

Spring Block 4

Perimeter and area

Small steps

Step 1

Perimeter of rectangles

Step 2

Perimeter of rectilinear shapes

Step 3

Perimeter of polygons

Step 4

Area of rectangles

Step 5

Area of compound shapes

Step 6

Estimate area

Perimeter of rectangles

Notes and guidance

In this small step, children build on learning from earlier years to find the perimeters of rectangles by measuring the sides and by calculation.

Children know that the perimeter is the distance around the outside of a two-dimensional shape. They recap measuring skills and recognise that they need to use a ruler accurately in order to get the correct answer. A common mistake is to measure from the end of the ruler rather than from the zero mark.

Children then explore different methods of finding the perimeter, for example adding all four sides separately, adding the length to the width and then doubling, or doubling the length and the width and then adding the results, before deciding which they find most efficient. Children use their understanding of perimeter to calculate missing lengths.

Things to look out for

- Children may line up the object they are measuring with the end of the ruler rather than the zero mark.
- When given the length and width of a rectangle, children may just add the two amounts.
- When measuring sides on a rectangle, children may get different dimensions for sides that should be equal.

Key questions

- What does “perimeter” mean?
- If a rectangle has a perimeter of 16 cm, could its length be 10 cm? Why or why not?
- Once you have measured the sides, how do you work out the perimeter?
- If you know the length and width of a rectangle, do you need to measure the other two sides?
- Which method do you think is more efficient?

Possible sentence stems

- The length is _____ and the width is _____, so the perimeter is _____
- _____ + _____ + _____ + _____ = $2 \times$ _____ + $2 \times$ _____
- The perimeter of the rectangle is _____

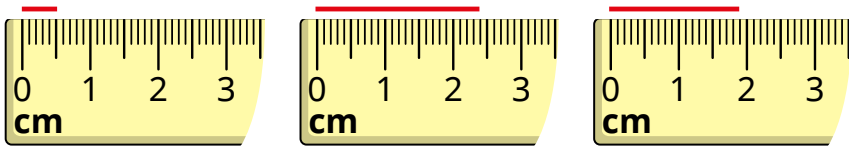
National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

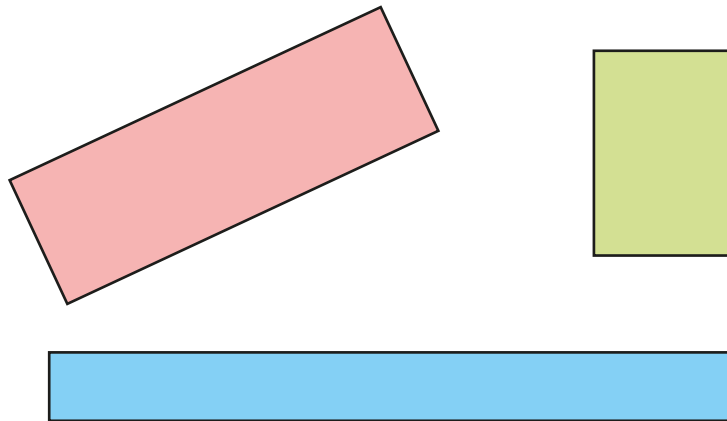
Perimeter of rectangles

Key learning

- What is the length of each line?



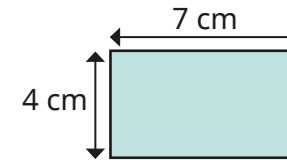
- Measure the sides of the rectangles to work out their perimeters.



_____ cm + _____ cm + _____ cm + _____ cm = _____ cm

- Draw a rectangle with a perimeter of 20 cm.
Compare your rectangle with a partner's.

- Rosie and Eva are finding the perimeter of this rectangle.



Rosie

$$7 \text{ cm} + 4 \text{ cm} + 7 \text{ cm} + 4 \text{ cm} = 22 \text{ cm}$$

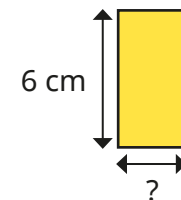
Eva

$$7 \text{ cm} + 4 \text{ cm} = 11 \text{ cm} \quad 11 \text{ cm} \times 2 = 22 \text{ cm}$$

What is the same about the methods? What is different?
Use both methods to find the perimeter of the rectangle.



