Sismo Learning

LESSON NOTE

Year 6 || Perimeter of compound shapes

Measurement || Perimeter, missing lengths, mixed units and problem solving

See | Investigate | Solve | Master | Outperform

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Lesson overview

By the end of this lesson I can

- explain what perimeter means and use P = 2 × (l + w) for rectangles
- find the perimeter of compound rectilinear shapes
- find missing lengths using the rule total right = total left, total up = total down
- use the rectangle shortcut and spot when a dent adds extra length
- work with decimals and convert between mm, cm, m and km
- work backwards from a perimeter and solve word problems
- show that shapes with the same area can have different perimeters

Key vocabulary

Perimeter	the total distance around the outside of a shape
Compound shape	a shape made by joining simpler shapes
Rectilinear	a shape whose corners are all right angles
Formula	a rule written with letters, such as P = 2 × (l + w)
Dent	a part of a shape that cuts inwards, like the gap in a U
Convert	change a measurement into a different unit

Prior knowledge

Pupils should already be able to add and subtract whole numbers and decimals, multiply and divide by 10, 100 and 1000, and recognise rectangles, squares and right angles (Year 4 and Year 5 measurement).

How this note is organised

S	**See**: the key idea explained with a diagram.
I	**Investigate**: a short question to think about and discuss before the examples.
S	**Solve**: six worked examples, solved step by step the way you would on paper.
M	**Master**: six practice questions for each concept. Answers are at the back.
O	**Outperform**: challenge questions that stretch your thinking.

Six concepts || 36 worked examples || 36 practice questions || 4 challenge questions || 108 marks in total. Diagrams are not drawn to scale. Letters in green on a diagram are lengths for you to find.

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CONCEPT 1

Perimeter of simple shapes

S See

Perimeter is the total distance all the way around the outside of a flat shape. Imagine an ant walking along every edge until it gets back to where it started. The distance it walks is the perimeter.

For a rectangle, opposite sides are equal, so we can use a **formula**:

$$P = 2 \times (l + w)$$

where l is the length and w is the width. For a square, all four sides are equal, so **P = 4 × side**. For any **regular** shape, multiply the number of sides by the length of one side.

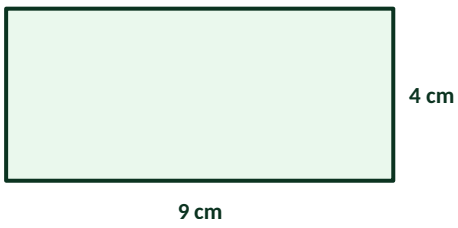
I Investigate

A rectangle is 9 cm long and 4 cm wide. Amaka adds 9 + 4 + 9 + 4. Tobi works out 2 × (9 + 4). Do they get the same answer? Why does Tobi's method always work for rectangles?

S Solve: worked examples

Worked example 1.1

Find the perimeter of this rectangle.



Step 1: Write the length of every side

Opposite sides of a rectangle are equal, so the sides are 9, 4, 9 and 4.

Step 2: Add all four sides

P = 9 + 4 + 9 + 4

P = 26 cm

ANSWER Perimeter = 26 cm

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Worked example 1.2

Find the perimeter of this rectangle.



Step 1: Write the formula

$P = 2 \times (l + w)$

Step 2: Substitute the length and width

$P = 2 \times (13 + 7)$

Step 3: Work out the bracket first, then multiply

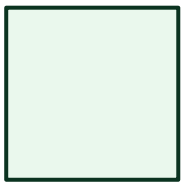
$P = 2 \times 20$

P = 40 cm

ANSWER Perimeter = 40 cm

Worked example 1.3

Find the perimeter of this square.



Step 1: All four sides of a square are equal

Each side is 8 cm.

Step 2: Multiply by 4

$P = 4 \times 8$

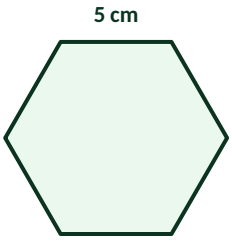
P = 32 cm

ANSWER Perimeter = 32 cm

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Worked example 1.4

Find the perimeter of this regular hexagon.



Step 1: Count the sides

A regular hexagon has 6 equal sides, each 5 cm.

Step 2: Multiply the number of sides by the side length

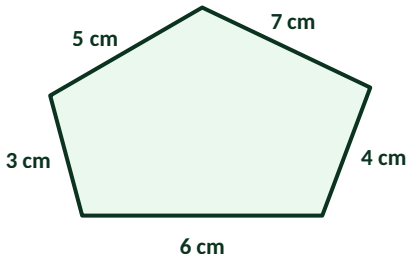
$P = 6 \times 5$

P = 30 cm

ANSWER Perimeter = 30 cm

Worked example 1.5

Find the perimeter of this pentagon. It is not a regular shape.



Step 1: Add every side, going round once

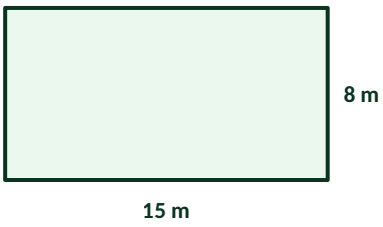
$P = 6 + 4 + 7 + 5 + 3$

P = 25 cm

ANSWER Perimeter = 25 cm

Worked example 1.6

Find the perimeter of this rectangle.



