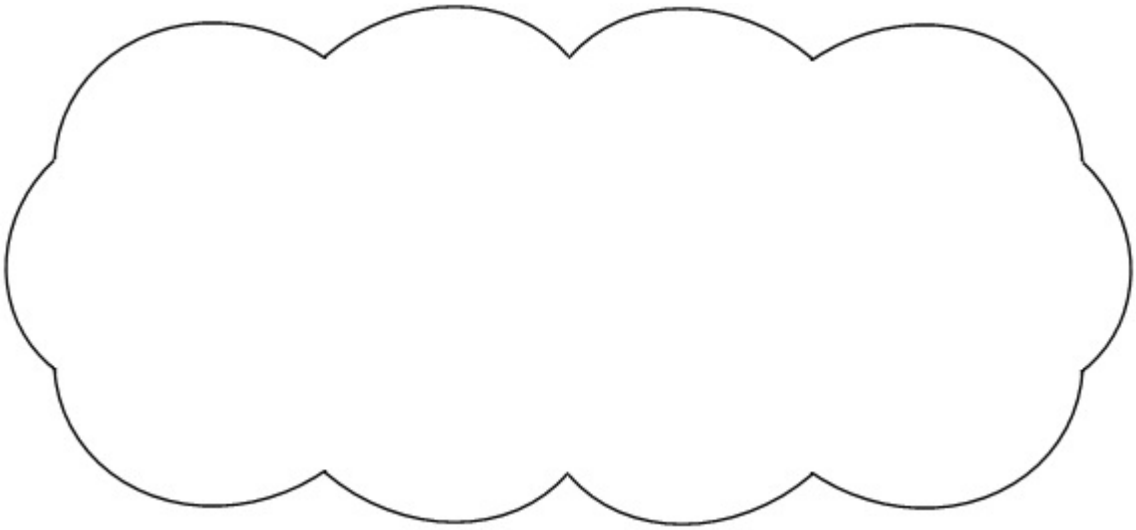
(c) Joe says:

> The shape with the **biggest area** is shape **C**.

Is Joe correct?

Yes ☐ No ☐

Explain your answer.

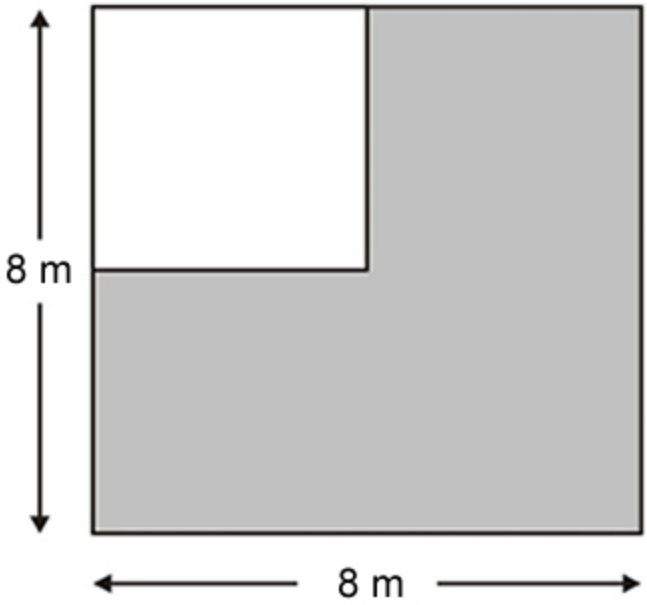


1 mark

35. Simon's garden is 8 × 8 meters.

He wants to build a **square** patio in one of the corners of his garden.

Each side of the patio is **half** the length of a side of the garden.



Not actual size

What is the **area** of the remaining garden?

Show your method

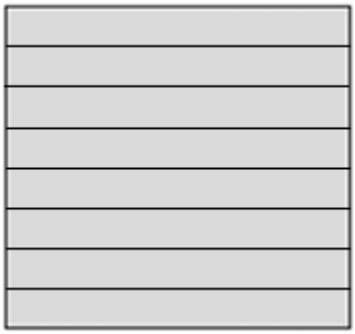
m^2

2 marks

36. The area of this square is 64 cm^2.

Not actual size

The square is cut to create 8 identical rectangles.



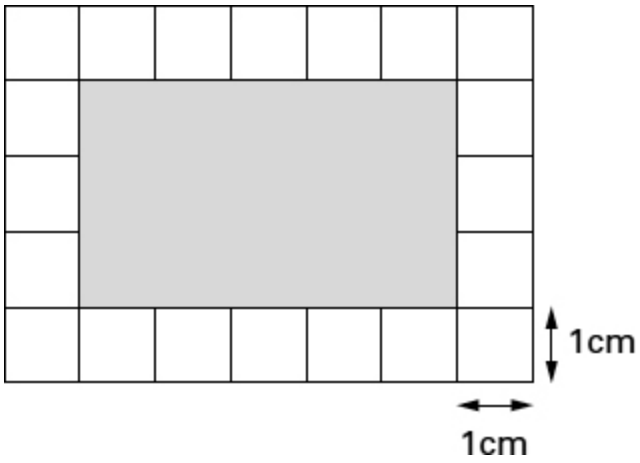
What is the **perimeter** of **one** of the small rectangles?

