

M1 Maths  
Learning by Thinking

# M1-4 Length, Area and Volume 1

- calculating perimeters of polygons
- calculating areas of rectangles and volumes of rectangular prisms

[Learn](#)   [Answers](#)

This LbT (Learning by Thinking) module is an alternative to the 'Learn' section of the normal module. It is designed to lead the student to work out the maths themselves by solving problems. Thus it contains only minimal explanations. The rationale behind the approach can be read [here](#).

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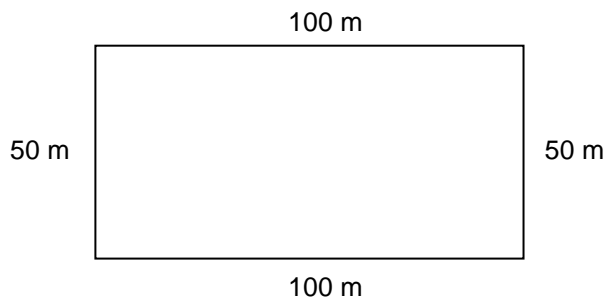
## Learn

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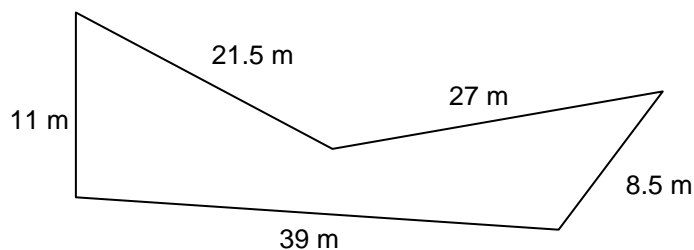
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### Perimeters of polygons

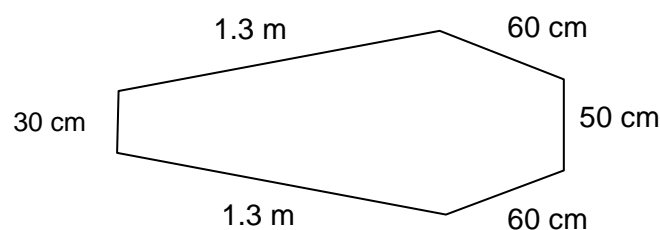
- Q1 The picture to the right is a map of a football field. How far would you have to walk to walk right around it?



- Q2 A polygon is a shape with straight sides. Find the distance around the outside of the polygon below.



- Q3 The mathematical word for 'distance around the outside of a shape' is *perimeter*. Find the perimeter of this polygon. Be careful – different units!

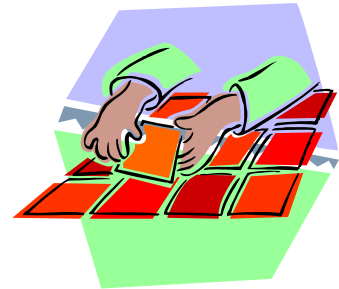


Q4 Find the perimeter of a regular hexagon (6-sides) if all the sides are 2.1 cm long.

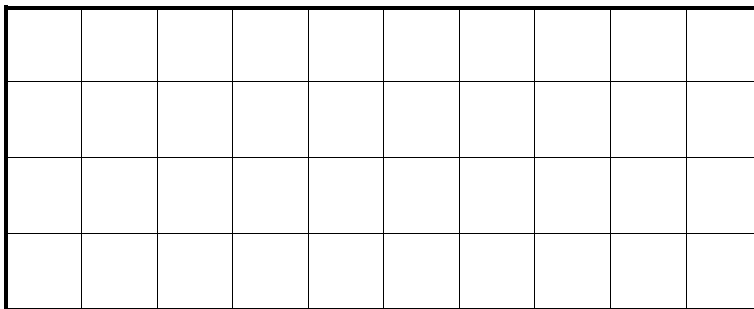
Q5 Draw a couple of other polygons on paper, measure each side length and write it on the picture, then calculate the perimeter.

