

Perimeter

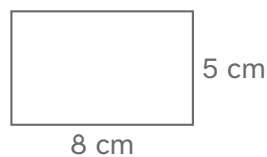
Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

Here is a rectangle.



*Diagram **NOT** accurately drawn*

Tomasz makes a new rectangle by doubling the length and doubling the width of this rectangle.

He says,

“The new rectangle will have 4 times the perimeter.”

Is Tomasz correct?

You must show how you get your answer.

Perimeter of this rectangle: $8 + 5 + 8 + 5 = 26$ cm

The new rectangle is 16 cm long and 10 cm wide.

Perimeter of the new rectangle: $16 + 10 + 16 + 10 = 52$ cm

$52 \div 26 = 2$, so the new perimeter is only 2 times as big.

Tomasz is **not** correct.

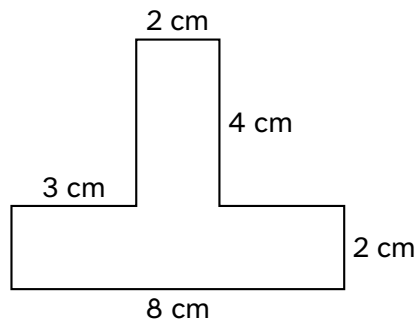
Answer: No. The perimeter goes from 26 cm to 52 cm, which is only 2 times as big

Tip: Doubling every side doubles the perimeter. It is the **area** that becomes 4 times as big (40 cm^2 to 160 cm^2).

Marks: 1 mark for 26 and 52 (or for 16 and 10 used to find a perimeter). 1 mark for “no” with a correct comparison.

2 (3 marks)

The diagram shows a shape made from two rectangles.
All the corners are right angles.



*Diagram **NOT** accurately drawn*

Work out the perimeter of the shape.

The shape has 8 sides, and 3 of them are not labelled.

Left edge of the shape: same as the right edge, 2 cm.

Left side of the top part: same as its right side, 4 cm.

Short horizontal edge on the right: $8 - 3 - 2 = 3 \text{ cm}$.

Add all 8 sides:

$$8 + 2 + 3 + 4 + 2 + 4 + 3 + 2 = 28 \text{ cm}$$

Answer: 28 cm

Tip: Just adding the numbers on the diagram gives 19, which is wrong. Find every missing length first, then tick off each side as you add it.

Marks: 1 mark for one missing length. 1 mark for all the missing lengths. 1 mark for 28.

3 (3 marks)

The length of a rectangle is 5 cm more than its width.

The perimeter of the rectangle is 38 cm.

Work out the length and the width of the rectangle.

Let the width be w .

Then the length is $w + 5$.

$$\text{Perimeter: } w + (w + 5) + w + (w + 5) = 4w + 10$$

$$4w + 10 = 38$$

$$4w = 28$$

$$w = 7 \text{ cm}$$

$$\text{Length: } 7 + 5 = 12 \text{ cm}$$

$$\text{Check: } 12 + 7 + 12 + 7 = 38 \quad \checkmark$$

Answer: length 12 cm, width 7 cm

Tip: Another way: half the perimeter is one length plus one width, 19 cm. Then find two numbers that add to 19 and differ by 5.

Marks: 1 mark for $4w + 10 = 38$ (or for length + width = 19). 1 mark for 7. 1 mark for both 12 and 7.

4 (3 marks)

A square has sides of length 7 cm.

A rectangle has the same perimeter as the square.

The length of the rectangle is 10 cm.

Work out the width of the rectangle.

Perimeter of the square: $4 \times 7 = 28$ cm

So the rectangle also has perimeter 28 cm.

Two lengths: $10 + 10 = 20$ cm

The two widths make $28 - 20 = 8$ cm

One width: $8 \div 2 = 4$ cm

Answer: 4 cm

Marks: 1 mark for 28. 1 mark for $28 - 20$. 1 mark for 4.

5 (3 marks)

The diagram shows a shape made from 5 identical equilateral triangles.

The perimeter of the shape is 35 cm.

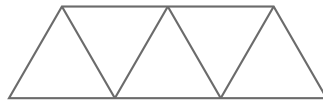


Diagram **NOT** accurately drawn

Work out the perimeter of one triangle.

Count the triangle sides round the outside of the shape:

3 along the bottom, 2 along the top and 1 at each end: 7 sides.

Each side: $35 \div 7 = 5$ cm

An equilateral triangle has 3 equal sides.

Perimeter of one triangle: $3 \times 5 = 15$ cm

Answer: 15 cm

Tip: Don't do $35 \div 5 = 7$. Some sides of the triangles are inside the shape, so they are not part of its perimeter.

