Spring Block 3

Area, perimeter and volume

White Rose MATHS

Small steps

Step 1	Perimeter of rectangles and rectilinear shapes
Step 2	Area of rectangles
Step 3	Area of compound shapes
Step 4	Estimate area
Step 5	Area of triangles
Step 6	Area of parallelograms
Step 7	Volume – cubic centimetres
Step 8	Volume of a cuboid

Small steps

Step 9	Compare volume
Step 10	Estimate volume and capacity

Perimeter of rectangles and rectilinear shapes

Notes and guidance

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

Encourage children to explore different methods of finding the perimeter of a rectangle, for example adding all four sides separately; adding the length to the width and then doubling; doubling the length and the width and then adding together.

When calculating the perimeter of a rectilinear shape, encourage children to first label the unknown lengths and then to mark sides as they add them to the total, to avoid counting sides more than once. Year 5 children may need greater support when working out the unknown lengths of rectilinear shapes. Year 6 children should explore different methods of finding the perimeter of rectilinear shapes, comparing their efficiency. They could also be challenged to work out unknown lengths when given the perimeter.

Things to look out for

- Children may struggle to see that the two shorter sides are equal to the longer opposite side on a rectilinear shape.
- Children may not use efficient strategies to calculate perimeter, instead always adding lengths in order.

Key questions

- What strategies can you use to work out the perimeter?
- How can you use the labelled sides to find the unknown side(s)? Do you need to add or subtract?
- Which method do you think is more efficient?

Possible sentence stems

- The length is _____ cm and the width is _____ cm, so the perimeter is _____ cm.
- _____ +/– _____ = _____, so the longer/shorter side is _____

Single age small step links

- Perimeter of rectangles (Y5)
- Perimeter of rectilinear shapes (Y5)
- Area and perimeter (Y6)

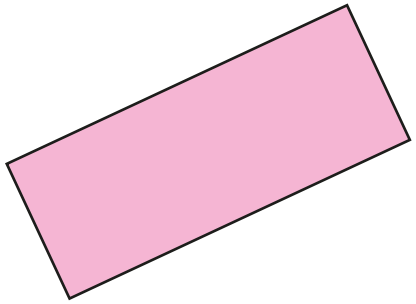
National Curriculum links

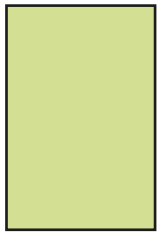
- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres (Y5)
- Recognise that shapes with the same areas can have different perimeters and vice versa (Y6)

Perimeter of rectangles and rectilinear shapes

Key learning

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



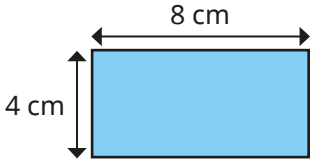


_____ cm + _____ cm + _____ cm + _____ cm = _____ cm

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

Rosie

8 cm + 4 cm + 8 cm + 4 cm = 24 cm

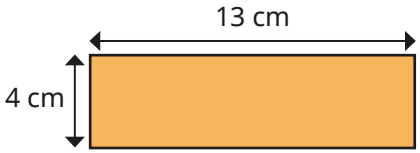


Eva

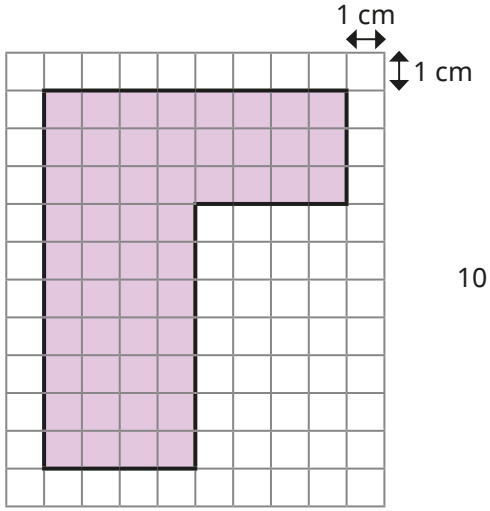
8 cm + 4 cm = 12 cm 12 cm x 2 = 24 cm

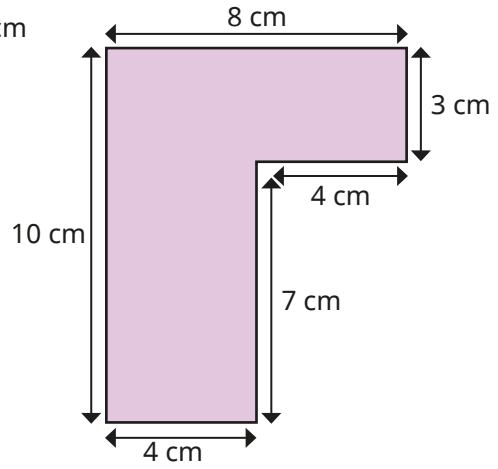
What is the same about the methods? What is different?

Use both methods to find the perimeter of the rectangle.



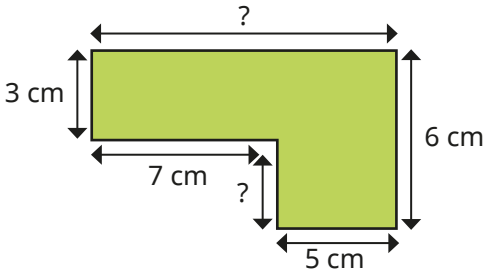
- Work out the perimeters of the shapes.

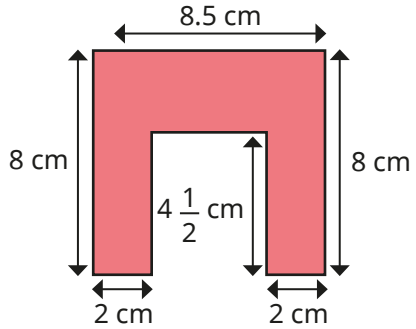




What do you notice?

- Find the unknown lengths and then the perimeter of each shape.

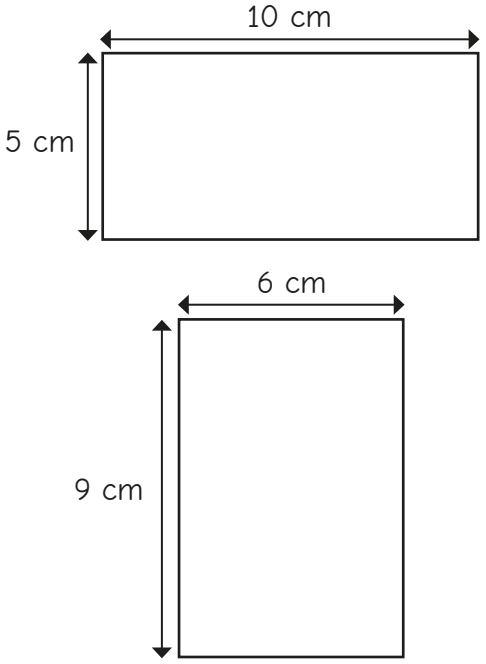




Perimeter of rectangles and rectilinear shapes

Reasoning and problem solving

Tiny thinks that these are all the possible rectangles with a perimeter of 30 cm.



Is Tiny correct?

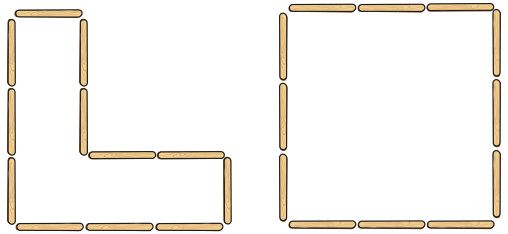
Explain your answer.

No

multiple possible answers, e.g.

A rectangle that is 4 cm by 11 cm also has a perimeter of 30 cm.

Teddy has made two rectilinear shapes using lolly sticks.



The length of each lolly stick is 9 cm.

Work out the perimeter of each shape.

What do you notice?

Both shapes have a perimeter of 108 cm.

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

> When one side length of a square is an odd number, the perimeter is even.

Explain your answer.

always true

Area of rectangles

Notes and guidance

In this small step, children find the areas of rectangles by counting squares, and then by calculation.