Show your method

cm

2 marks

37. Here is a shaded rectangle drawn on a grid of centimtre squares.

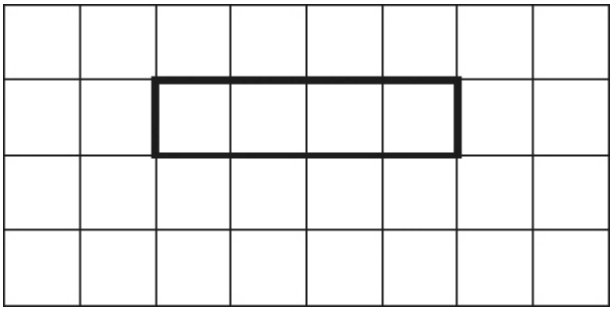


What is the **area** of the **shaded rectangle**?

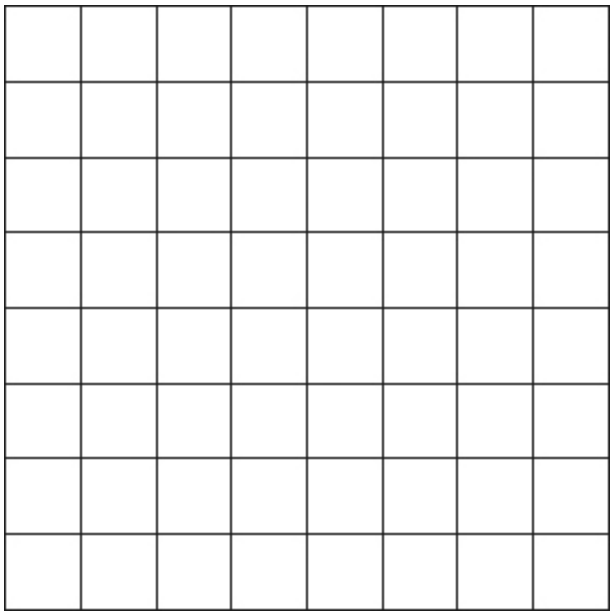
cm²

1 mark

38. This rectangle has **4** small squares inside.



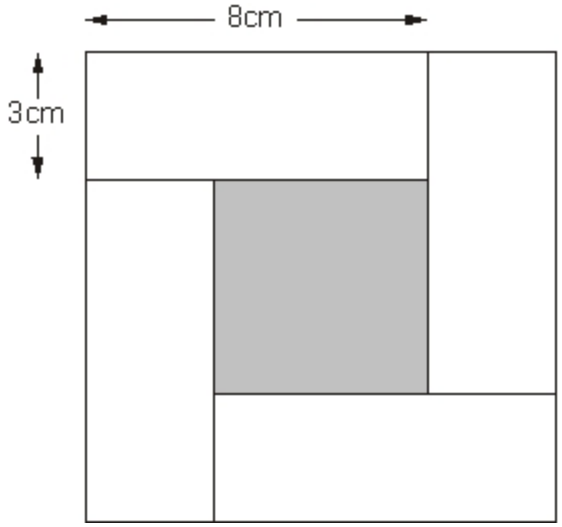
Draw a rectangle that has **12** small squares inside.



1 mark

39. **Find the area**

The diagram shows four identical white rectangles around a shaded square.



Not drawn accurately

What is the area of the shaded square?

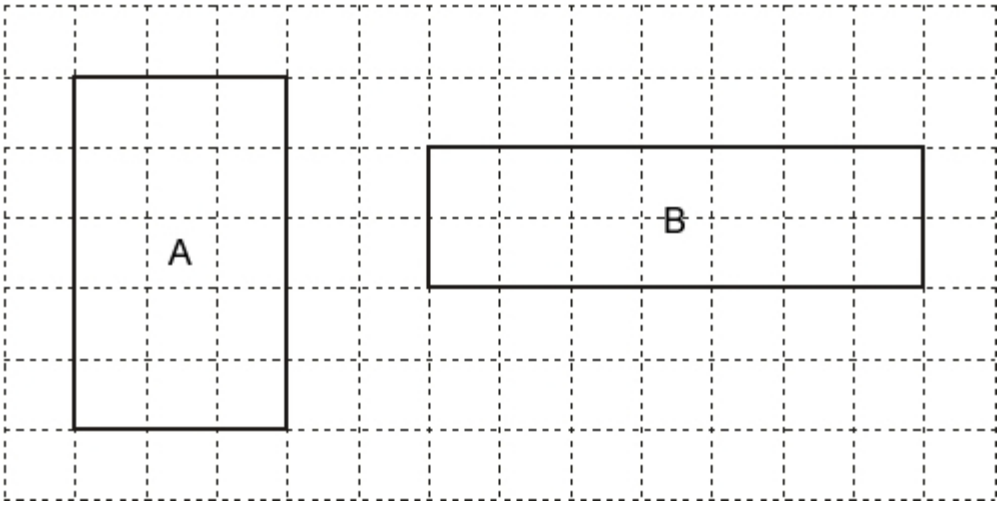
Show your method

cm^2

2 marks

40. **Rectangles**

Look at the two rectangles on the centimetre square grid.