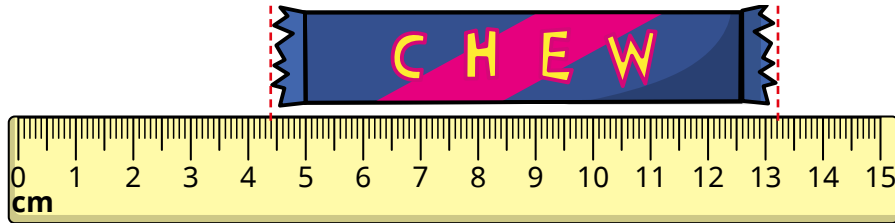
- The perimeter of a square is 16 cm.
What is the length of each side?
- The perimeter of this rectangle is 18 cm.
What is the width of the rectangle?



Perimeter of rectangles

Reasoning and problem solving

Teddy thinks this chew bar is 13.2 cm long.



Do you agree?

Explain your answer.



No

Is the statement always true, sometimes true or never true?

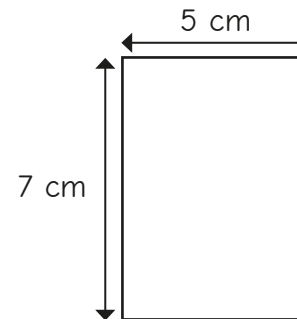
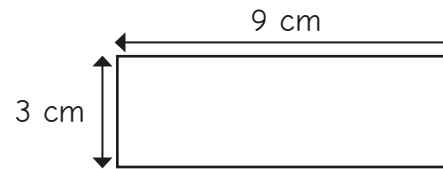
When the sides of a rectangle are all odd numbers, the perimeter is even.

Explain your answer.



always true

Esther thinks that she has drawn all the possible rectangles with a perimeter of 24 cm.



Do you agree with Esther?

Explain your answer.

No multiple possible answers, e.g. A rectangle that is 11 cm by 1 cm has a perimeter of 24 cm.

Perimeter of rectilinear shapes

Notes and guidance

In this small step, children build on their Year 4 learning to calculate the perimeters of rectilinear shapes.

A rectilinear shape is a shape that has only straight sides and right angles. This can look like two or more rectangles that have been joined together and is sometimes referred to as a compound shape. Children should be familiar with both terms. When calculating the perimeter of a rectilinear shape, encourage children to mark sides that they have already included in their total, to avoid counting sides more than once.

Children may notice the connection between the perimeter of some rectilinear shapes and the rectangle that can be drawn around the shape.

Things to look out for

- Children may miscount when adding the sides of rectilinear shapes.
- If children do not have a secure understanding of addition and subtraction, they may struggle when finding missing sides.
- Children may find it difficult to see that the two shorter sides are equal to the longer opposite side on the rectilinear shape.

Key questions

- What does “perimeter” mean?
- What are the properties of a square/rectangle?
- Why is this a rectilinear shape?
- How can you use the labelled sides to find the unknown side of the rectilinear shape? Do you need to add or subtract?
- What strategies can you use to work out the perimeter?
- How do you know that you have included all the sides?
- What is the perimeter of the shape?

Possible sentence stems

- _____ + _____ = _____, so the longer side = _____
- _____ - _____ = _____, so the other shorter side = _____
- The perimeter of the shape is _____

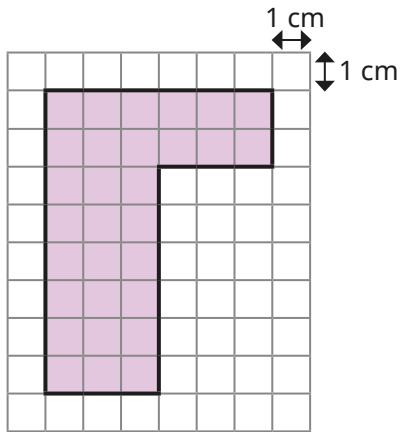
National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