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Step 1: Write the formula

$P = 2 \times (l + w)$

Step 2: Substitute the length and width

$P = 2 \times (15 + 8)$

Step 3: Work out the bracket first, then multiply

$P = 2 \times 23$

$P = 46$ m

ANSWER **Perimeter = 46 m**

Watch out

- Perimeter is measured in units of length (cm, m, mm), never square units such as cm^2.
- A rectangle has four sides, even if only two lengths are written on the diagram.
- Work out the bracket first in $P = 2 \times (l + w)$.

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M Master: practice questions

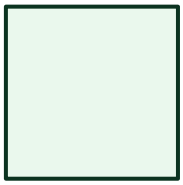
1.1 [2 marks]

Find the perimeter of this rectangle.



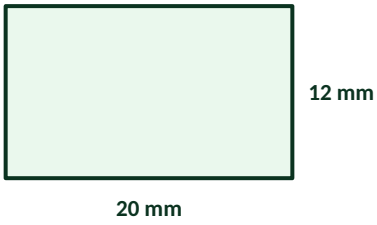
1.2 [2 marks]

Find the perimeter of this square.



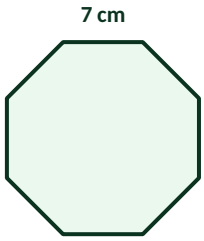
1.3 [2 marks]

Find the perimeter of this rectangle.



1.4 [2 marks]

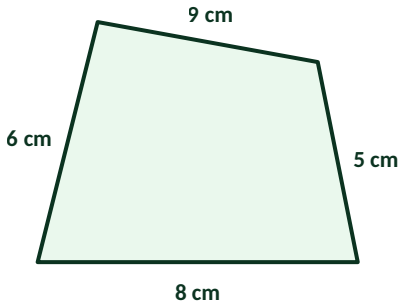
Find the perimeter of this regular octagon.



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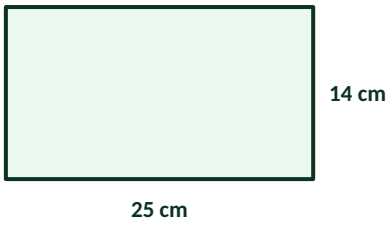
1.5 [2 marks]

Find the perimeter of this quadrilateral.



1.6 [2 marks]

Find the perimeter of this rectangle.



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CONCEPT 2

Compound shapes with every side given

S See

A **compound shape** (also called a composite shape) is made by joining simple shapes together. A **rectilinear** shape is one where every corner is a right angle.

To find the perimeter, choose a corner, then go round the shape **once**, writing down every side as you pass it. Tick each side on the diagram so you do not miss one or count one twice.

Only the **outside** edges count. Lines inside the shape (where two rectangles were joined) are not part of the perimeter.

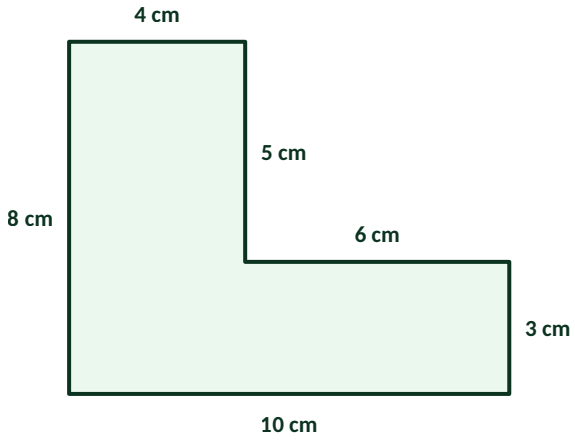
I Investigate

An L shape has 6 sides. A T shape has 8 sides. How many sides does a plus shape (cross) have? Draw one and count.

S Solve: worked examples

Worked example 2.1

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 10 + 3 + 6 + 5 + 4 + 8

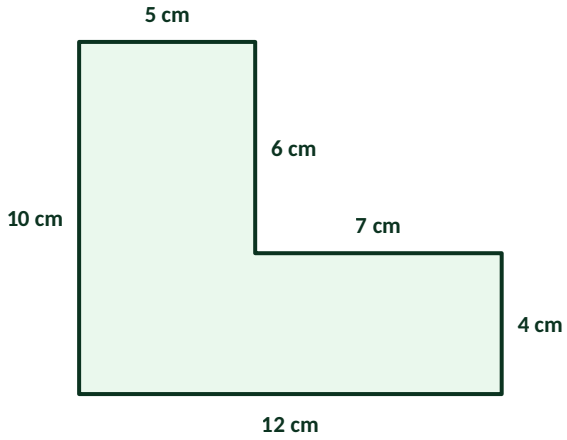
P = 36 cm

ANSWER **Perimeter = 36 cm**

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Worked example 2.2

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

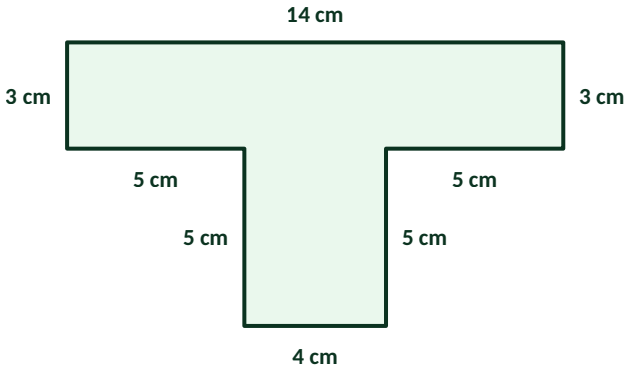
P = 12 + 4 + 7 + 6 + 5 + 10

P = 44 cm

ANSWER Perimeter = 44 cm

Worked example 2.3

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 4 + 5 + 5 + 3 + 14 + 3 + 5 + 5

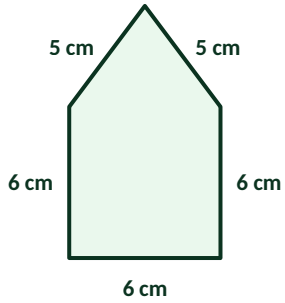
P = 44 cm

ANSWER Perimeter = 44 cm

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Worked example 2.4

This shape is a square with a triangle on top. Find its perimeter.