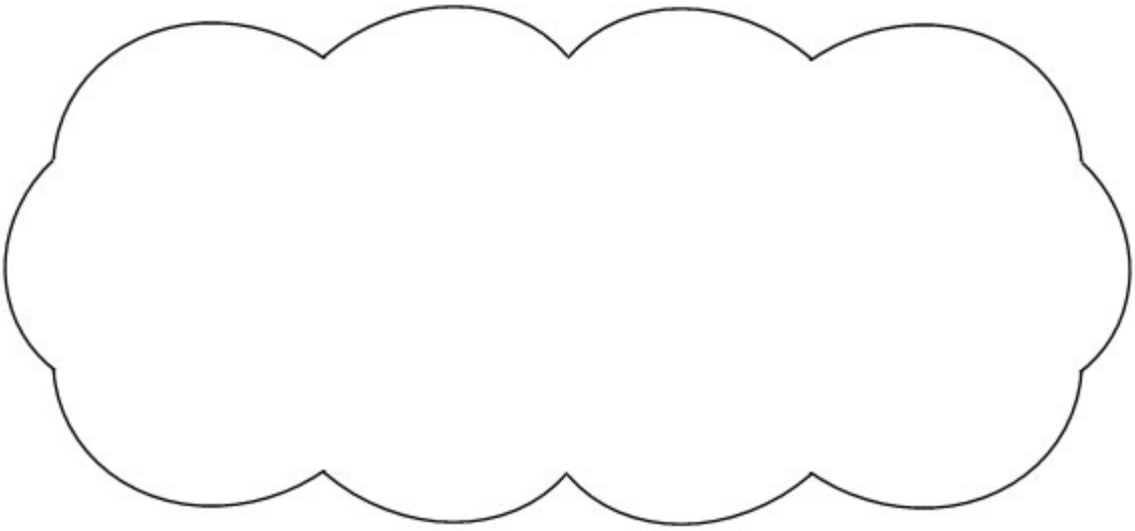


(a) Which rectangle has the **larger perimeter**?

Tick (✓) A or B.

☐ A ☐ B

Explain how you know.



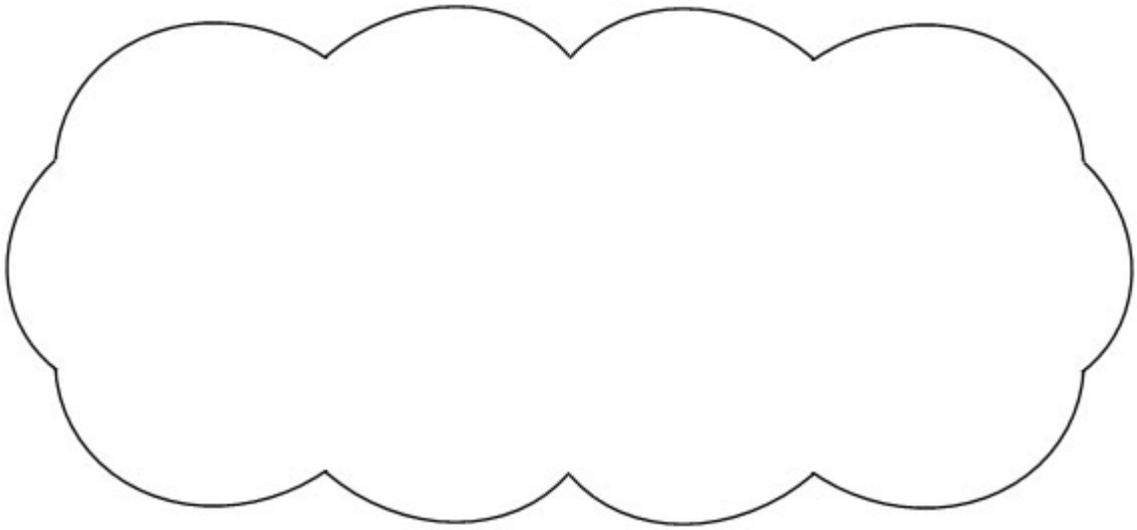
1 mark

(b) Which rectangle has the **larger area**?

Tick (✓) A or B.

☐ A ☐ B

Explain how you know.



1 mark

Mark schemes

1. 9 cm

[1]

2. 20 cm

[1]

4. 14

1

16

1

18

Accept follow through as their response for the second mark + 2

U1

[3]

5. 150 m

[1]

6. Award **TWO** marks for completing the table correctly, as shown:

Shape	Name of Shape	Perimeter
Shape A	Hexagon	48cm
Shape B	Rhombus	32cm
Shape C	Pentagon	40cm
Shape D	Octagon	64cm

If incorrect, award **ONE** mark for all shapes named correct or all perimeters correctly calculated.