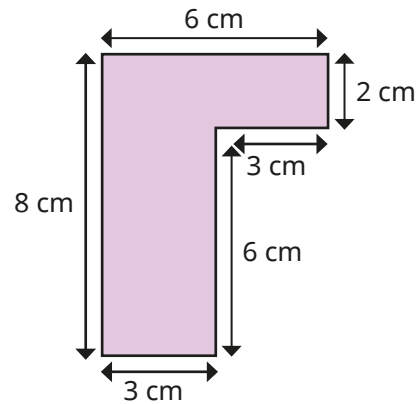
Perimeter of rectilinear shapes

Key learning

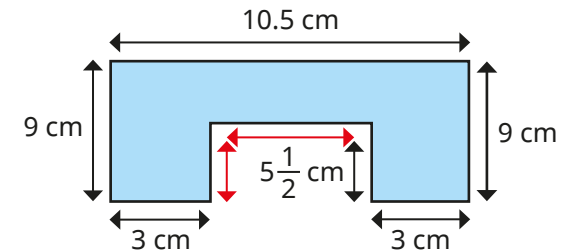
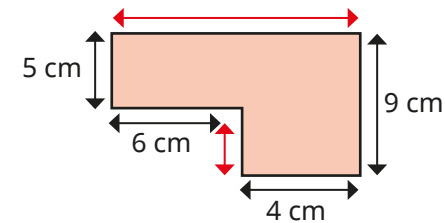
- Work out the perimeters of the shapes.



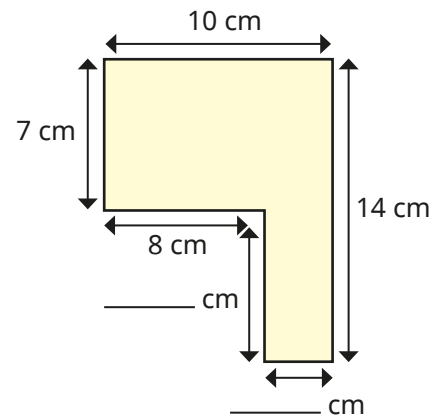
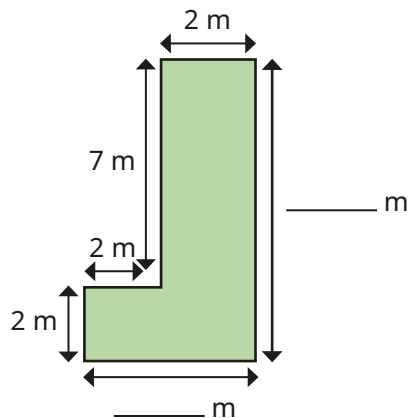
What do you notice?



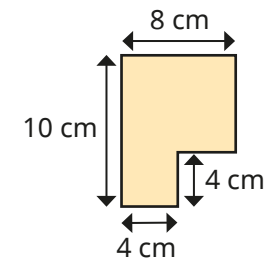
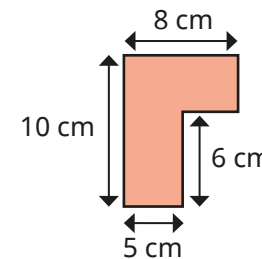
- Find the unknown lengths (shown in red) and then the perimeter of each shape.



- Work out the unknown lengths on each rectilinear shape.



- Work out the perimeters of the shapes.



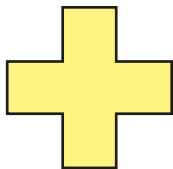
What do you notice?

Perimeter of rectilinear shapes

Reasoning and problem solving

Here is a rectilinear shape.

All the sides are the same length and are a whole number of centimetres.



Which of these lengths could be the perimeter of the shape?

- 48 cm
- 36 cm
- 80 cm
- 120 cm
- 66 cm

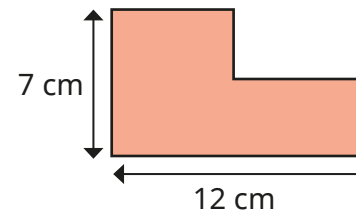
Explain your reasoning.

Can you think of any other possible perimeters?

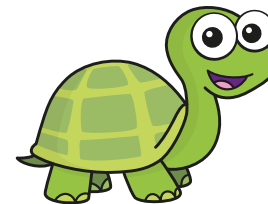
48 cm, 36 cm,
120 cm

any multiple of 12,
e.g. 24 cm, 72 cm

Tiny is finding the perimeter of this shape.