Year 5 children are introduced to the square centimetre (cm^2) for the first time. Highlight the difference between 1 cm and 1 cm^2, establishing that cm is a measure of length and cm^2 is a measure of area. Children should recognise 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. Encourage them to reflect on the differences between area and perimeter.

Year 5 children may deepen their understanding by exploring arrays, and how these can help to explain why they can multiply length and width to calculate the area of a rectangle. When this understanding is secure, children can move on to the area of shapes not drawn on a centimetre squared grid.

If appropriate, Year 6 children can identify shapes that have the same area by using factor pairs. They can also use factor pairs to draw different rectangles that have the same area.

Things to look out for

- Children may rely on counting squares to find the area.
- Children may confuse the concepts of area and perimeter.

Key questions

- What is the formula to find the area of a rectangle?
- How can you work out area in a more efficient way?
- How could you draw a different rectangle that has an area of _____ cm^2?

Possible sentence stems

- The total number of squares in the shape is _____
  The area of the rectangle is _____ cm^2
- Area = _____ × _____

Single age small step links

- Area of rectangles (Y5)

- Shapes – same area (Y6)
- Area and perimeter (Y6)

National Curriculum links

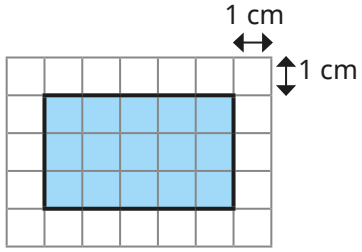
- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm^2) and square metres (m^2), and estimate the area of irregular shapes (Y5)
- Recognise that shapes with the same areas can have different perimeters and vice versa (Y6)

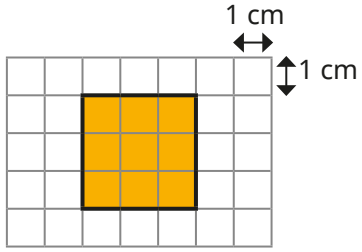
Area of rectangles

Key learning

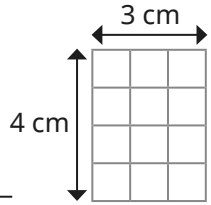
- On the grids, the area of each square is 1 cm²

  Find the area of each shape.





- Complete the sentences to describe the rectangle.



  The length of the rectangle is _____ cm.

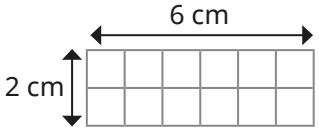
  The width of the rectangle is _____ cm.

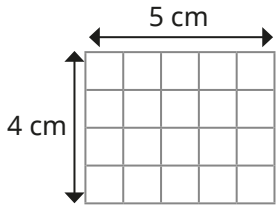
  The total number of squares in the rectangle is _____

  The area of the rectangle is _____ cm²

  _____ cm × _____ cm = _____ cm²

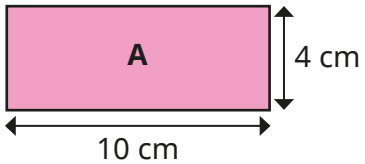
  Use the same method to find the areas of the rectangles.

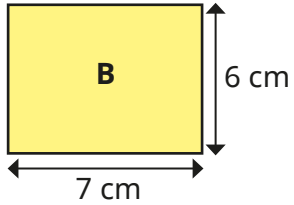


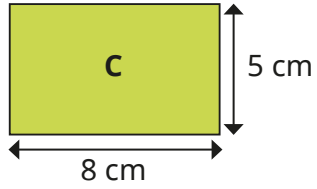


- Find the areas of the rectangles.

  Which two rectangles have the same area?







  How do you know?

- Draw a rectangle with an area of 16 cm² and label the lengths.

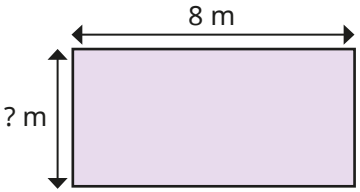
  How many different rectangles can you draw?

  Your diagrams do not have to be drawn to scale.

  Compare rectangles with a partner.

- The area of the rectangle is 32 m²

  What is the width of the rectangle?

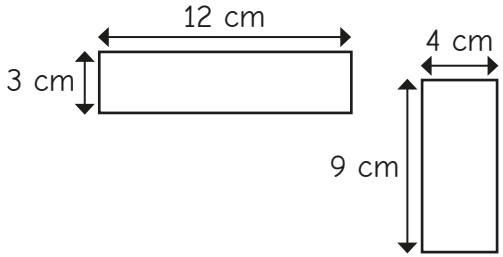


  Draw a different rectangle with an area of 32 m²

Area of rectangles

Reasoning and problem solving

Tiny thinks that these are the only rectangles with an area of 36 cm²



Is Tiny correct?

Explain your answer.

No

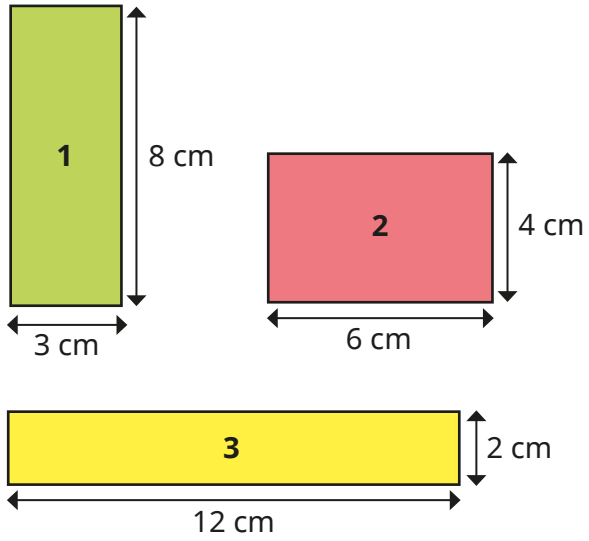
Is the statement always true, sometimes true or never true?

> A rectangle's area is less than its perimeter.

Give examples to support your answer.

sometimes true

Which rectangle has the greatest area?



Sketch the next rectangle in the pattern.

What is its area?

How do you know?

All the rectangles have the same area. | 24 cm²

Area of compound shapes

Notes and guidance

In this small step, children 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, children may physically cut or split compound shapes. They can 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 of other shapes and that the area of the compound shape remains the same, whichever way the shape is split. Encourage Year 6 children to look for the most efficient way to split the shape, rather than always splitting it the same way. They can also explore when it may be more efficient to find the area of a rectilinear shape by subtracting the missing part from the area of a whole rectangle. Children then apply their learning from earlier steps to find unknown lengths on rectilinear shapes, then work out the areas.

Things to look out for

- Children may not be secure in finding unknown lengths of shapes by adding or subtracting known lengths.
- Children may not split the shape correctly and/or may not know which lengths correspond to which shape.

Key questions

- How can you split the rectilinear shape into rectangles? Is there more than one way?
- Is the total area different if you split the shape differently?
- How can you work out the unknown side lengths?

Possible sentence stems

- Area of rectangle A = _____ cm^2

  Area of rectangle B = _____ cm^2

  Total area = _____ + _____ = _____ cm^2

Single age small step links

- Area of compound shapes (Y5)

- Shapes – same area (Y6)
- Area and perimeter (Y6)

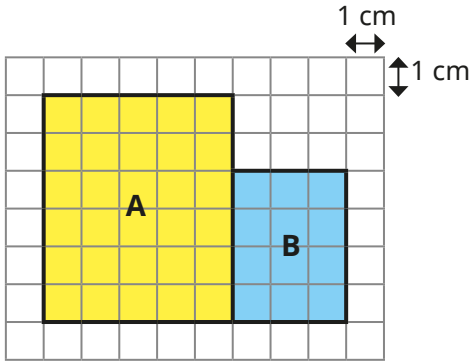
National Curriculum links

- 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 (Y5)

Area of compound shapes

Key learning

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

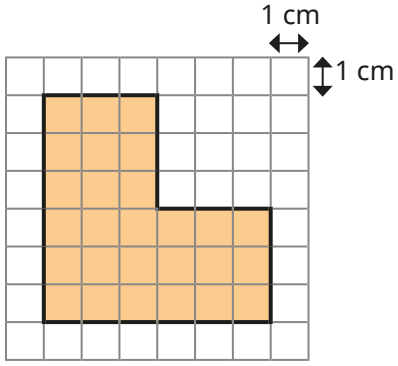


  - What is the area of rectangle A?
  - What is the area of rectangle B?
  - What is the area of the compound shape?