[2]

7. 9 cm

Assessment guidance: The multiplication tables check will assess pupils' fluency. Once pupils can automatically recall multiplication facts, they should be able to apply their knowledge to questions like those shown here.

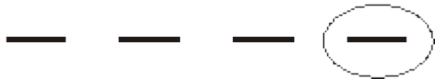
[1]

8. 42 cm

Assessment guidance: The multiplication tables check will assess pupils' fluency. Once pupils can automatically recall multiplication facts, they should be able to apply their knowledge to questions like those shown here.

[1]

9. (a) Indicates trapezium, ie



Accept unambiguous indication

1

(b) 17

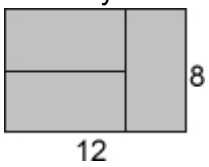
1

[2]

10. 40

2

or Shows or implies correct dimensions for the large rectangle, even if there is further incorrect working, eg

- 12cm by 8cm
- 

- 4 + 4 + 8 + 4 + 8 + 4 + 8
- 20 × 2
- 12 × 8 (= 96)

Accept for 1m, minimally acceptable implication, eg

- 

- *Four 4s and three 8s seen, with the intention to add also shown*

1
U1

[2]

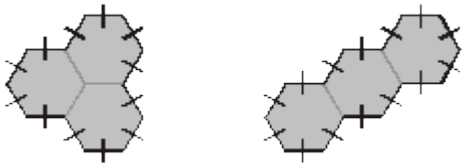
11. (a) 10

1

(b) Award **ONE** mark for indicating A and giving a correct explanation, eg

- Comparing the perimeters of A and B, eg
  - A's perimeter is 12cm, but B's is 14cm
  - A's perimeter is 2 less than B's
  - A has 12 vertices, B has 14 vertices

Accept minimally acceptable explanation, eg

- *12, 14*
- *18 – 6, 18 – 4*
- *2 less*
- *A has 9 corners sticking out, B has 10*
- 

***Do not** accept vague or incomplete explanations, eg*

- *A is 12*
- *A is less than B*
- *I counted them and A has a smaller perimeter*
- *I counted the edges*
- *I measured the lines*
- *B has more sides*

***Do not** accept explanations which include incorrect mathematics or incorrect information that is relevant to the explanation, eg*

- *A is 12 but B is 15*

- Showing or implying the difference in the number of touching edges, eg
  - In A, 6 sides are on the inside but B only has 4
  - 3 sides meet in A but only 2 in B
  - In A all three shapes have 2 meeting sides, but in B only two shapes have 1 meeting side
  - A has 1 more pair of touching sides
  - 2 more sides are hidden for A
  - They are both made of 3 hexagons, but A is more compact and B is more stretched out

Accept minimally acceptable explanation, eg

- *More sides are together*
- *6 in A and 4 in B*
- *A has 3 lines and B has 2 lines*
- *I counted the touching edges*
- *It is fatter*
- *More bunched up*
- *B is more spread out*
- *B is longer (or thinner)*

***Do not** accept vague or incomplete explanations, eg*

- *In A, 6 sides are on the inside*
- *Shape A looks smaller than shape B*
- *Shape A has more edges missing*

***Do not** accept explanations which include incorrect mathematics or incorrect information that is relevant to the explanation, eg*

- *6 sides meet in a A but only 2 in B*

U1

[2]

12. 22

[1]

13. Completes all three rows correctly, eg:

-

rectangle	3 cm	3 cm	13 cm	13 cm
rhombus	8 cm	8 cm	8 cm	8 cm
kite	12 cm	12 cm	4 cm	4 cm

Accept side lengths in each row may be given in any order
Accept correct values with cm omitted eg, for the rectangle:

- *13 3 13*

2

or

Completes two rows correctly

1

[2]

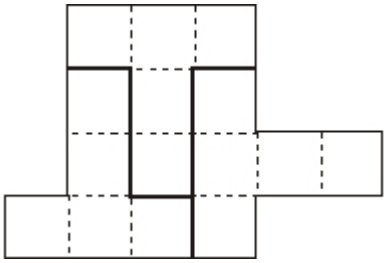
14. 20

Accept answers between 19.6 and 20.4 exclusive.

U1

[1]

15. (a) Show how three T-shapes fit together, ie



Accept slight inaccuracies in drawing provided intention is clear

1

(b) 15

1

[2]