Step 1: Add every side, going round once

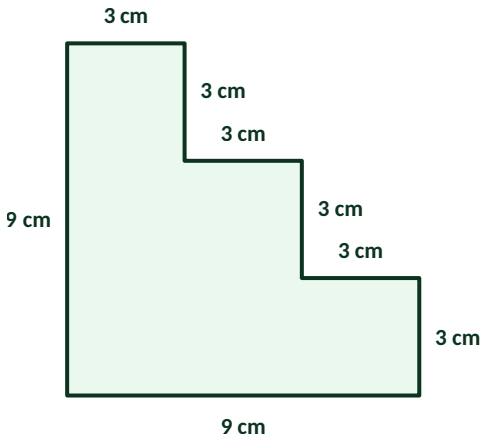
P = 6 + 6 + 5 + 5 + 6

P = 28 cm

ANSWER Perimeter = 28 cm

Worked example 2.5

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 9 + 3 + 3 + 3 + 3 + 3 + 3 + 9

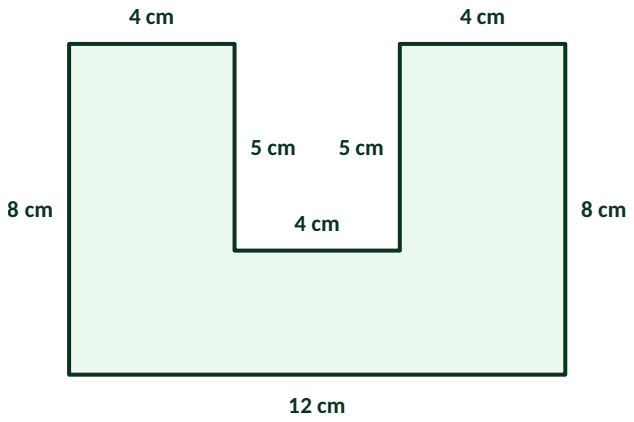
P = 36 cm

ANSWER Perimeter = 36 cm

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Worked example 2.6

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 12 + 8 + 4 + 5 + 4 + 5 + 4 + 8

P = 50 cm

ANSWER **Perimeter = 50 cm**

Watch out

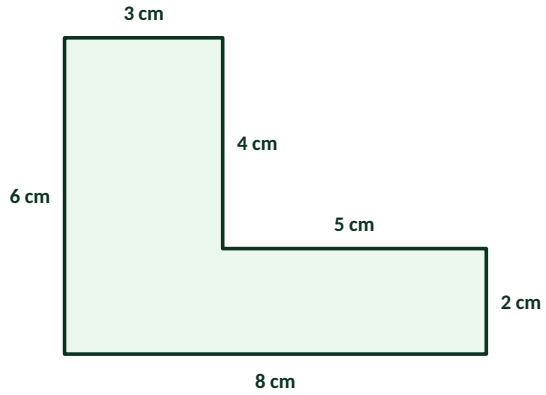
- Count the number of sides first, then check your sum has the same number of terms.
- Do not add any line that is inside the shape.
- Start and finish at the same corner.

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M Master: practice questions

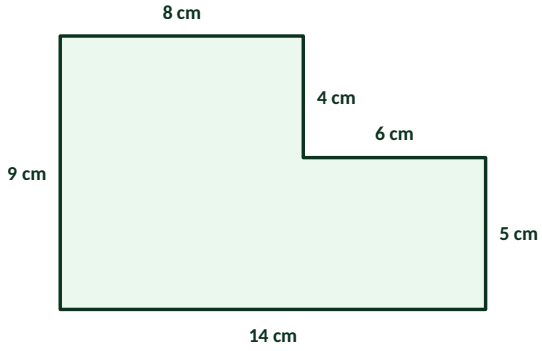
2.1 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



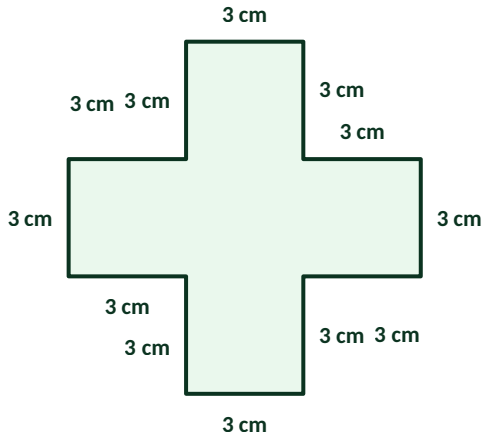
2.2 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



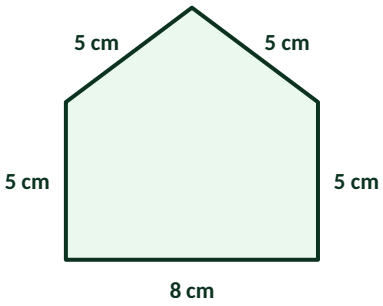
2.3 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



2.4 [2 marks]

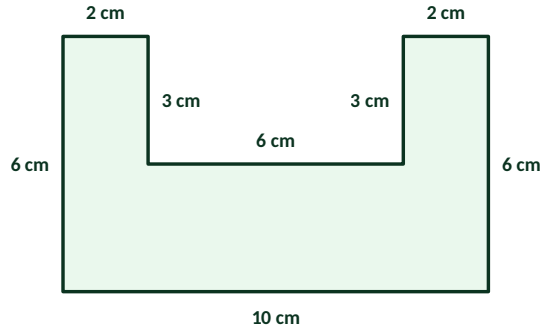
This shape is a rectangle with a triangle on top. Find its perimeter.