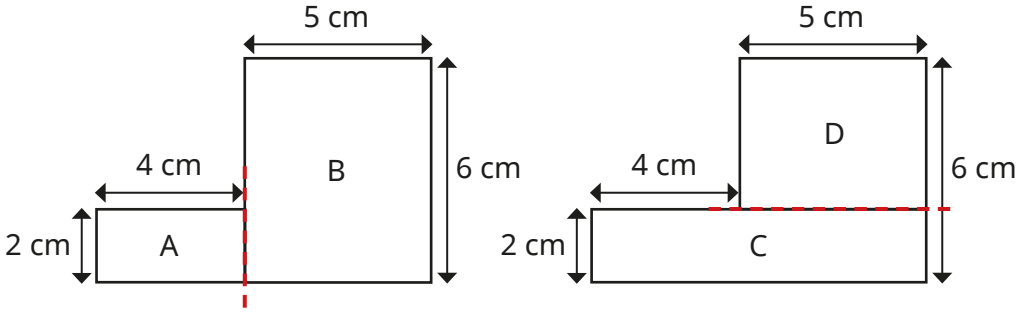
- Find the area of the compound shape.

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

  Compare methods with a partner.



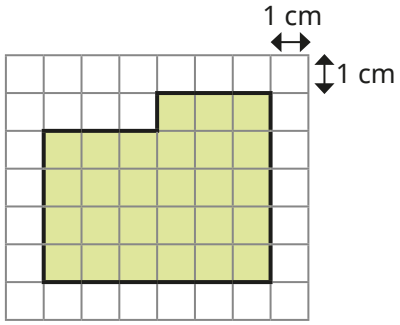
- Both of these rectilinear shapes are made from two rectangles.



  Work out the areas of the rectangles to work out the areas of the rectilinear shapes.

  What do you notice?

- Mo has found the area of the compound shape.



6 × 5 = 30

30 – 3 = 27

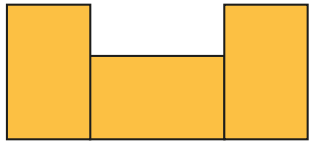
The area is 27 cm²

  Explain why Mo's method works.

Area of compound shapes

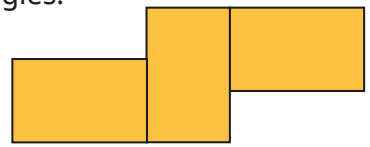
Reasoning and problem solving

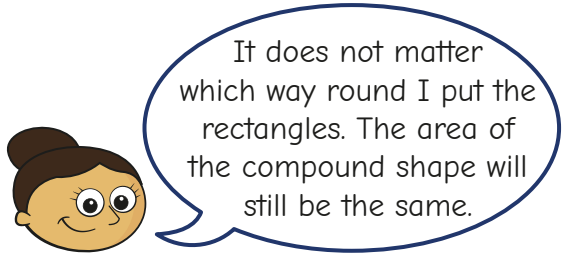
Dora puts three 8 cm by 5 cm rectangles next to each other.



What is the area of the compound shape?

Dora changes the positioning of the rectangles.





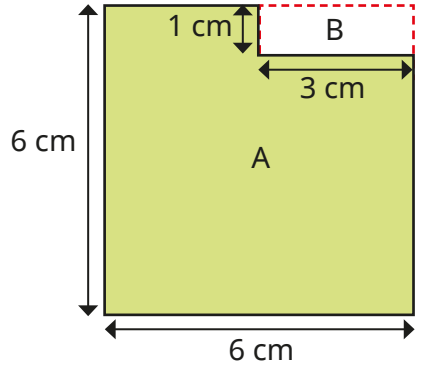
Is Dora correct?

Explain your answer.

120 cm²

Yes

Tiny is finding the area of the shaded shape.



Area of A = 6 cm x 6 cm = 36 cm²

Area of B = 1 cm x 3 cm = 3 cm²

Total area = 39 cm²

Is Tiny correct?

Explain your answer.

No

Estimate area

Notes and guidance

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

Children should be aware that the estimate is not exact and other people may make 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 covered, but not if less than half is covered. Children also use their knowledge of fractions to estimate how much of a square is covered. Year 6 children may focus on matching up partly covered squares to create whole squares.

When estimating the area of larger shapes, children can find the areas of rectangles within them 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.

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?

Possible sentence stems

- _____ whole squares are covered.

  _____ squares are more than half covered.

  Estimate of the total area = _____ + _____ = _____ cm^2

Single age small step links

- Estimate area (Y5)
- N/A

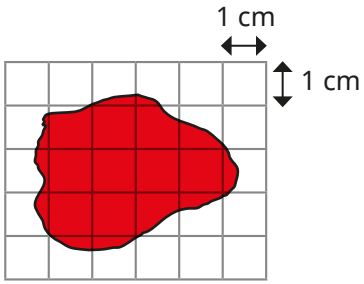
National Curriculum links

- 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 (Y5)

Estimate area

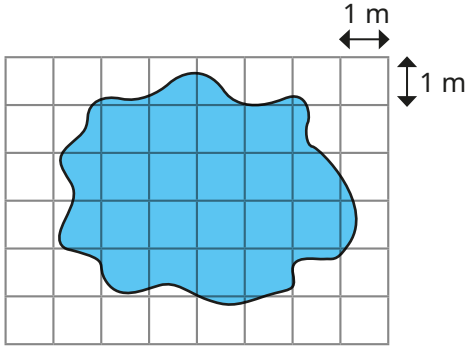
Key learning

- Scott estimates the size of the shape as 11 cm^2



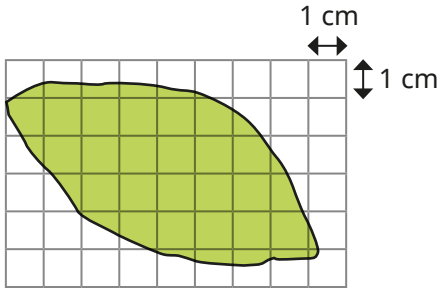
How do you think that Scott made his estimate?

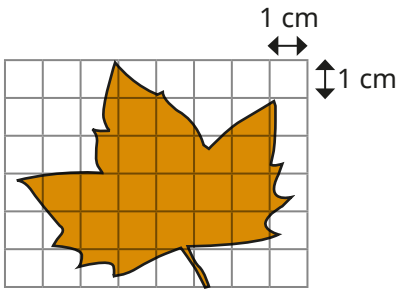
- Here is the size of Jack's pond on a metre-squared grid.



  - 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.

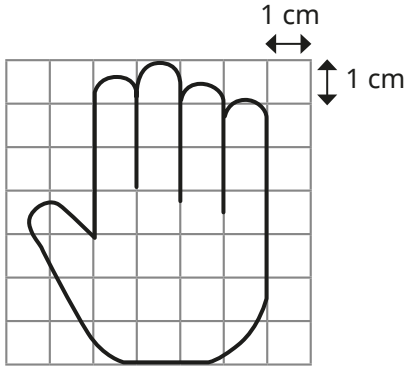




Which area was harder to estimate? Why?

Compare answers with a partner.

- Esther has drawn around her hand on centimetre-squared paper.

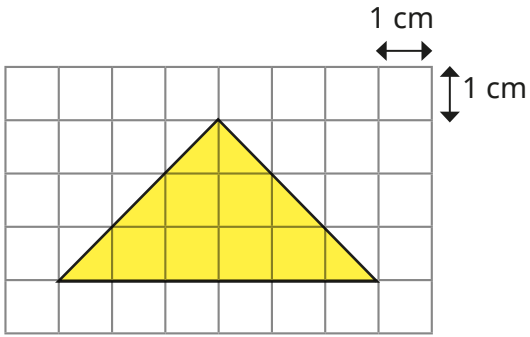


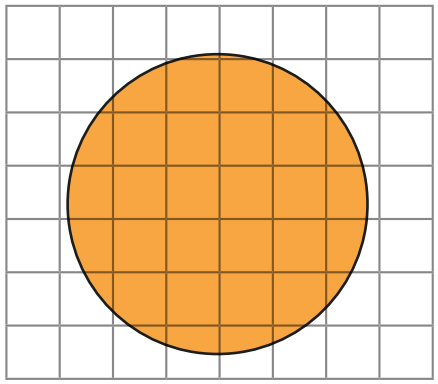
Estimate the area of Esther's hand.