16. No mark scheme for this question.

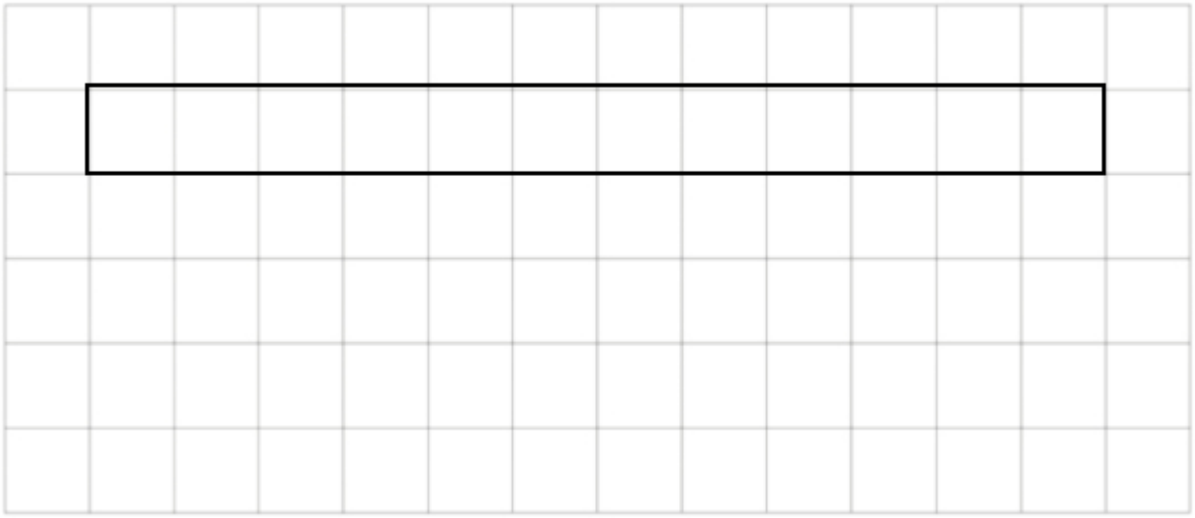
Please refer to the notes for discussion points.

[1]

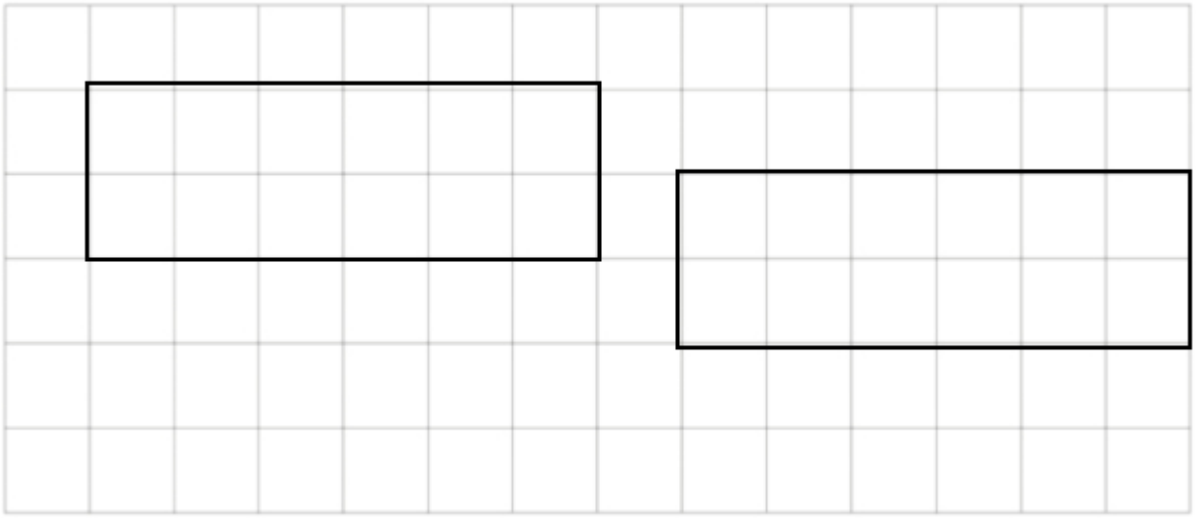
17. 162 m^2

[1]

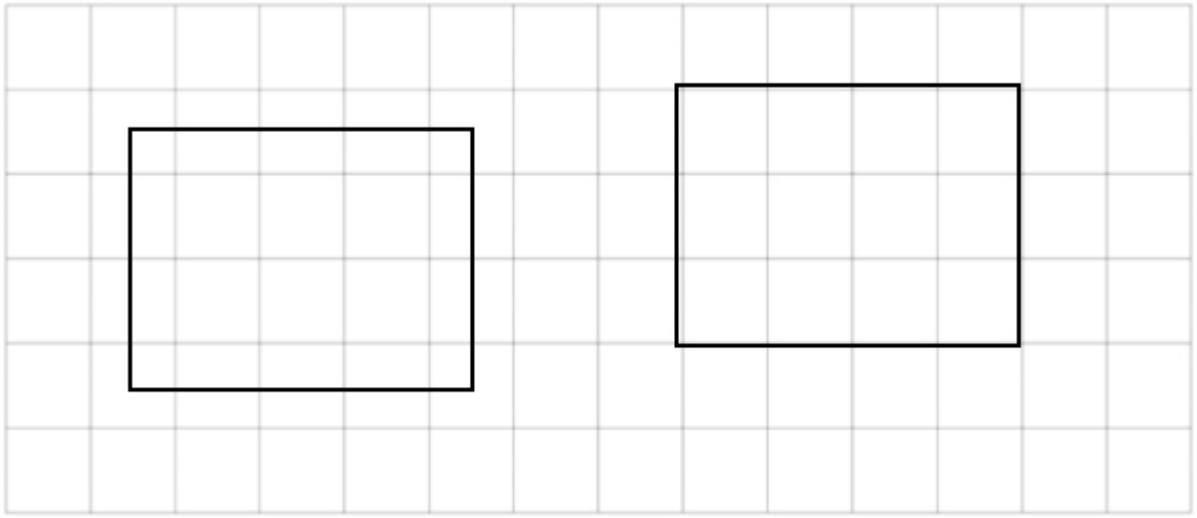
18. Any rectangle with an area of 12 squares, e.g.