I have enough information to find the perimeter.



Do you agree with Tiny?

Explain your answer.

Yes

Perimeter of polygons

Notes and guidance

In this small step, children apply their knowledge of perimeter to find the perimeters of polygons and to solve word problems.

A polygon is a closed two-dimensional shape with straight sides. The difference between regular and irregular shapes could be a good discussion point during this step. A regular shape is a two-dimensional shape with equal sides and angles, so a square is a regular rectangle. When given the length of one side, children use their knowledge of regular shapes to find the perimeter by multiplying by the number of sides.

Children use the perimeter of a shape to find a missing side. Using pictorial representations, such as drawing the shape and adding the known values, will support children when problem solving.

Things to look out for

- Children may not be able to identify the relationship between the given length, width or perimeter in the problems.
- Children may confuse the terms “regular” and “straight” and think that all rectangles are regular.

Key questions

- What is a regular shape?
- What is the difference between a square and a rectangle?
- Are all rectangles regular?
- How many sides does the shape have? What calculation will give you its perimeter?
- Would drawing the shape help you to solve the problem?
- What operation are you going to use? Why?

Possible sentence stems

- A _____ shape has equal sides and angles.
- The regular shape has _____ sides and each side is _____. Therefore, the perimeter is _____ \times _____ = _____
- To find the perimeter of the shape, I need to...
- The perimeter of the shape is _____

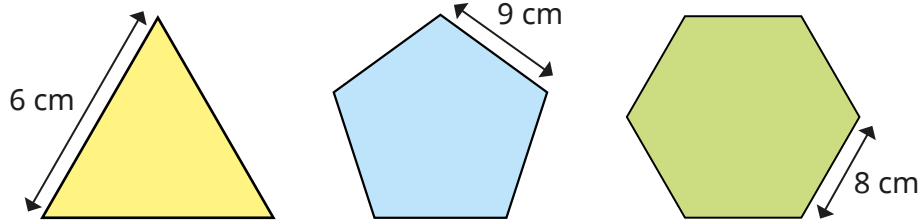
National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

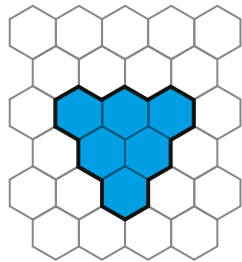
Perimeter of polygons

Key learning

- Work out the perimeter of each regular shape.

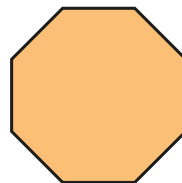


- Each regular hexagon on the grid has a side length of 2 cm.



What is the perimeter of the shaded shape?

- Mo measures three sides of this regular octagon. The total length of the three sides is 21 cm. What is the perimeter of the octagon?



- The perimeter of a tennis court is approximately 70 m. Its width is 11 m.

What is the length of the tennis court?

- A kitchen is 9 m long and 9 m wide.

A living room has a perimeter of 38 m.

Which room has the greater perimeter?

What could the living room's length and width be?

- Tom wants to find the perimeter of a swimming pool.

The length of the pool is three times the width.

The width is 16 m.

What is the length of the swimming pool?

What is the perimeter of the swimming pool?



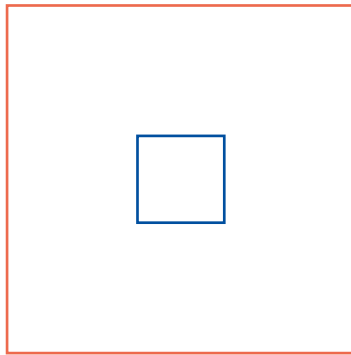
- The perimeter of a regular hexagon is 222 cm.

Work out the length of one side of the hexagon.

Perimeter of polygons

Reasoning and problem solving

Here is a square inside another square.



16 cm

One side of the inner square is 4 cm long.

The perimeter of the outer square is four times the perimeter of the inner square.