Estimate area

Reasoning and problem solving

Estimate the areas of the shapes.





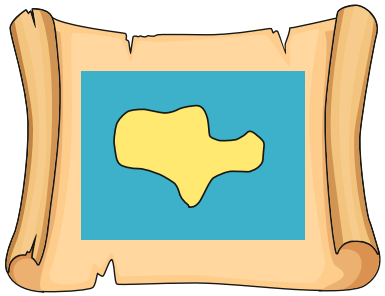
Which area is easier to estimate?

What do you notice?

triangle: 9 cm²

circle: 24 cm²

The triangle is easier.



Use centimetre-squared paper.

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

Each square represents 3 m²

The Pirate Island must have a total area of 188 m²

The island must include these features:

- lake with a total area of 38 m²
- forests with a total area of 66 m²
- mountains with a total area of 72 m²
- marshes with a total area of 12 m²

Compare answers as a class.

Area of triangles

Notes and guidance

In this small step, children find the area of a triangle, first by counting squares and then by using the formula.

Remind children to use efficient strategies for calculating and estimating the areas of shapes. Start with triangles that only contain full and half squares, before moving on to triangles that involve sections of squares greater and less than half.

Year 5 children may spend more time counting squares to secure their understanding, whereas Year 6 children should progress to using the formula. Establish that the area of a right-angled triangle with the same length and perpendicular height as a rectangle is half the area of the rectangle, and so the formula for the area of a right-angled triangle is area = $\frac{1}{2}$ × base × perpendicular height. Ensure that children have the opportunity to explore this mathematical vocabulary.

Year 6 children may also use the formula to find the area of any triangle, identifying that the perpendicular height may not always be the length of one of the sides or that the base may not always be located at the bottom of a triangle.

Things to look out for

- Children may not be able to identify the base and/or perpendicular height.

Key questions

- Can you see any parts of squares that combine to make approximately one full square?
- What does "perpendicular" mean?

Possible sentence stems

- The base is _____ cm. The perpendicular height is _____ cm.

  Area = $\frac{\square}{\square}$ × _____ × _____

Single age small step links

- N/A

- Area of a triangle – counting squares (Y6)
- Area of a right-angled triangle (Y6)
- Area of any triangle (Y6)

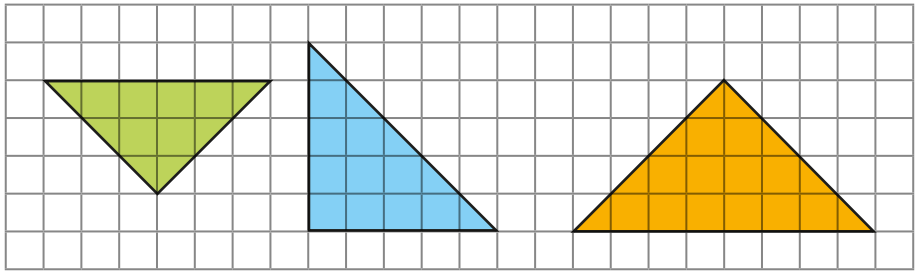
National Curriculum links

- Recognise when it is possible to use formulae for area and volume of shapes (Y6)
- Calculate the area of parallelograms and triangles (Y6)

Area of triangles

Key learning

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



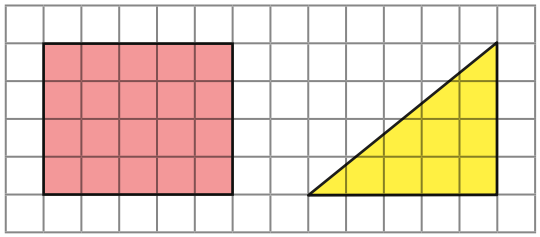
The triangle has _____ full squares.

The triangle has _____ half squares.

_____ + _____ = _____

The total area of the triangle is _____ cm^2

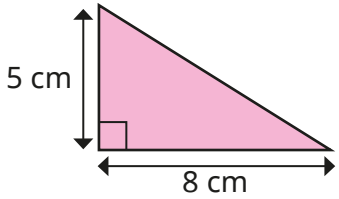
- Here is a rectangle and a right-angled triangle.



  - What is the area of the rectangle?
  - What is the area of the right-angled triangle?

What do you notice?

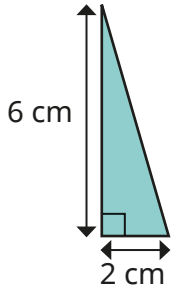
- Huan uses the formula to work out the area of the right-angled triangle.

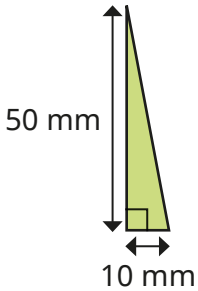


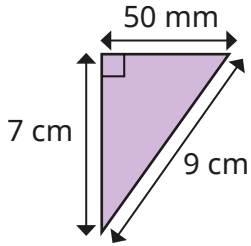
$\text{area} = \frac{1}{2} \times \text{base} \times \text{perpendicular height}$

$\text{area} = \frac{1}{2} \times 8 \times 5 = \frac{1}{2} \times 40 = 20 \text{ cm}^2$

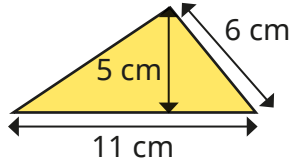
Use the formula to find the areas of the triangles.







- Here is a triangle.

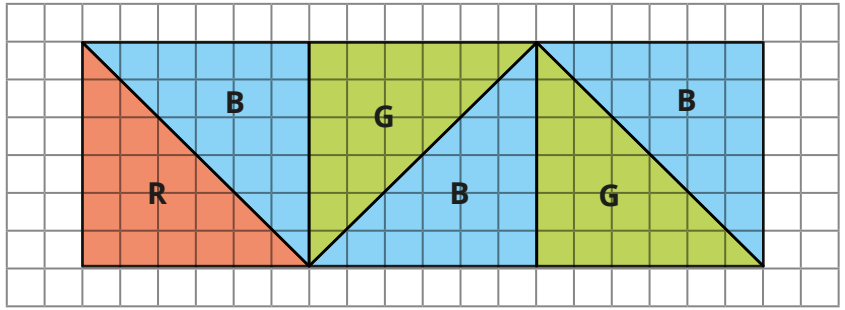


  - What is the length of the base of the triangle?
  - What is the perpendicular height of the triangle?
  - Use the formula area = $\frac{1}{2}$ × base × perpendicular height to work out the area of the triangle.

Area of triangles

Reasoning and problem solving

Aisha draws three squares and splits them into six right-angled triangles.



What is the total area of the green (G) triangles?

What is the area of the red (R) triangle?

What is the total area of the blue (B) triangles?

Compare methods with a partner.

green: 36 cm²

red: 18 cm²

blue: 54 cm²

The area of a right-angled triangle is 30 cm²

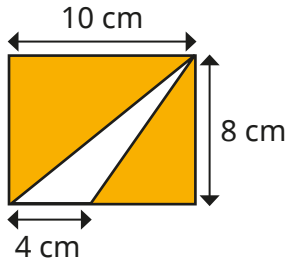
What could the base and height be?

How many solutions can you find?

multiple possible answers, e.g.

12 cm and 5 cm

Here is a flag.



Find the area of the flag that is white.

Find the area of the flag that is not white.

Is there more than one way to find the answers?

white: 16 cm²

not white: 64 cm²

Area of parallelograms

Notes and guidance

In this small step, children explore the area of a parallelogram, identifying and using a formula.

Encourage children to look at the properties of a parallelogram, comparing them to the properties of a rectangle. They first explore parallelograms on squared paper. Using the "cut-and move" method, they rearrange the parts of the parallelogram to make a rectangle, in which the length and width correspond to the base and perpendicular height of the parallelogram. This leads to the formula for the area of a parallelogram: area = base × perpendicular height.