## Areas of Rectangles

The size of a 2D shape is called its *area*. This is the amount of space inside it. The area of a rectangle in square centimetres (cm<sup>2</sup>) is the number of 1 cm by 1 cm squares that will fit inside it (or that are needed to cover it).



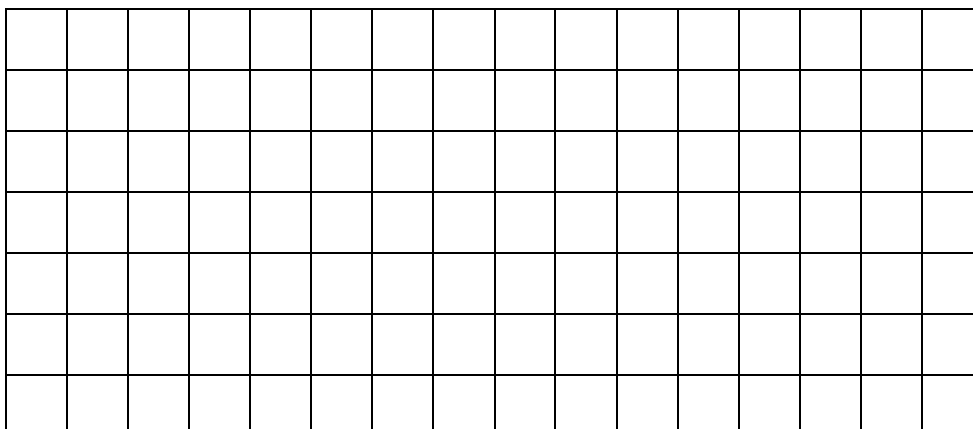
A 10 cm by 4 cm rectangle can be covered with 1 cm squares like this:



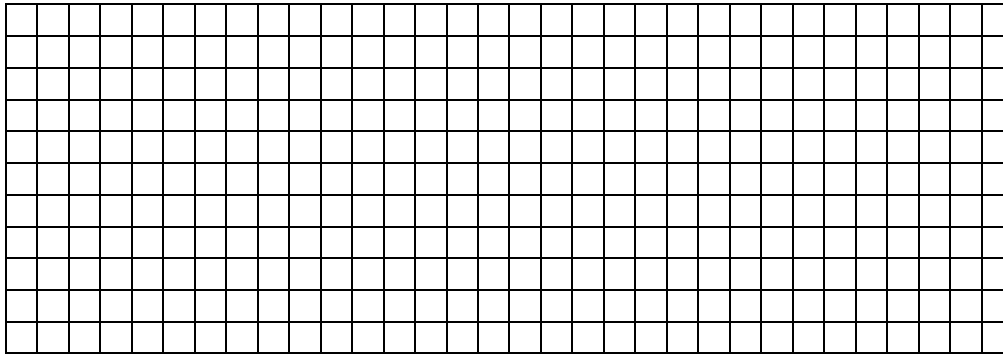
Q6 How many squares does it take to cover the rectangle above?

Q7 What is the area of the rectangle?

Q8 In the picture below, determine the number of squares to find the area of the rectangle. Assume that the squares are 1 cm by 1 cm (which means that the picture is not necessarily to scale).



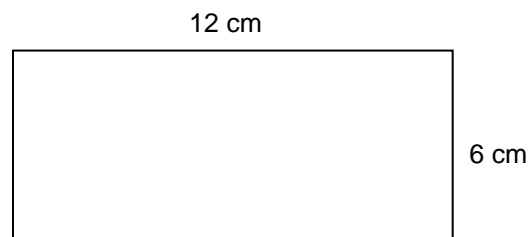
Q9 Do the same with this one.