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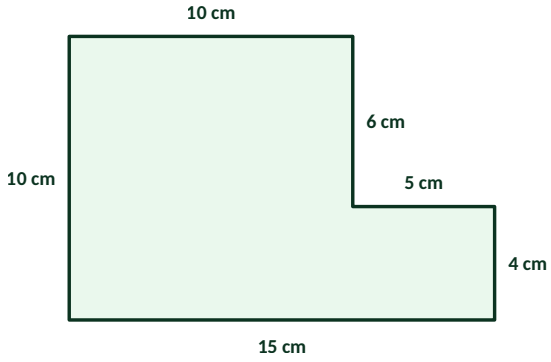
2.5 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



2.6 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



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CONCEPT 3

Finding missing lengths

S See

Often some lengths are not written on the diagram. In a rectilinear shape we can always find them using one rule:

Total going right = Total going left
Total going up = Total going down

This is true because when you walk round the shape you finish where you started. Every step to the right must be undone by steps to the left.

So a long side is equal to the shorter parallel sides added together, and a short side is the long side **minus** the other parallel parts.

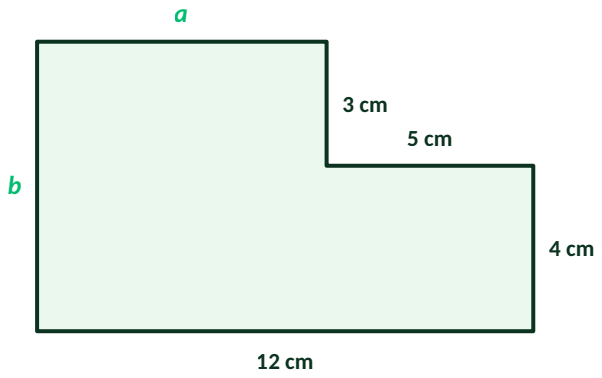
I Investigate

In an L shape the bottom is 12 cm and the top step is 5 cm. Without measuring, how long is the other top side? How do you know?

S Solve: worked examples

Worked example 3.1

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

12 = 5 + a

a = 12 − 5

a = 7 cm

Vertical sides: total going up = total going down

4 + 3 = b

b = 4 + 3

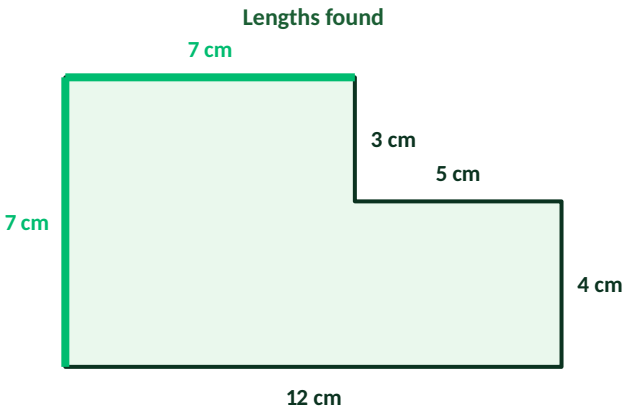
b = 7 cm

Step 2: Add all the sides, going round the shape once

P = 12 + 4 + 5 + 3 + 7 + 7

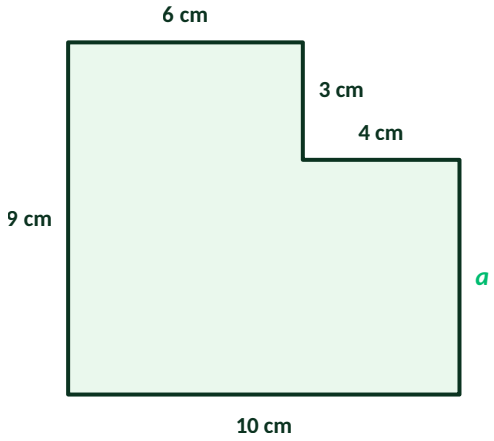
P = 38 cm

ANSWER **Perimeter = 38 cm**



Worked example 3.2

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Vertical sides: total going up = total going down