Provide many examples of parallelograms, where the perpendicular height is indicated with a right angle and where it is not. Year 6 children need to be able to identify the base and perpendicular height when given more than the required measurements. Model this carefully, so that children do not believe that area = $l \times w$.

Things to look out for

- Children may try to use the formula for finding the area of a rectangle or a triangle.
- Children may struggle to identify the base and perpendicular height.

Key questions

- How could you change the parallelogram into a rectangle?
- How will this help you to find the area?
- How can you count the squares accurately to find the area?
- How do you know that you have found the base/ perpendicular height?
- What is the formula for finding the area of a parallelogram?

Possible sentence stems

- The base of the parallelogram is _____ cm.
  The perpendicular height of the parallelogram is _____ cm.
  The area of the parallelogram is _____ × _____ = _____ cm^2

Single age small step links

- N/A

- Area of a parallelogram (Y6)

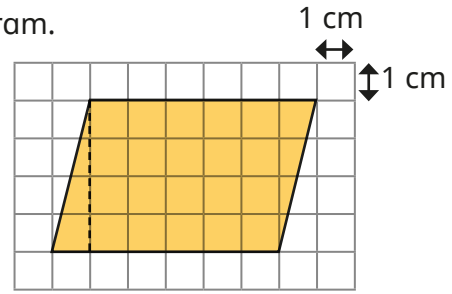
National Curriculum links

- Recognise when it is possible to use formulae for area and volume of shapes (Y6)
- Calculate the area of parallelograms and triangles (Y6)

Area of parallelograms

Key learning

- Here is a parallelogram.



  - Copy the parallelogram onto centimetre-squared paper.

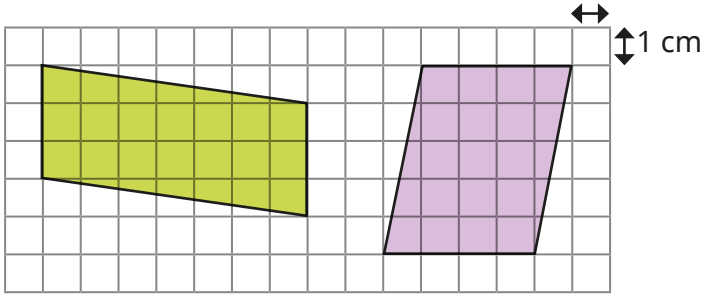
    Estimate its area by counting squares.
  - Now cut along the dotted line.

    Move the triangle to make a rectangle.

    What is the area of the rectangle?

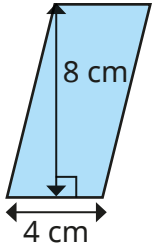
    What do you notice?

- Work out the areas of the parallelograms.



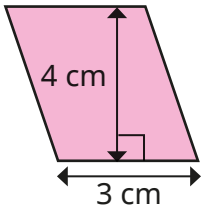
Explain your method to a partner.

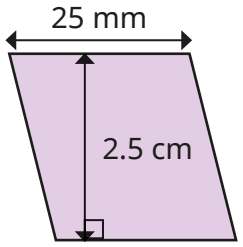
- Jack is working out the area of the parallelogram.

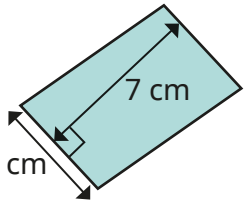


area = base x perpendicular height
= 4 cm x 8 cm
= 32 cm²

Use Jack's method to find the areas of the parallelograms.

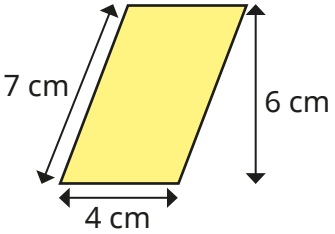


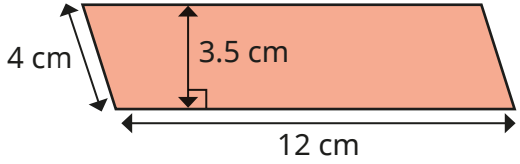




- Label the base b and perpendicular height h on each parallelogram.

Then find the area of each shape.



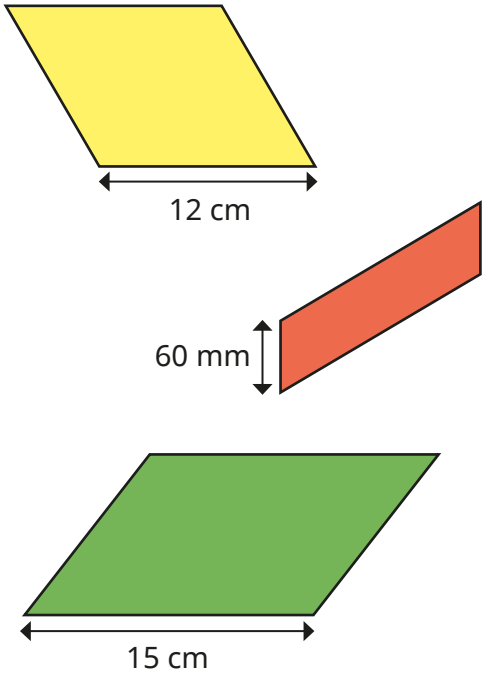


Area of parallelograms

Reasoning and problem solving

These parallelograms each have an area of 60 cm²

Find the perpendicular height of each shape.

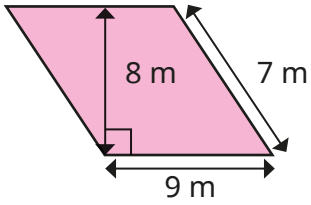


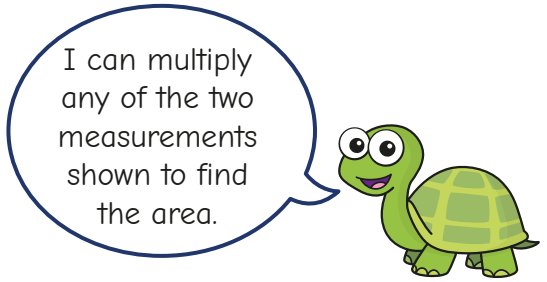
5 cm

10 cm

4 cm

Tiny is finding the area of the parallelogram.





Is Tiny correct?

Explain your answer.

Work out the area of the parallelogram.

No

72 m²

Volume – cubic centimetres

Notes and guidance

In this small step, children learn that volume refers to the amount of three-dimensional space an object takes up, and they measure volume using cubes.

Children begin by making simple shapes with interlocking cubes and describe the volume of each shape in terms of the number of cubes. They then use pictorial representations to work out how many cubes there are in each shape, including counting the cubes that cannot be seen in the picture. They move on to find the volume of a variety of shapes, using the fact that each cube has a volume of one cubic centimetre (1 cm^3).

Year 6 children should explore shapes where they can find the volume by multiplying the volume shown from a single layer by the number of equal layers. This can include cuboids and other prisms. They could also explore the relationship between the total volume of a cuboid and its length, width and height. The formula for finding the volume of a cuboid is covered in more detail in the next step.

Things to look out for

- Children may only count the visible cubes when working out the volume of a 3-D shape, ignoring the "hidden" cubes.

Key questions

- What is volume?
- What unit can you use to measure volume?
- How many cubes are there in this layer? How many equal layers are there? So how can you find the volume?

Possible sentence stems

- The number of cubes needed to make the shape is _____
- The volume of the shape is _____ cubic centimetres.

Single age small step links

- Cubic centimetres (Y5)
- Volume – counting cubes (Y6)

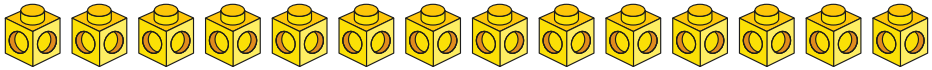
National Curriculum links

- Estimate volume and capacity (Y5)
- Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units (Y6)

Volume – cubic centimetres

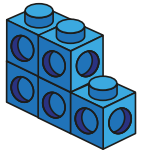
Key learning

- Using 14 cubes, how many different shapes can you make?