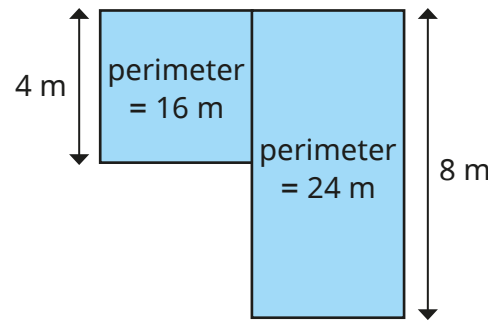
What is the length of one side of the **outer** square?

Show your workings.

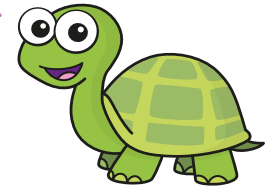
A school stage is made up of two parts.

The larger part has a perimeter of 24 m and a length of 8 m.

The smaller part has a perimeter of 16 m and a length of 4 m.



The perimeter of the stage is $24\text{ m} + 16\text{ m} = 40\text{ m}$.



Explain why Tiny is wrong.

Find the actual perimeter of the stage.

Tiny's total includes sides that are inside the shape.

32 m

Area of rectangles

Notes and guidance

In Year 4, children learnt that area was the space inside a two-dimensional shape. In this small step, they recap this key concept by making a visual comparison of two shapes without having to work out the area. They then go on to find the areas of shapes by counting squares, and are introduced to the square centimetre (cm^2) by counting squares on a centimetre squared grid. Highlight the difference between 1 cm and 1 cm^2 , to ensure children understand that cm is a measure of length and cm^2 is a measure of area.

Arrays can help children understand why they can multiply the length by the width to calculate the area of a rectangle, which they can then use to find the area of shapes not drawn on a centimetre squared grid. Children should be made aware that cm^2 is not the only unit used to measure area, and other units such as mm^2 , m^2 and km^2 are also examples of units of area.

Things to look out for

- When counting squares, children may count a square twice or miss a square out when counting.
- Children may rely on counting squares to find area, instead of multiplying the length by the width.
- Children may confuse the concepts of area and perimeter.

Key questions

- What is area?
- What is the difference between 1 cm and 1 cm^2 ?
- Which shape has the greater/greatest area?
Can you tell just by looking?
- How can you work out area in a more efficient way?
- Will multiplying the length by the width calculate the area of any shape? Why/why not?

Possible sentence stems

- There are _____ squares inside the shape, so the area of the shape is _____ squares.
- Area = _____ \times _____
- _____ \times _____ = _____, so the area of the shape is _____

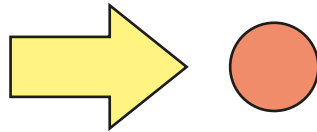
National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm^2) and square metres (m^2), and estimate the area of irregular shapes

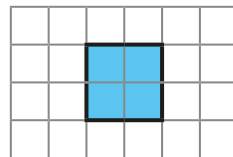
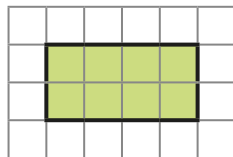
Area of rectangles

Key learning

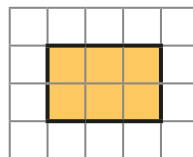
- Which shape has the greater area?
How do you know?



- On the grid, the area of each square is 1 cm^2
Find the area of each shape.



- Complete the sentences to find the area of the rectangle.



▶ There are _____ rows of _____ squares.

There are _____ squares altogether.

_____ \times _____ = _____

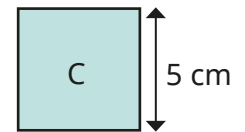
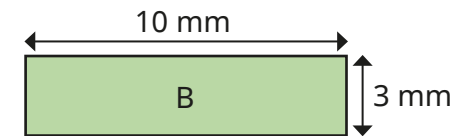
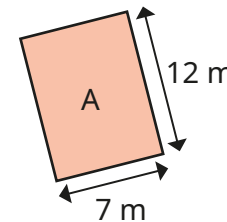
▶ There are _____ columns of _____ squares.

There are _____ squares altogether.

_____ \times _____ = _____

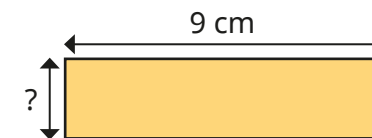
What do you notice?

- Shapes A and B are rectangles.
Shape C is a square.
Work out the area of each shape.