a + 3 = 9

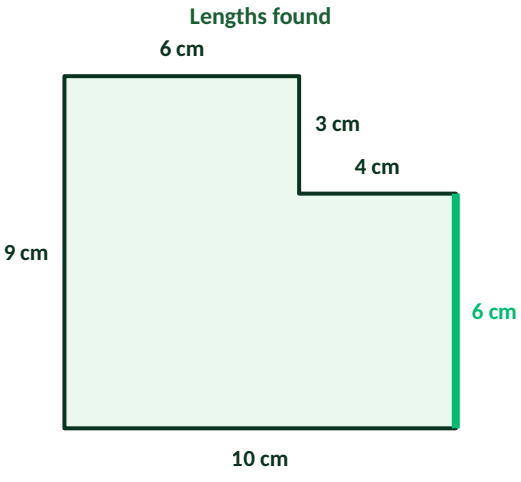
a = 9 − 3

a = 6 cm

Step 2: Add all the sides, going round the shape once

P = 10 + 6 + 4 + 3 + 6 + 9

P = 38 cm

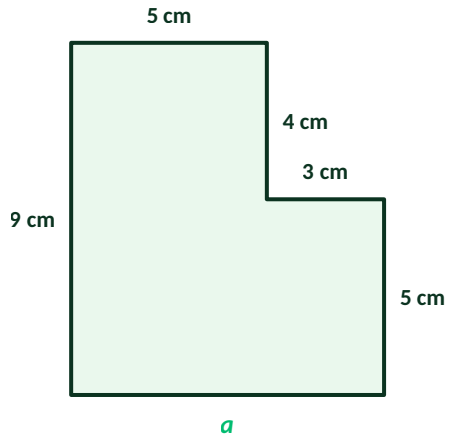


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ANSWER Perimeter = 38 cm

Worked example 3.3

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

a = 3 + 5

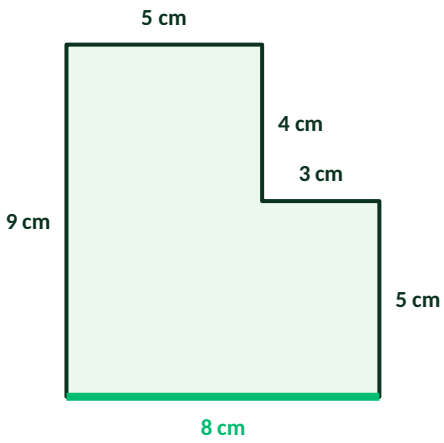
a = 8 cm

Step 2: Add all the sides, going round the shape once

P = 8 + 5 + 3 + 4 + 5 + 9

P = 34 cm

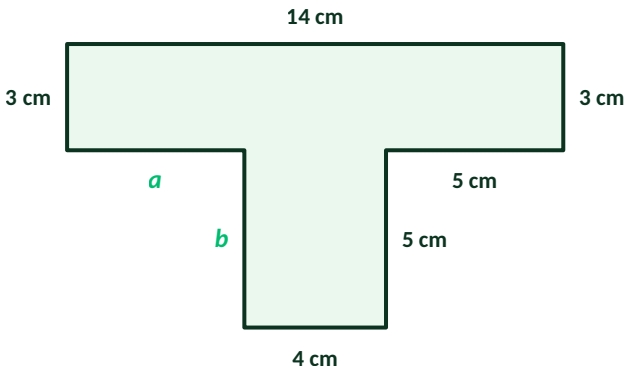
Lengths found



ANSWER Perimeter = 34 cm

Worked example 3.4

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

4 + 5 + a = 14

a = 14 − 4 − 5

a = 5 cm

Vertical sides: total going up = total going down

5 + 3 = 3 + b

b = 5 + 3 − 3

b = 8 − 3

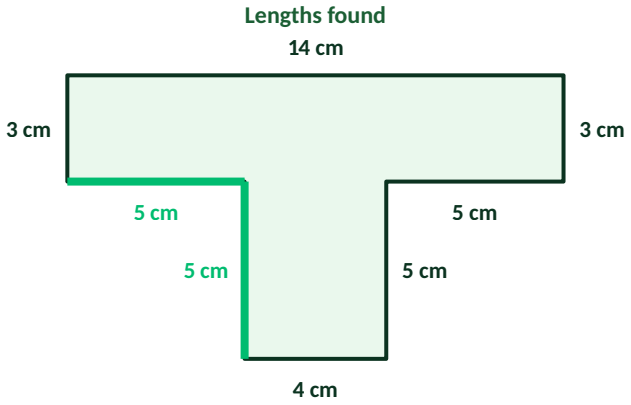
b = 5 cm

Step 2: Add all the sides, going round the shape once

P = 4 + 5 + 5 + 3 + 14 + 3 + 5 + 5

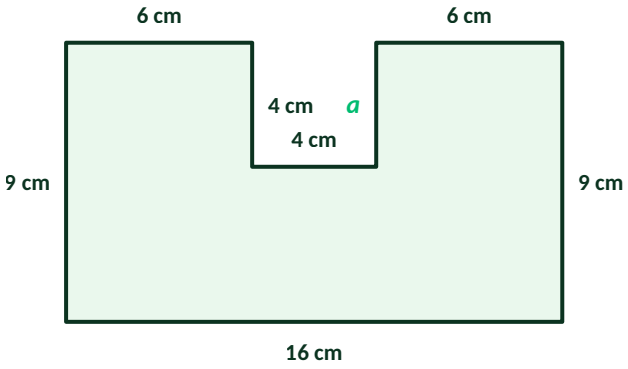
P = 44 cm

ANSWER **Perimeter = 44 cm**



Worked example 3.5

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Vertical sides: total going up = total going down