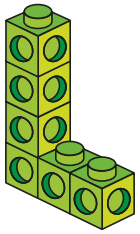


- Eva and Filip are using cubes to make shapes.

Eva



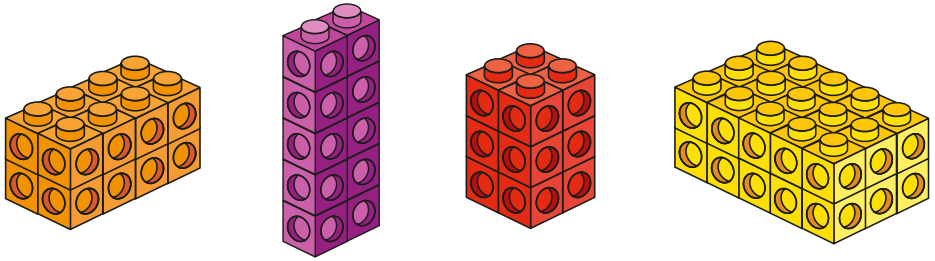
Filip



How many cubes have they each used?

- Dani uses cubes to make some cuboids.

Each cube has a volume of 1 cm^3

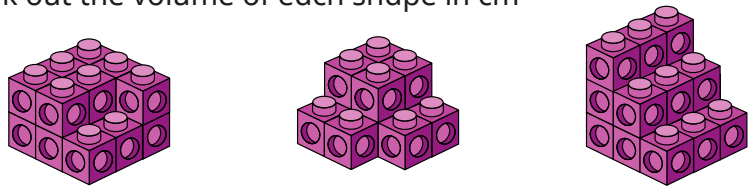


What is the volume of each cuboid?

How did you work it out?

- Each shape is made using centimetre cubes.

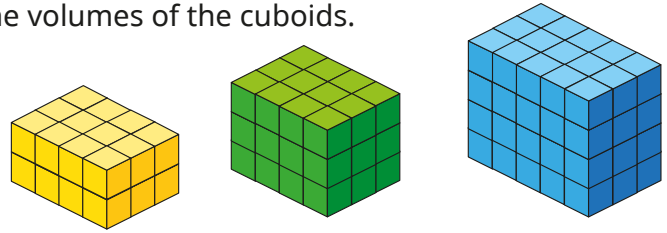
Work out the volume of each shape in cm^3



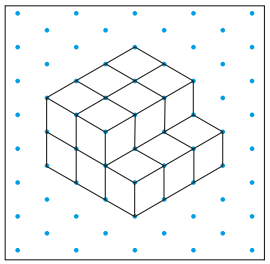
What is the quickest way of finding the volumes?

- Each cuboid is made using centimetre cubes.

Find the volumes of the cuboids.



- Brett draws this shape on isometric paper.

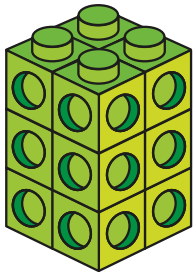


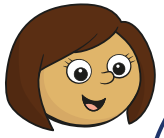
How many cubes does he need to make his 3-D shape?

Volume – cubic centimetres

Reasoning and problem solving

Kim is working out the volume of this cuboid.



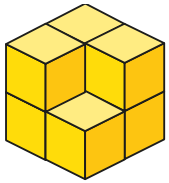


I can see that the top layer is made up of 4 cubes and there are 3 layers, so I can work out the volume with the multiplication 4 × 3

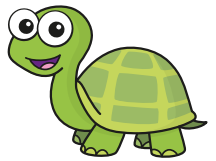
Is Kim correct?

Explain your answer.

Yes



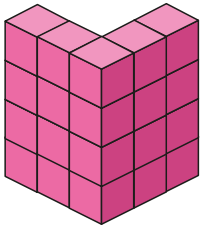
I only need 6 cubes to make this shape.



Do you agree with Tiny?

Explain your reasons.

No



What could the volume of this shape be?

Compare answers with a partner.

between 20 and 27 cubes

Volume of a cuboid

Notes and guidance

In this small step, children move on from counting cubes to finding the volumes of cuboids using multiplication and applying a formula.

Children discover that they can use multiplication to find the number of cubes in one "layer" of the shape and then multiply this by the number of layers to find the total volume. This will help children identify the formula: volume of cuboid = length × width × height. They should recognise that the formula works whichever way they look at the cuboid and what they think of as a "layer".

Year 5 children may benefit from using cubes, as well as representing cuboids on isometric paper, to support their understanding of the formula. Encourage Year 6 children to find the most efficient method to calculate the volume using the associative law of multiplication.

Things to look out for

- Children may think that it is impossible to find the volume without cubes.
- When finding the volumes of cubes, children may think that they need more than one measurement.

Key questions

- What is volume?
- How many cubes are there in one layer? How do you know?
- What is the formula to find the volume of a cuboid?
- What is the most efficient order to multiply the three numbers?

Possible sentence stems

- There are _____ cubes in each layer.
  There are _____ layers.
  The volume of the cuboid is _____
- The volume of the cuboid is _____ × _____ × _____ = _____

Single age small step links

- N/A

- Volume of a cuboid (Y6)

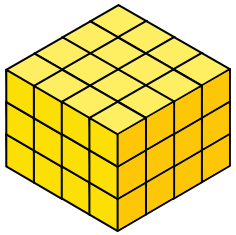
National Curriculum links

- Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units (Y6)

Volume of a cuboid

Key learning

- The cuboid is made using centimetre cubes.



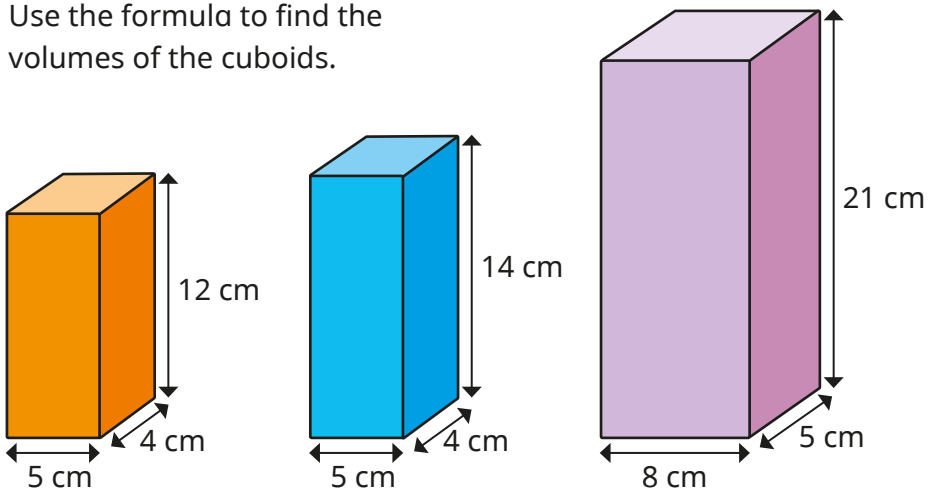
  - What is the volume of the cuboid?
  - What is the length, width and height of the cuboid?
  - Find the product of the length, width and height.

  What do you notice?

- Here is the formula for the volume of a cuboid.

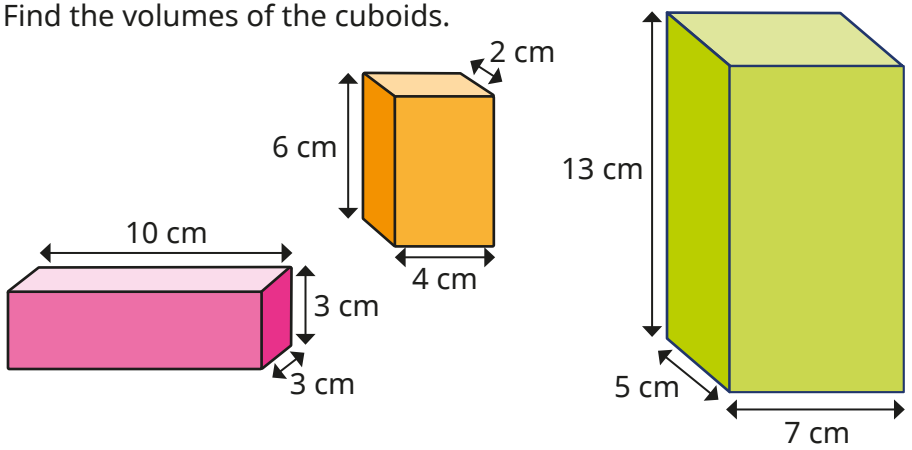
> volume = length × width × height

Use the formula to find the volumes of the cuboids.