Or



Or



Accept slight inaccuracies in drawing provided the intention is clear.

[1]

19. a. 1,800 cm^2

1

b. 2400 cm^2

1

[2]

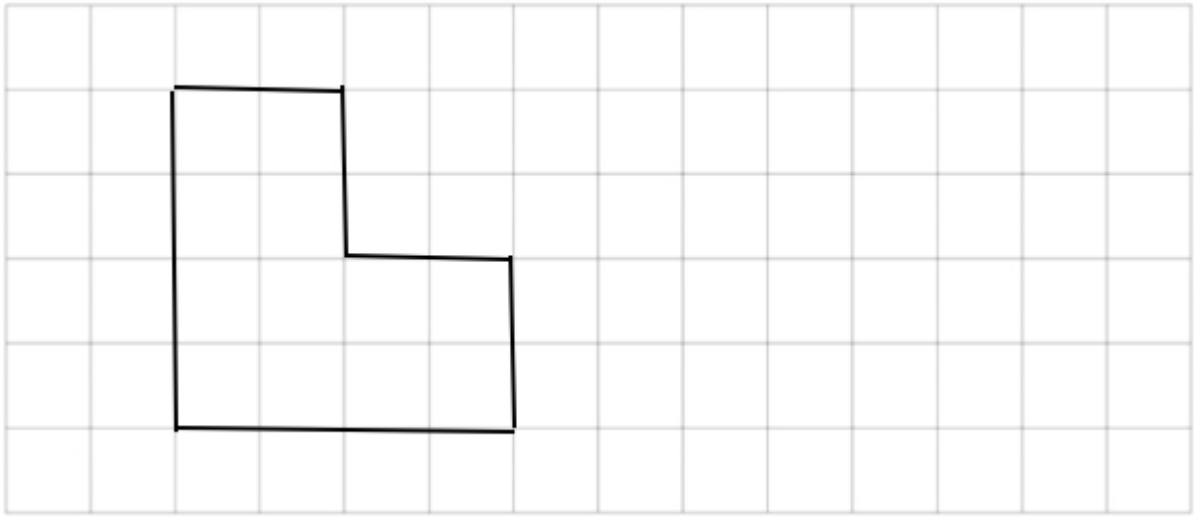
20. a. 15 cm^2

b. 14 cm^2

Check values on printed version in case sizing has been altered.

[2]

21. Any six-sided shape with straight edges and an area covering 12 squares in total, e.g.



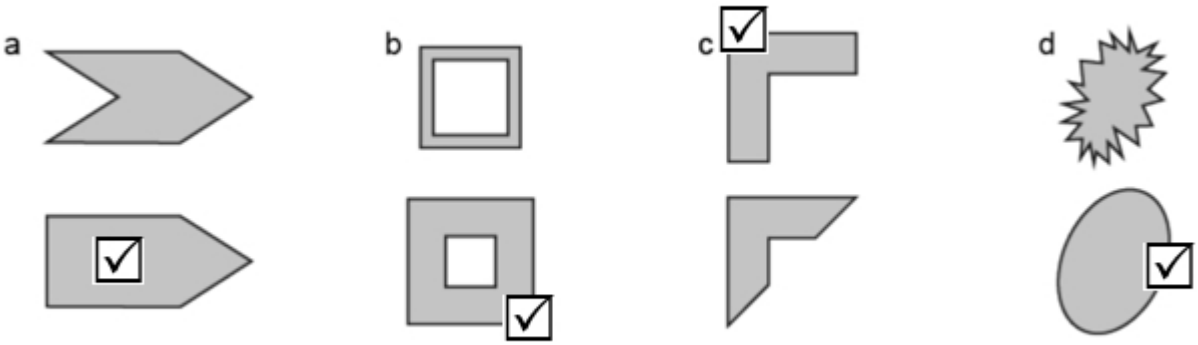
Accept slight inaccuracies in drawing provided the intention is clear.

[1]

22. a, b, c

[1]

23. Award **TWO** marks for all four shapes ticked correctly, as shown:



If the answer is incorrect, award **ONE** mark for three shapes correctly ticked.

Accept alternative unambiguous positive indication of the correct answer, e.g. Y, circled etc.

***Do not** accept an answer where both shapes are ticked.*

[2]

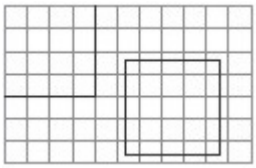
24. Award **TWO** marks for all correct, as shown:

a. 12 cm^2
b. 6 cm^2
c. 4 cm^2
d. 6 cm^2

If incorrect, award **ONE** mark for any three correct.

[2]

26. Draws a 4 by 4 square, eg:



Accept any square where the width is between 3.5 cm and 4.5 cm at all points.