- Draw a rectangle with an area of 12 cm^2 and label the lengths.
How many different rectangles can you find?
They do not have to be drawn to scale.
Compare rectangles with a partner.

- The area of the rectangle is 18 cm^2



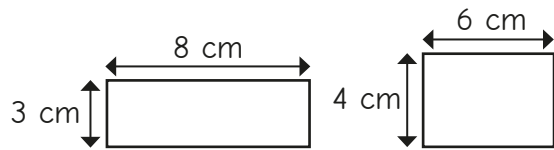
What is the width of the rectangle?

Area of rectangles

Reasoning and problem solving



Tiny thinks that these are the only rectangles that you can draw with an area of 24 cm^2



No

Do you agree with Tiny?
Explain your answer.



Is the statement always true, sometimes true or never true?



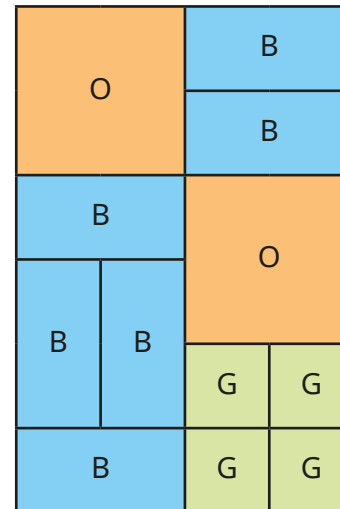
A rectangle's area is always greater than its perimeter.

sometimes true

Give examples to support your answer.



Each orange square (O) has an area of 24 cm^2



48 cm^2

72 cm^2

24 cm^2

144 cm^2

Calculate the total orange area.
Calculate the blue (B) area.
Calculate the green (G) area.
What is the total area of the whole shape?

Area of compound shapes

Notes and guidance

In this small step, children learn to calculate the areas of compound shapes, which are shapes made up of two or more other shapes. The focus is on rectilinear shapes.

To support their understanding, give children compound shapes for them to physically cut or split. They could find the area of each rectangle and deduce the total area of the shape. Some children will split their compound shape differently from others. This will highlight that a compound shape is made up from other shapes and that the area of the compound shape remains the same, whichever way the shape is split.

Children apply their learning from earlier steps to find missing lengths on the shape to support finding the area.

Things to look out for

- Children may rely on counting squares to find area, instead of multiplying the length by the width for the area of each rectangle.
- Children need to be secure in finding missing lengths of shapes by adding or subtracting known lengths.
- Children need to be careful when splitting up compound shapes to make sure they know which lengths correspond to which shape.

Key questions

- How do you work out the area of a rectangle?
- Are there any rectangles within the shape?
- How can you split the shape?
- Is there more than one way to split the shape?
- Do you get a different total area if you split the shape differently?

Possible sentence stems

- To find the area of the compound shape, I need to split it into _____ and then ...
- Area of rectangle A = _____
Area of rectangle B = _____
Total area = _____ + _____ = _____

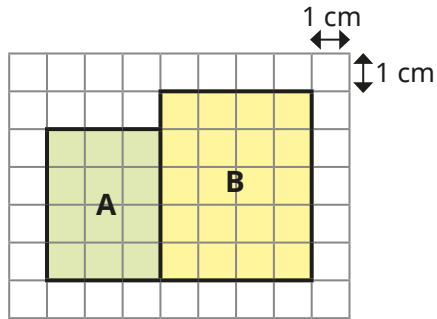
National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm²) and square metres (m²), and estimate the area of irregular shapes

Area of compound shapes

Key learning

- A compound shape is made up of two rectangles, A and B.

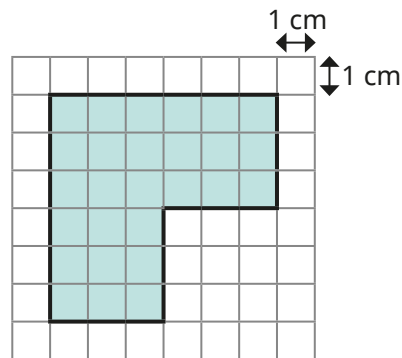


- ▶ What is the area of A?
- ▶ What is the area of B?
- ▶ What is the area of the compound shape?