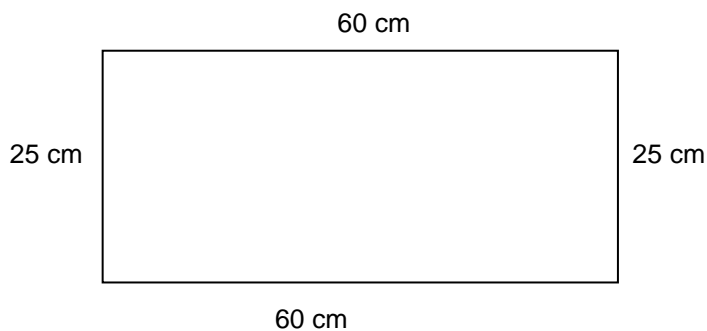
Q10 Find the area of a similar rectangle which has 100 1 cm by 1 cm squares along the top and 40 down the side.

Q11 Describe a shortcut for finding the area (number of squares) and use it to find the area of a rectangle which has 220 1 cm by 1 cm squares along the top and 100 1 cm by 1 cm squares down the side.

Q12 What is the area of this rectangle?

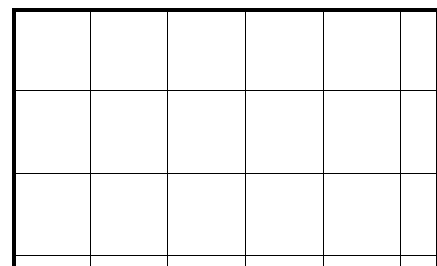


Q13 What is the area of the rectangle below?



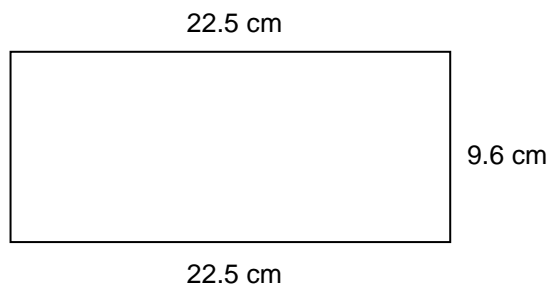
Q14 What is an easy way to find the area of a rectangle from its length and its width?

Q15 What if the length and width are not whole numbers? For example, a rectangle 5.5 cm by 3.2 cm. Do you think your method will still work?



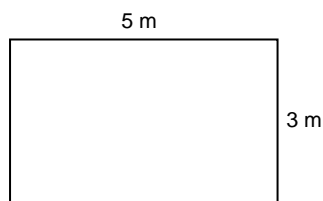
Q16 Calculate the area of the 5.5 cm by 3.2 cm rectangle above by the method you described in Q14. Then redo it by finding the areas of all the part squares and adding them to the areas of the whole squares. Do you get the same answer?

Q17 What is the area of this rectangle?



Q18 What is the area of a rectangle 14.75 cm by 9.21 cm?

All the rectangles above have been measured in centimetres, giving an area in square centimetres ( $\text{cm}^2$ ). But the same methods work for any unit. For instance, the rectangle below, 5 m by 3 m, has an area of  $15 \text{ m}^2$  (15 square metres).



Q19 Find the area of a rectangle 12 m by 7 m.

Q20 Find the area of a rectangle 6.5 m by 2.1 m.

Q21 Find the area of a rectangle 25 km by 6 km.

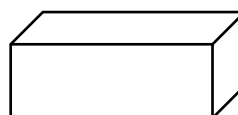
Q22 Find the area of a rectangle 8 inches by 5 inches.

Q23 Find the area of a rectangle 2 m by 40 cm (Be careful – different units!)

Q24 Find the area of a rectangle 1.2 km by 300 m.

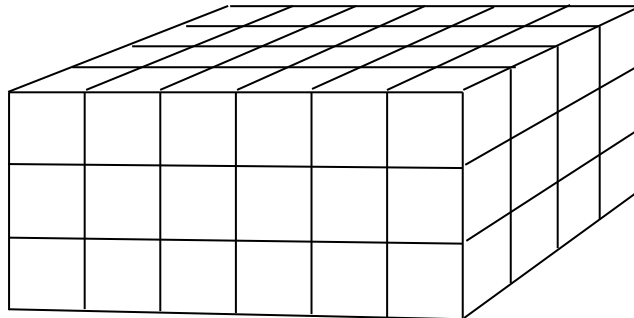
## Volumes of Rectangular Prisms

A rectangular prism is a box shape, like this.