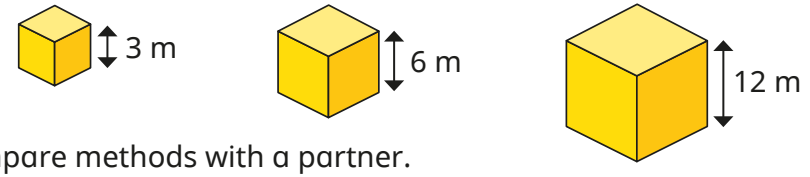


Does it matter in which order you multiply the numbers?

- Find the volumes of the cuboids.

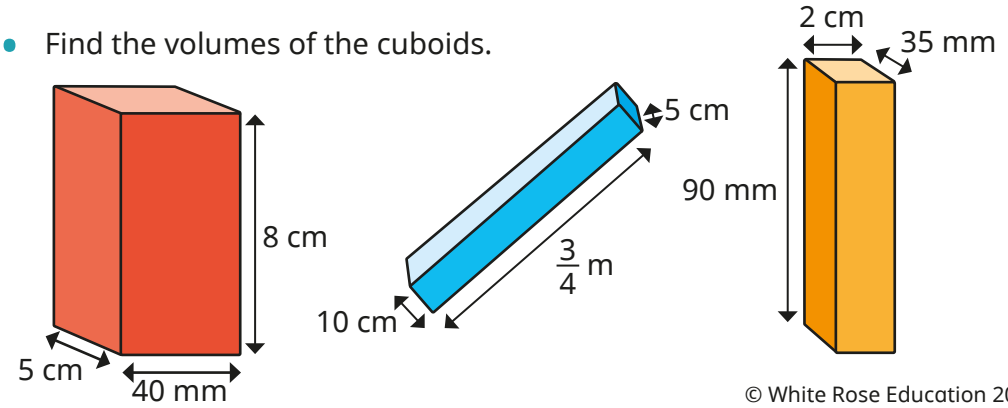


- Find the volumes of the cubes.



Compare methods with a partner.

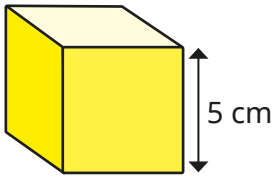
- Find the volumes of the cuboids.

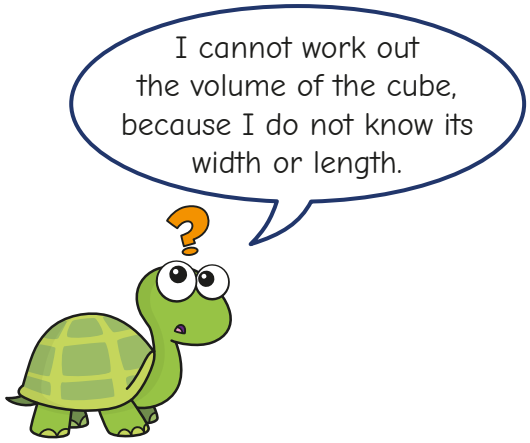


Volume of a cuboid

Reasoning and problem solving

Here is a cube.



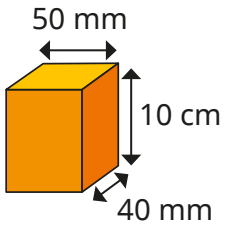


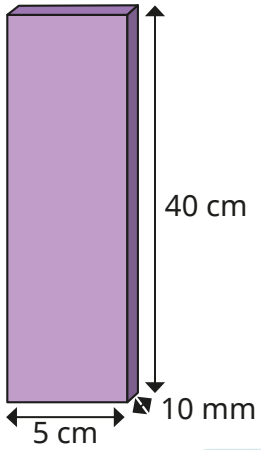
Do you agree with Tiny?

Explain your answer.

No

Which cuboid has the greater volume?

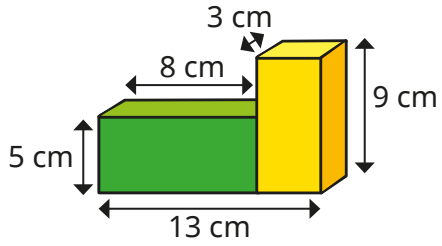




Explain how you know.

Both cuboids have the same volume: 200 cm^3

Calculate the volume of the compound shape.



255 cm^3

Compare volume

Notes and guidance

In previous years, children compared the volume of liquid in different containers using simple vocabulary. In this small step, they find the volumes of different shapes, either by counting cubes or using the formula, then compare the volumes.

Start with 3-D shapes made from interlocking cubes, asking children to say which contains more cubes and so has the greater volume. They can then move on to pictorial representations, working out the number of cubes needed to make each shape before deciding which has the greater volume.

Year 5 children may spend more time focusing on comparing the volume of shapes by counting the cubes, whereas Year 6 children should be given the opportunity to compare cuboids by using the formula.

Things to look out for

- Children may assume that a taller shape always has a greater volume.
- Children may say that a shape made with more cubes has a greater volume than one with fewer cubes, without considering the size of the cubes.
- Children may use the formula for the volume of a cuboid when finding the volumes of different shapes.

Key questions

- How can you find the total volume of the shape?
- How can you tell which shape has the greater volume?
- Are the cubes the same size? Why does this matter?

Possible sentence stems

- The volume of shape A is _____

  The volume of shape B is _____

  Shape _____ has the greater volume.

Single age small step links

- Compare volume (Y5)

- N/A

National Curriculum links

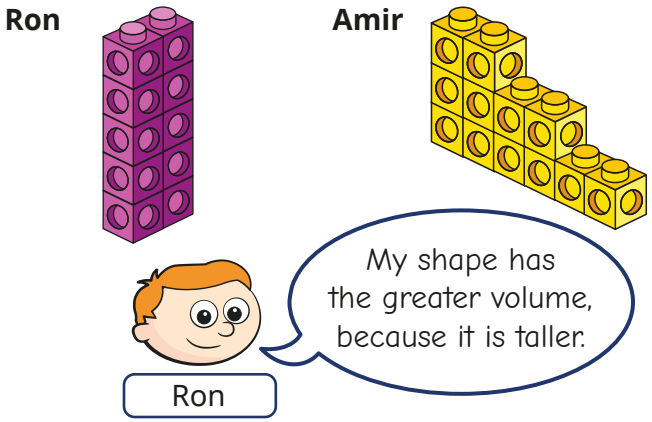
- Estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes)] and capacity [for example, using water] (Y5)
- Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units (Y6)

Compare volume

Key learning

- Ron and Amir each make a shape using cubes.

  Each cube has a volume of 1 cm³

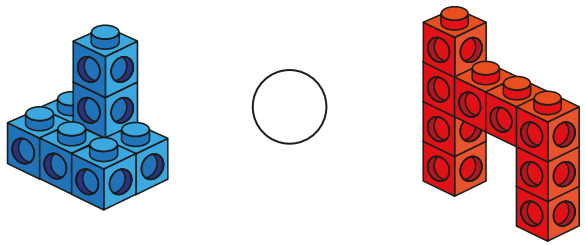


  Is Ron correct?

  Explain your answer.

- Write <, > or = to compare the volume of the shapes.