9 + 4 = a + 9

a = 9 + 4 − 9

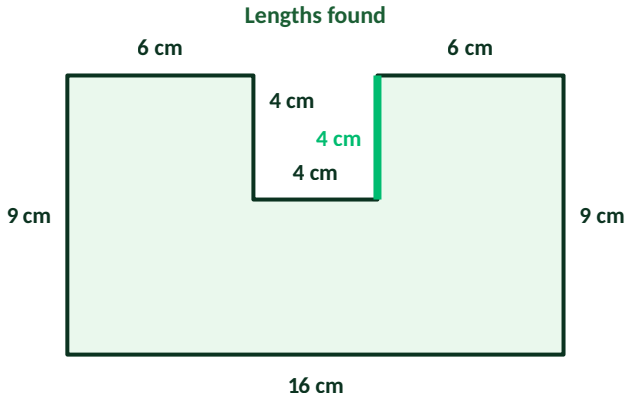
a = 13 − 9

a = 4 cm

Step 2: Add all the sides, going round the shape once

P = 16 + 9 + 6 + 4 + 4 + 4 + 6 + 9

P = 58 cm

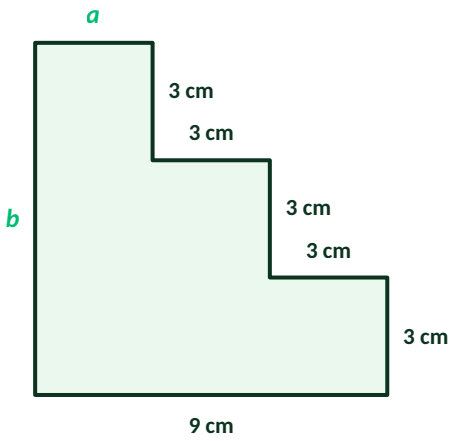


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ANSWER Perimeter = 58 cm

Worked example 3.6

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

$9 = 3 + 3 + a$

$a = 9 - 3 - 3$

a = 3 cm

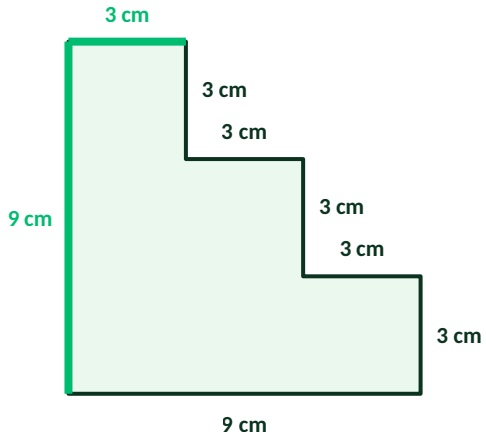
Vertical sides: total going up = total going down

$3 + 3 + 3 = b$

$b = 3 + 3 + 3$

b = 9 cm

Lengths found



Step 2: Add all the sides, going round the shape once

$P = 9 + 3 + 3 + 3 + 3 + 3 + 3 + 9$

P = 36 cm

ANSWER Perimeter = 36 cm

Watch out

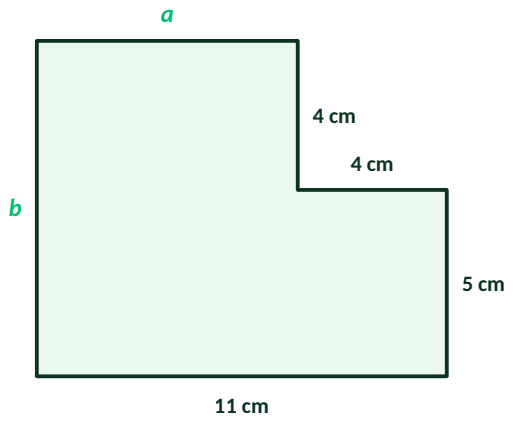
- Match the missing side with sides going the same way (horizontal with horizontal, vertical with vertical).
- Find every missing length before you add up the perimeter.
- Check your answer: the long side should equal the two short parallel sides added.

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M Master: practice questions

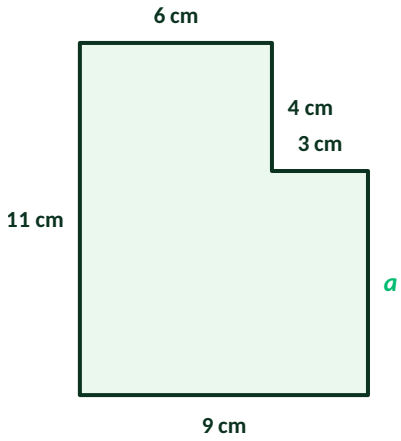
3.1 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



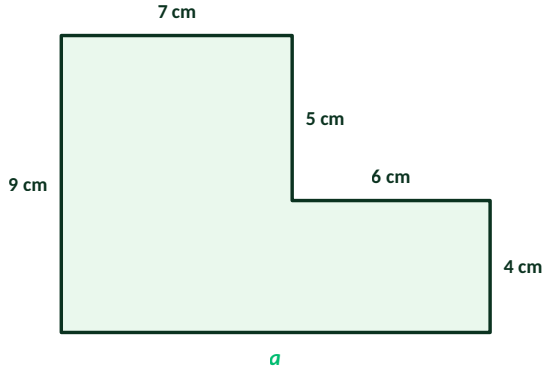
3.2 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



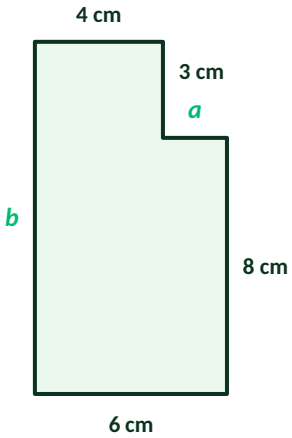
3.3 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



3.4 [3 marks]