U1

[1]

27. (a) Draws a square of side length 4

1

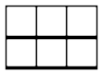
(b) Draws a square of side length 5

Accept lines not ruled or accurate
Accept provided the pupil's intention is clear

1

[2]

28. Correct drawing of ant rectangle with an area of 6 cm^2 anywhere on the page, eg



! ***Drawing not accurate or ruled***
Accept provided the pupil's intention is clear

[1]

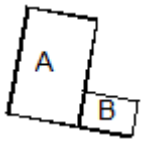
29. 30

2

or Shows a complete correct method with no more than one computational error

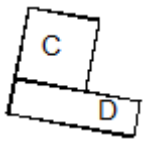
The most common correct methods:

Calculate the area as 2 non-overlapping parts, A and B, as shown in the diagram



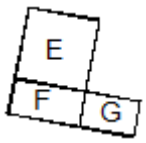
- 4 × 6 + 3 × 2
- 24 + 6
- 4 × 6 = 28 *(error)*, 28 + 6 = 34

Calculate the area as 2 non-overlapping parts, C and D, as shown in the diagram



- 7 × 2 + 4 × 4
- 14 + 16
- 4 × 4 = 18 *(error)*, 18 + 14 = 32

Calculate the area as 3 non-overlapping parts, E, F and G, as shown in the diagram



- 4 × 4 + 4 × 2 + 3 × 2
- 16 + 8 + 6

Calculate the area as two parts that need to be subtracted, eg
- 6 × 7 − 4 × 3
- 42 − 12

Do not accept conceptual error, eg
- *6 × 4 + 7 × 2 (overlapping parts)*
- *6 × 4 × 7 × 2 (given lengths multiplied)*

! Method not shown fully
If there is no evidence of an incorrect method, accept the following:

- *24 + error but not 14 (for A and B)*
- *14 + error but not 24 (for C and D)*
- *16 + 8 error but not 14 (for E, F, G)*
- *16 + error not 24 or 14 + 6 (for E, F, G)*
- *Error but not 24 + 8 + 6 (for E, F, G)*
- *42 − error (subtraction method)*
- *Error − 12 (subtraction method)*

1

[2]

30. (a) 10

1

(b) 5

Accept follow through as half their (a)

1

(c) 20

! Follow through
Accept follow through as
their (a) + 2 × their (b), or
2 × their (a), or
4 × their (b)

1

[3]

31. (a) Gives a correct explanation, eg

- It has six sides
- It has 6 angles
- It has 6 corners

Accept minimally acceptable explanation, eg

- *6 edges*
- *6 lines*
- *6 points*
- *6 faces*

Do not accept incomplete explanation, eg

- *6*

1

(b) 7.5 or equivalent

Do not accept incorrect notation, eg

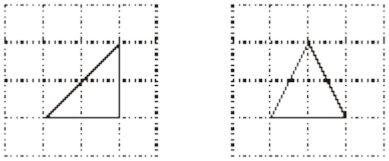
- $7\frac{1}{2}$

1

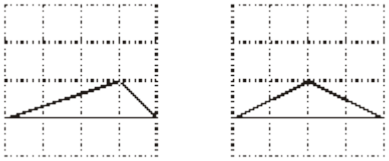
(c) Draws a triangle with an area of $2cm^2$

The most common correct drawings:

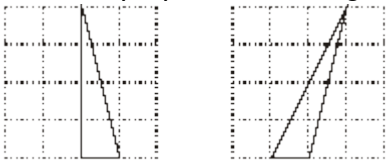
Have integer values for both the base and perpendicular height
eg, for base 2, perpendicular height 2

- 

eg, for base 4, perpendicular height 1

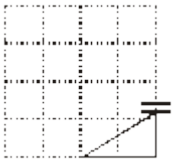
- 

eg, for base 1, perpendicular height 4

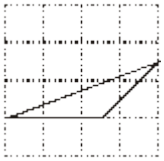
- 

Have the base, or the perpendicular height, or both, as a non-integer value, but supporting working shows this is deliberate

eg, for base 3, perpendicular height $1\frac{1}{3}$

- 

eg, for base 2.5, perpendicular height 1.6

- 

2.5 and 1.6 seen

! Lines not ruled or accurate
Accept provided the pupil's intention is clear

! Base or perpendicular height not accurate
Accept provided the pupil's intention is clear

1

[3]

32. Gives a value between 18½ and 20½ inclusive
Accept equivalent fractions or decimals

[1]

33. (a) 4

1

(b) 2

Accept follow through as their (a) ÷ 2

1

[2]

34. (a) D

1

(b) C

Accept unambiguous indication

eg, for part (b)

- *Triangle*

1

(c) Indicates No and gives a correct explanation

The most common correct explanations:

Refer to at least one of the other shapes having the same area as shape C, eg

- All of the shapes have the same area because they are made from 4 of the same sized tiles
- Each shape is made from 4 equal triangles
- Two tiles make a square and all the shapes are made of 2 squares

Refer to at least one of the other shapes having an area of 8 squares, eg

- All the shapes have an area of 8 squares

Accept minimally acceptable explanation, eg

- *Same*
- *E is the same*
- *All 4*
- *All 2*

Do not accept incomplete or incorrect explanation, eg

- *4 tiles*
- *B has a bigger area*

Accept minimally acceptable explanation, eg

- *All 8*
- *B is 8 as well*

! Squares taken to be square centimetres, eg

- All $8cm^2$

Condone

Do not accept incorrect explanation, eg

- *They all have the same area of 16 squares*

U1

[3]

35. Award **TWO** marks for the correct answer of 48

If the answer is incorrect, award **ONE** mark for evidence of appropriate method, e.g.