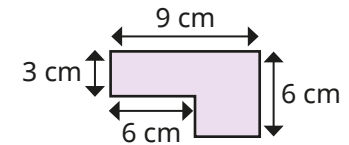
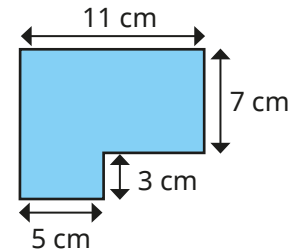
- Find the area of the compound shape.

How many ways can you split the compound shape in order to work out the area?

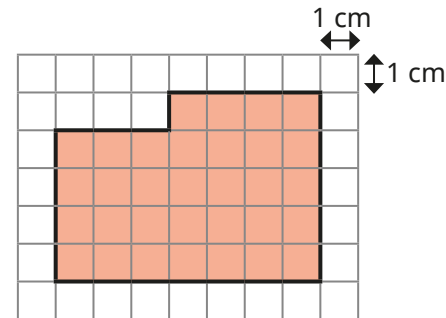
Compare methods with a partner.



- Find the areas of the compound shapes.



- Whitney has found the area of this compound shape.



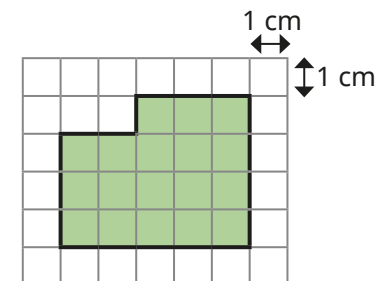
$$7 \times 5 = 35$$

$$35 - 3 = 32$$

The area is 32 cm^2

Explain why Whitney's method works.

Use Whitney's method to find the area of the shape.



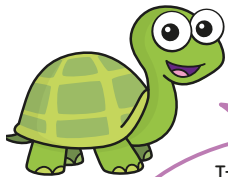
Area of compound shapes

Reasoning and problem solving

Tiny puts three 7 cm by 4 cm rectangles next to each other.



What is the area of the compound shape?



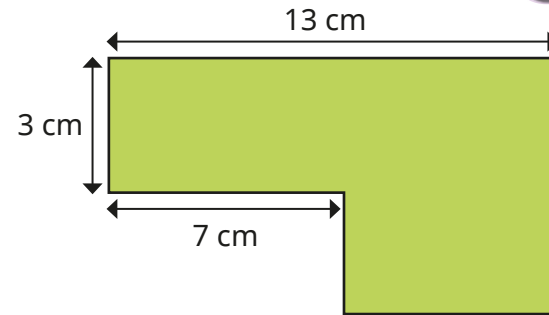
It does not matter which way round I put the rectangles. The shape will still have the same area.

Do you agree with Tiny?
Explain your reasoning.

84 cm²

Yes

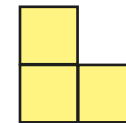
The area of the shape is 69 cm²



Work out the perimeter of the shape.

42 cm

The compound shape is made up of three squares.



The area of each square is 25 cm²
What is the perimeter of the compound shape?

40 cm

Estimate area

Notes and guidance

In this small step, children use their knowledge of counting squares to estimate the areas of non-rectilinear shapes.

Children should be aware that the estimate is not exact and other people may find a different estimate. One way to obtain an estimate is to find the total number of complete squares, then include a square if more than half of it is coloured, but not if less than half is coloured. Children use their knowledge of fractions to estimate how much of a square is covered.

For larger shapes, the areas of rectangles within them can be found by multiplying the length by the width, rather than counting all the squares individually.

To avoid repetition or miscounting, children can physically annotate when counting squares. An alternative method is to match up part-covered squares to create wholes, but this is more demanding and time consuming.

Things to look out for

- Children may struggle to identify which part-covered squares are more than half covered.
- Children may miscount or include the same square twice.

Key questions

- What does “approximate” mean?
- What does “estimate” mean?
- How many whole squares are covered?
- How many part squares are more than half covered?
- Are there any part-covered squares that you could combine to make a full square?
- Does it matter if your answer is not exactly the same as a partner’s? Why/why not?