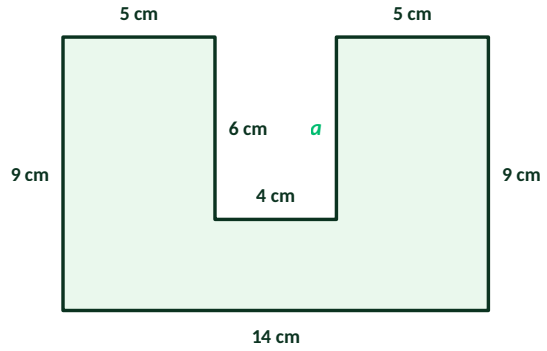
Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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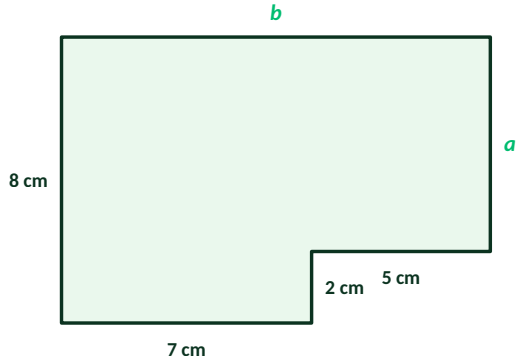
3.5 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



3.6 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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CONCEPT 4

The rectangle shortcut and shapes with dents

S See

Look at an L shape or a staircase. If you push the steps outwards they line up with the edges of a rectangle drawn round the shape. So the perimeter is the **same** as the surrounding rectangle:

$$P = 2 \times (W + H)$$

where W is the total width and H is the total height. This works when the shape has **no dents**, which means every inward step faces out.

If the shape has a **dent** (like a U shape), the two sides inside the dent are extra. Add the depth of the dent **twice**.

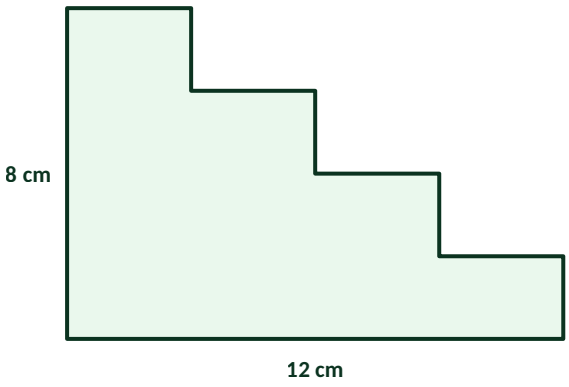
I Investigate

Draw a 6 by 4 rectangle on squared paper. Cut a small square from one corner. Does the perimeter go up, go down or stay the same? Now cut a square from the middle of one side. What happens?

S Solve: worked examples

Worked example 4.1

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 12 cm (the full length across)

Height = 8 cm (the full height)

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Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (12 + 8)

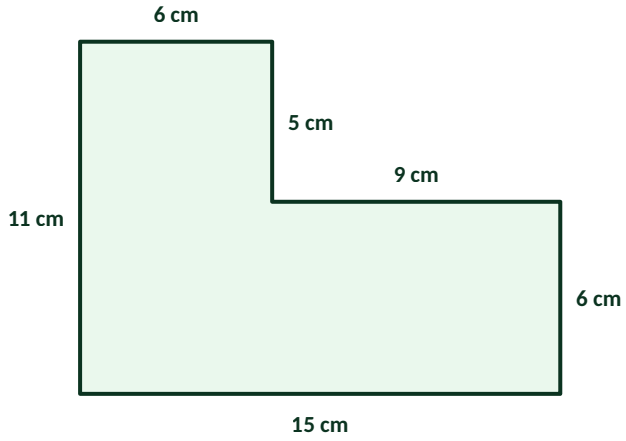
P = 2 × 20

P = 40 cm

ANSWER **Perimeter = 40 cm**

Worked example 4.2

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 15 + 6 + 9 + 5 + 6 + 11

P = 52 cm

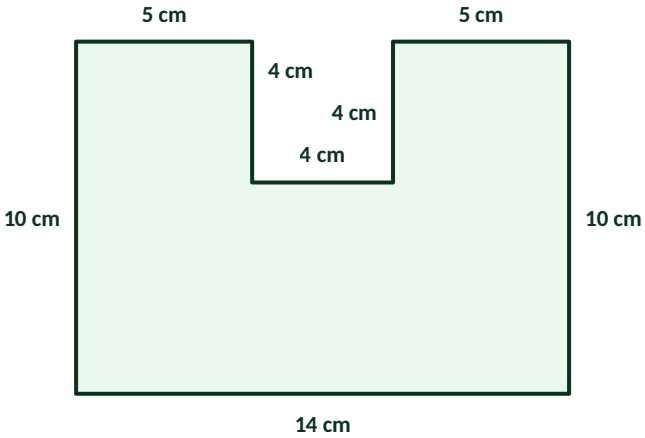
Step 2: Check with the rectangle shortcut

P = 2 × (15 + 11) = 2 × 26 = 52 cm ✓

ANSWER **Perimeter = 52 cm**

Worked example 4.3

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



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Step 1: Find the width and height of the surrounding rectangle

Width = 14 cm (the full length across)

Height = 10 cm (the full height)

Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (14 + 10)