$8 \times 8 = 64$

$\frac{3}{4}$ of 64

OR

$(8 \times 8) - (4 \times 4)$

OR

$(4 \times 4) \times 3$

*Answer need not be obtained for the award of **ONE** mark.*

Up to 2m (U1)

[2]

36. 18

2

or

8(cm) and 1(cm) seen *(the dimensions of the rectangle)*

OR

Shows or implies a complete correct method, eg:

- $\sqrt{64} = 6$ (*error*)
  $6 \div 4 = 1.5$
  $1.5 \times (6 + 1)$
- $8 \times 8 = 64$
  $8 \div 8 = 2$ (*error*)
  $8 + 2 + 8 + 2$

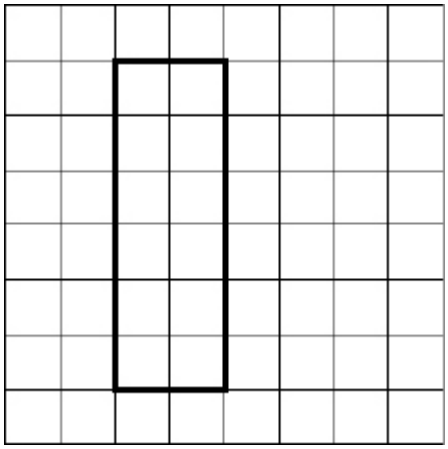
[2]

37. 15

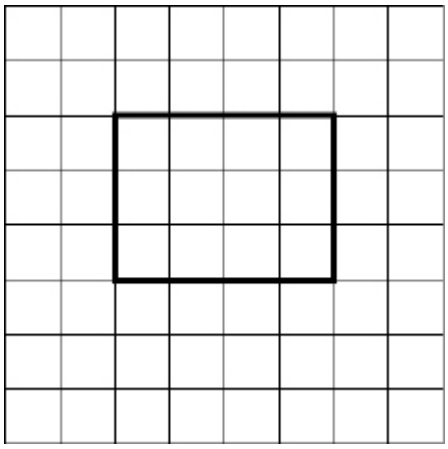
U1

[1]

38. Any rectangle with an area of 12 squares, eg



OR



Accept slight inaccuracies in drawing provided the intention is clear.
Vertices must be closer to correct grid point than any other grid point.
Accept rectangles with measurements not drawn wholly on grid, eg 12 × 1 rectangle.
Award the mark if a correctly drawn rectangle is separated into individual centimetre squares.

[1]

39. Award **TWO** marks for the correct answer of 25(cm^2)

If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, eg

- 8 − 3 = 6 *(error)*
  6 × 6 = 36cm^2

- 8 + 3 = 12 *(error)*
  12 × 12 = 144
  8 × 3 × 4 = 96
  144 − 96 = 48cm^2

Up to 2

[2]

40. (a) Indicates B and gives a correct explanation, eg

- The perimeter of B is 18 but the perimeter of A is 16
- B is 2 × 9 but A is 2 × 8
- 2(5 + 3) is less than 2(2 + 7)
- B's perimeter is 2 more than A's

Accept minimally acceptable explanation, eg

- *16, 18*
- *8, 9*
- *2 more*
- *I counted round the outside of the shapes*
- *Outline of B is longer*

! Throughout the question, units incorrect or omitted
Ignore

Do not accept incomplete or incorrect explanation, eg
B is 18
A is 5 by 3 but B is 2 by 7
B is bigger than A
B is longer
I counted the squares around the outside
I counted the squares
B is 19 but A is 16

U1

(b) Indicates A and gives a correct explanation, eg

- The area of A is 15 but the area of B is 14
- A is 5 × 3 but B is 7 × 2
- A's area is one more than B's

Accept minimally acceptable explanation, eg

- *15, 14*
- *1 more*
- *I multiplied the length and width*
- *I counted the squares inside*

Do not accept incomplete or incorrect explanation, eg

- *A is 15*
- *A is 5 by 3 but B is 2 by 7*
- *A is bigger than B*
- *Multiply them together*
- *I counted the squares*
- *A is 15 but B is 12*

! Responses to parts (a) and (b) transposed but otherwise completely correct, even if there is incorrect use of words 'area' and 'perimeter'

Mark as 0; 1

! Throughout the question, the dimensions of one or both rectangles are incorrect

If the dimensions are incorrect but consistent, and both question parts are otherwise correct, mark as 0; 1

U1

[2]