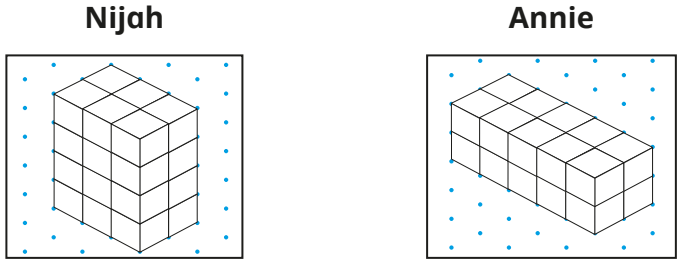
  Each cube has a volume of 1 cm³



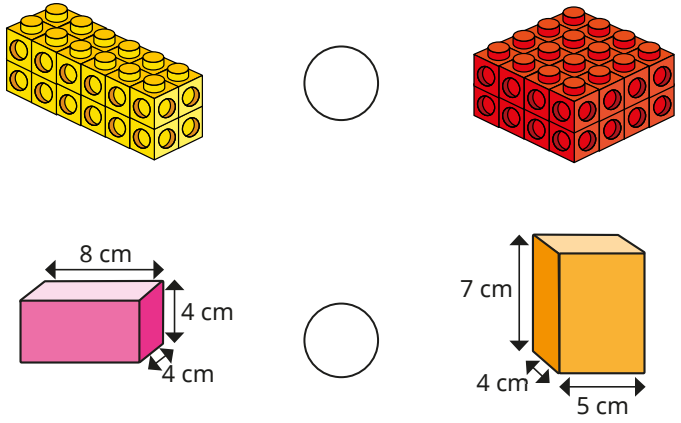
- Nijah and Annie each draw a cuboid on isometric paper.

  Each cube has a volume of 1 cm³

  Whose cuboid has the greater volume?



- Write <, > or = to compare the volumes of the cuboids.



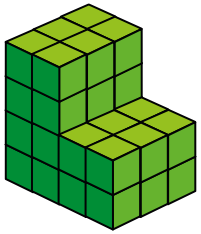
Compare volume

Reasoning and problem solving

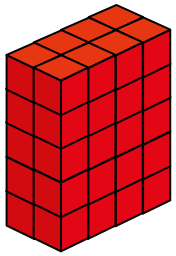
Tom, Jo and Dexter each build a shape using cubes.

Each cube has a volume of 1 cm^3

Tom



Dexter



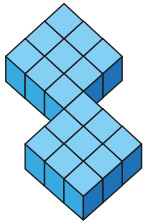
Jo's shape has a volume that is greater than Tom's, but smaller than Dexter's.

What could the volume of Jo's shape be?

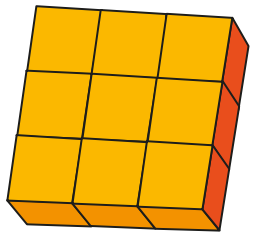
any volume between 36 cm^3 and 40 cm^3

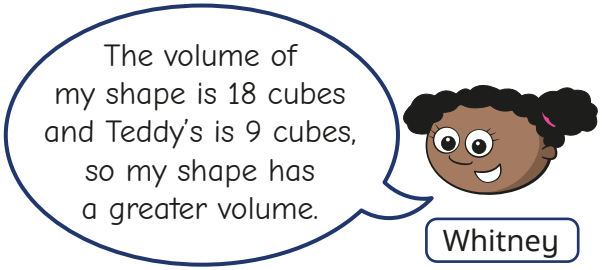
Whitney and Teddy each make a shape using cubes.

Whitney



Teddy





Is Whitney correct?

Explain your answer.

No

Estimate volume and capacity

Notes and guidance

In this step, children estimate the volume and capacity of different objects.

Review the difference between capacity and volume, highlighting that capacity refers to how much a container can hold and volume refers to how much space an object takes up.

Children use cubes to estimate the volumes of objects, for example the volume of a small book by making a similar-sized cuboid with interlocking cubes. For each object, discuss whether the actual volume is greater or less than the estimate. Children then look at the volumes of much larger objects, such as rooms, and consider the use of different units, such as m^3

When exploring capacity, include opportunities for children to investigate a range of containers of different sizes and of different capacities. Containers that children may be more familiar with, for example a 330 millilitre can and a 2-litre bottle, may help them to estimate the capacity of unknown containers. If appropriate, they can also estimate the capacity of a container with a known amount of liquid inside it.

Things to look out for

- Some objects will be harder to recreate using interlocking cubes than others.

Key questions

- What is the difference between capacity and volume?
- How can you use cubes to estimate the volume of an object?
- Is the actual volume greater or less than the estimated volume?
- Which container has the greater capacity? How do you know?

Possible sentence stems

- I estimate that the volume of _____ is _____ cm^3
- The actual volume of _____ is greater/less than the estimate.
- The capacity of the container is _____ ml/l.
- The volume of water in the container is about _____ ml/l.

Single age small step links

- Estimate volume (Y5)
- Estimate capacity (Y5)

- N/A

National Curriculum links

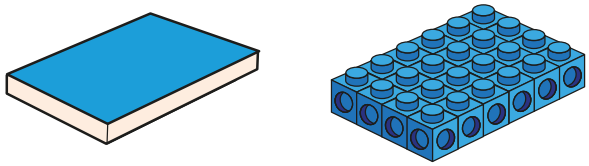
- Estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes)] and capacity (Y5)

Estimate volume and capacity

Key learning

- Teddy wants to estimate the volume of the notebook using cubes.

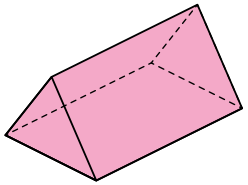
  He makes a cuboid.



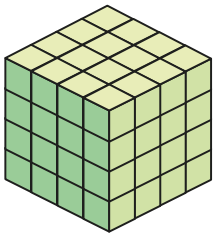
  Work out an estimate for the volume of the notebook.

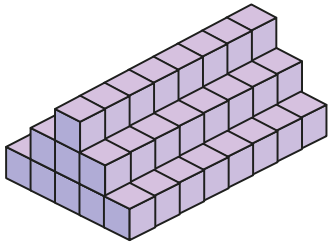
  Is the actual volume of the notebook greater or smaller than the estimate?

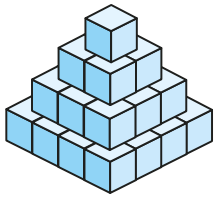
- Sam is estimating the volume of the triangular prism.



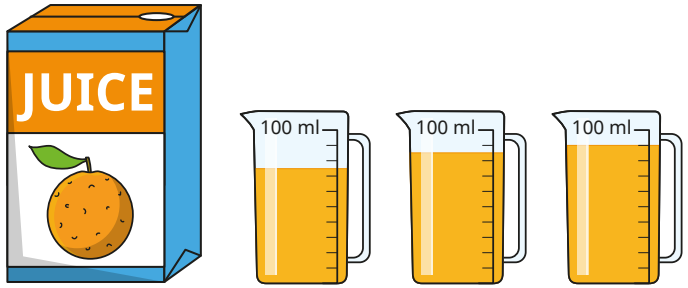
  Which representation will give Sam the best estimate for the volume of the triangular prism?







- Rosie pours all of the juice from the carton into the three containers.



  Estimate the capacity of the juice carton.

- What is the most appropriate capacity of a mug?

170 ml	2 litres	10.5 litres	250 ml

- Each container has a capacity of 1 litre.

  Estimate the volume of the water in each container.

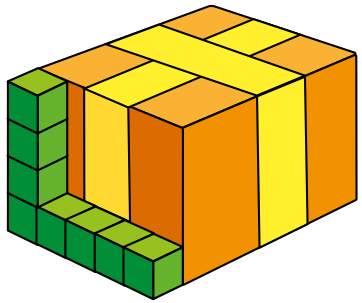
Estimate volume and capacity

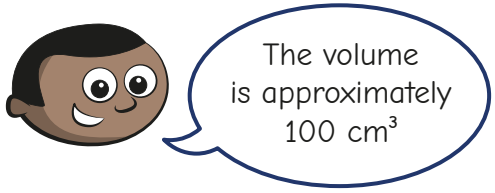
White Rose MATHS

Reasoning and problem solving

Mo is using cubes to estimate the volume of a present.

Each cube has a volume of 1 cm³





Is Mo correct?

Explain your answer.

Yes

Mo has estimated the length, width and height of the present and multiplied them together to give 100 cm³

1 cubic centimetre of water is the same as 1 millilitre of water and has a mass of 1 gram.

What is the mass of 1 litre of water?

How do you know?

1,000 g or 1 kg

Mrs Smith uses a bucket to fill up a paddling pool with water.

The bucket has a capacity of 500 ml.

The paddling pool has a capacity of 26 litres.

How many times does Mrs Smith have to fill and empty the bucket to fill the paddling pool?

52 times