Marks: 1 mark for 7 sides round the outside. 1 mark for $35 \div 7$ or 5. 1 mark for 15.

6 (2 marks)

A regular hexagon has sides of length $(2x + 1)$ cm.

The perimeter of the hexagon is 42 cm.

Work out the value of x .

A regular hexagon has 6 equal sides.

One side: $42 \div 6 = 7$ cm

So $2x + 1 = 7$

$2x = 6$

$x = 3$

Answer: $x = 3$

Marks: 1 mark for $42 \div 6$ or $6(2x + 1) = 42$. 1 mark for $x = 3$.

7 (4 marks)

Here is a parallelogram.

All the measurements are in centimetres.

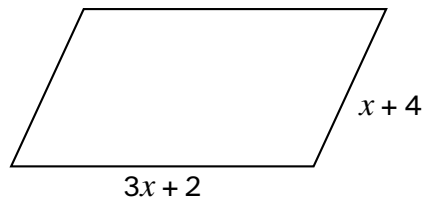


Diagram **NOT** accurately drawn

- (a) Write an expression, in terms of x , for the perimeter of the parallelogram.
Give your answer in its simplest form.

Opposite sides of a parallelogram are equal.

So there are two sides of $3x + 2$ and two sides of $x + 4$.

Perimeter: $(3x + 2) + (x + 4) + (3x + 2) + (x + 4)$

Collect the x terms: $3x + x + 3x + x = 8x$

Collect the numbers: $2 + 4 + 2 + 4 = 12$

Perimeter = $8x + 12$

Answer: $8x + 12$

Tip: Only two sides are labelled, but a parallelogram has four sides. Use both pairs.

Marks: 1 mark for adding four sides (two of each). 1 mark for $8x + 12$.

- (b) The perimeter of the parallelogram is 44 cm.
Work out the length of the longest side of the parallelogram.

$$8x + 12 = 44$$

$$\text{Subtract 12: } 8x = 32$$

$$\text{Divide by 8: } x = 4$$

$$\text{Sides: } 3x + 2 = 3 \times 4 + 2 = 14 \text{ cm and } x + 4 = 4 + 4 = 8 \text{ cm}$$

The longest side is 14 cm.

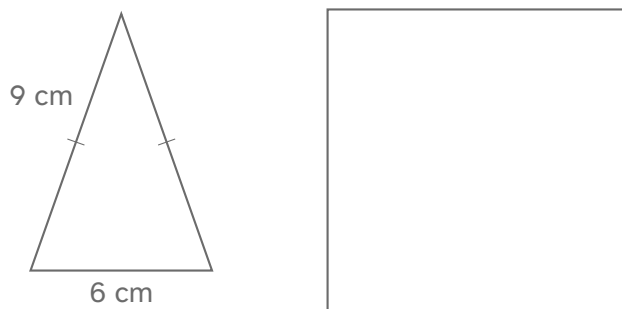
Answer: 14 cm

Tip: $x = 4$ is not the answer. Put it back into both expressions and choose the longer side.

Marks: 1 mark for $x = 4$. 1 mark for 14.

8 (4 marks)

The diagram shows an isosceles triangle and a square.



*Diagram **NOT** accurately drawn*

perimeter of the triangle : perimeter of the square = 3:5

Work out the length of one side of the square.

The triangle is isosceles, so its two slanting sides are both 9 cm.

Perimeter of the triangle: $9 + 9 + 6 = 24$ cm

3 parts = 24 cm, so 1 part = $24 \div 3 = 8$ cm

Perimeter of the square: 5 parts = $5 \times 8 = 40$ cm

Side of the square: $40 \div 4 = 10$ cm

Answer: 10 cm

Tip: The marks on the two slanting sides show they are equal, so the unlabelled side is also 9 cm. 40 cm is the perimeter of the square, not its side.

Marks: 1 mark for 24. 1 mark for $24 \div 3$ or 8 (one part). 1 mark for 40. 1 mark for a side of 10.

9 (4 marks)

A field is a rectangle 45 m long and 28 m wide.

Fencing is needed all the way round the field.

Fencing is sold in rolls. Each roll is 5 m long and costs £18.50

Work out the cost of the fencing.

The fencing goes all the way round, so find the perimeter.

Perimeter: $45 + 28 + 45 + 28 = 146$ m

Number of rolls: $146 \div 5 = 29.2$

29 rolls would not be enough, so round **up** to 30 rolls.

Cost: $30 \times 18.50 = £555$

Answer: £555

Tip: 29.2 rolls would normally round to 29, but 29 rolls is only 145 m of fencing. You must round up to buy enough.

Marks: 1 mark for 146. 1 mark for $146 \div 5$. 1 mark for 30 rolls. 1 mark for £555.