Possible sentence stems

- _____ whole squares are covered.
- _____ squares are more than half covered.
- Estimate of the total area = _____ + _____ = _____ cm^2

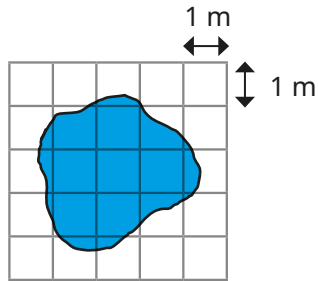
National Curriculum links

- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm^2) and square metres (m^2), and estimate the area of irregular shapes

Estimate area

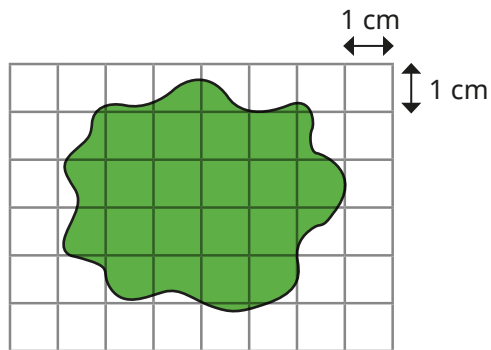
Key learning

- Jack estimates the size of the pond as 8 m^2



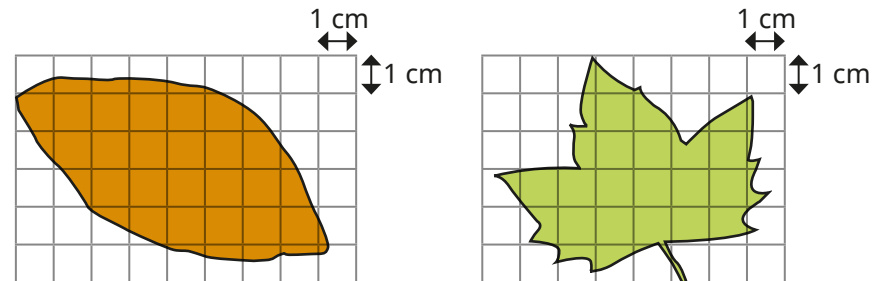
How do you think Jack made his estimate?

- Here is a shape on a centimetre squared grid.



- ▶ How many full squares are covered?
- ▶ How many squares are more than half covered?
- ▶ Estimate the area of the shape.

- Estimate the area of each leaf.



Which area was easier to estimate? Why?

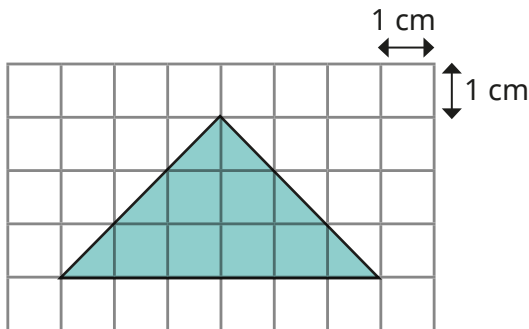
Compare answers with a partner.

- Draw a circle on centimetre squared paper. Estimate the area of your circle. Ask a partner to estimate the area of your circle. Compare your estimates.
- Trace some other non-rectilinear shapes onto centimetre squared paper and estimate their areas. Does where you put the shape on the grid make a difference to your estimate? Compare answers with a partner.

Estimate area

Reasoning and problem solving

Amir is finding the area of the shape.



It is only possible to estimate the area of this shape.

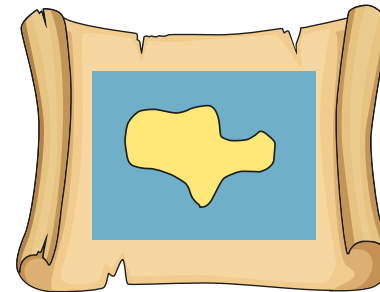


Do you agree with Amir?

Explain your answer



No



Use centimetre squared paper.

Draw a "Pirate Island" to be used as a treasure map.

Each square represents 4 m^2

The Pirate Island must have a total area of 240 m^2

The island must include these features:

- lake with a total area of 58 m^2
- forests with a total area of 86 m^2
- mountains with a total area of 92 m^2
- marshes with a total area of 12 m^2

Compare answers as a class.