The size of a 3D shape is called its *volume*. This is the amount of space inside it. The volume of a rectangular prism in cubic centimetres ( $\text{cm}^3$ ) is the number of 1 cm by 1 cm by 1 cm cubes that will fit inside it (or are needed to make it).

A 6 cm by 4 cm by 3 cm rectangular prism can be made from 1 cm cubes like this:

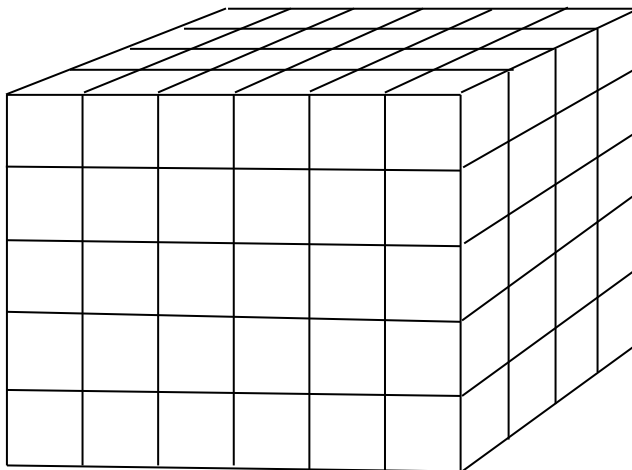


Q25 How many cubes does it take to make it?

Q26 What is its volume?

Q27 What is a short-cut method for finding the volume without counting every cube?

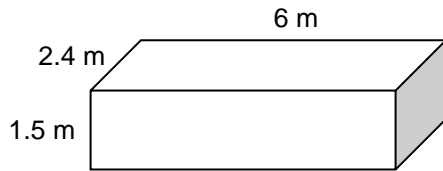
Q28 What is the volume of the rectangular prism made of 1 cm cubes below?



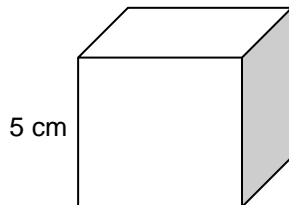
Q29 What is the volume of a rectangular prism 10 cm by 8 cm by 5 cm?

Q30 What is the volume of a rectangular room 10 m by 4 m by 3 m in cubic metres ( $\text{m}^3$ )?

Q31 Calculate the volume of this container.



Q32 Calculate the volume of this cubic wooden block.



Q33 What is the volume of a rectangular prism 5 mm by 4.5 mm by 0.6 mm?

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## Answers

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Q1 300 m

Q2 107 m

Q3 460 cm or 4.6 m

Q4 12.6 cm

Q6 40

Q7 40 cm<sup>2</sup>

Q8 112, 112 cm<sup>2</sup>

Q9 352, 352 cm<sup>2</sup>

Q10 4000 cm<sup>2</sup>

Q11 Multiply the number of squares along the top (or length of the top) by the number of squares down the side (or length of the side). 22 000 cm<sup>2</sup>

Q12 72 cm<sup>2</sup>

Q13 1500 cm<sup>2</sup>

Q14 Multiply its length by its width.

Q15 It will

Q16 You should

Q17 216 cm<sup>2</sup>

Q18 135.8475 cm<sup>2</sup>

Q19 84 m<sup>2</sup>

Q20 13.65 m<sup>2</sup>

Q21 150 km<sup>2</sup>

Q22 40 square inches

Q23 8000 cm<sup>2</sup> or 0.8 m<sup>2</sup>

Q24 360 000 m<sup>2</sup> or 0.36 km<sup>2</sup>

Q25 72

Q26 25 cm<sup>3</sup>

Q27 Multiply the 3 dimensions, i.e. multiply length × width × height

Q28 120 cm<sup>3</sup>

Q29 400 cm<sup>3</sup>

Q30 120 m<sup>3</sup>

Q31 21.6 m<sup>3</sup>

Q32 125 cm<sup>3</sup>

Q33 13.5 mm<sup>3</sup>