P = 2 × 24

P = 48 cm

Step 3: Add the extra sides inside each dent

A dent 4 cm deep adds 2 × 4 = 8 cm

P = 48 + 8

P = 56 cm

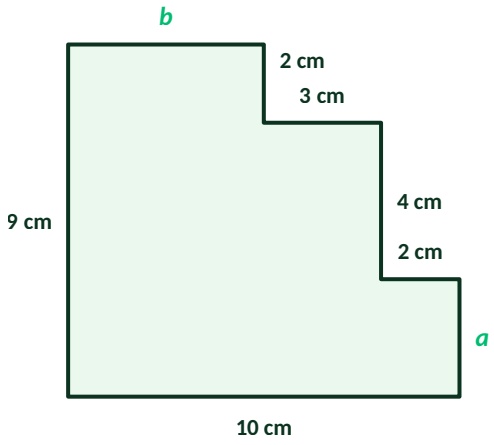
Step 4: Check by adding every side

P = 14 + 10 + 5 + 4 + 4 + 4 + 5 + 10 = 56 cm ✓

ANSWER **Perimeter = 56 cm**

Worked example 4.4

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

10 = 2 + 3 + b

b = 10 − 2 − 3

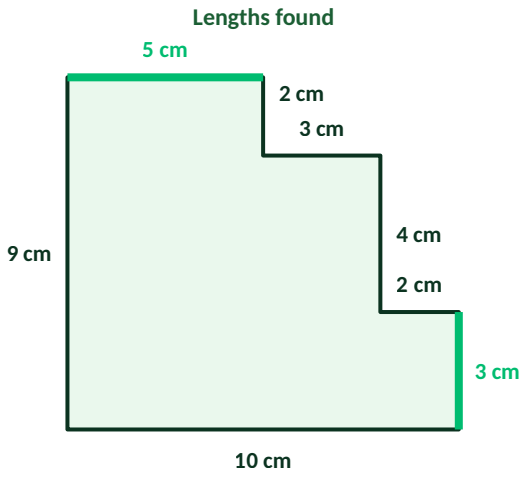
b = 5 cm

Vertical sides: total going up = total going down

a + 4 + 2 = 9

a = 9 − 4 − 2

a = 3 cm



Step 2: Add all the sides, going round the shape once

P = 10 + 3 + 2 + 4 + 3 + 2 + 5 + 9

P = 38 cm

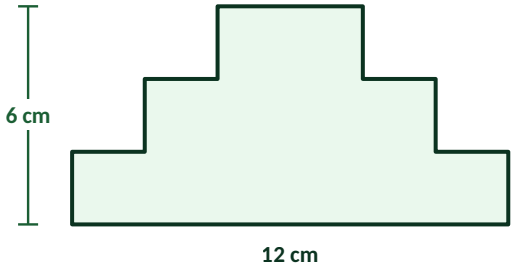
Step 3: Check with the rectangle shortcut

P = 2 × (10 + 9) = 2 × 19 = 38 cm ✓

ANSWER Perimeter = 38 cm

Worked example 4.5

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 12 cm (the full length across)

Height = 6 cm (the full height)

Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (12 + 6)

P = 2 × 18

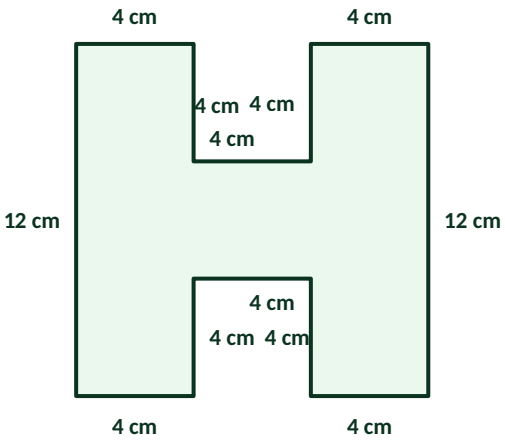
P = 36 cm

ANSWER Perimeter = 36 cm

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Worked example 4.6

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 12 cm (the full length across)

Height = 12 cm (the full height)

Step 2: Use the rectangle formula

$P = 2 \times (W + H)$

$P = 2 \times (12 + 12)$

$P = 2 \times 24$

$P = 48$ cm

Step 3: Add the extra sides inside each dent

A dent 4 cm deep adds $2 \times 4 = 8$ cm

A dent 4 cm deep adds $2 \times 4 = 8$ cm

$P = 48 + 16$

$P = 64$ cm

Step 4: Check by adding every side

$P = 4 + 4 + 4 + 4 + 4 + 12 + 4 + 4 + 4 + 4 + 4 + 12 = 64$ cm ✓

ANSWER Perimeter = 64 cm

Watch out

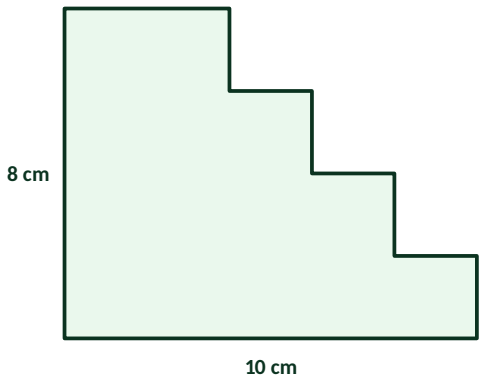
- The shortcut only works for shapes with no dents.
- For a dent, add 2 × depth, not just the depth once.
- W and H are the full width and full height of the whole shape.

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M Master: practice questions

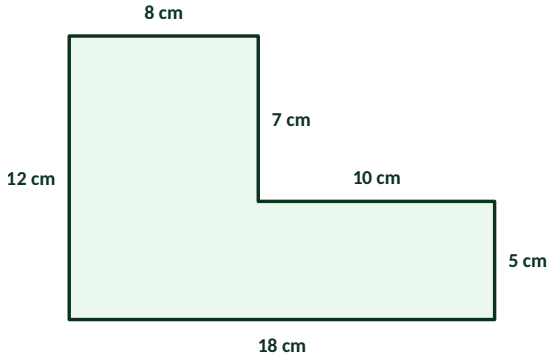
4.1 [3 marks]

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



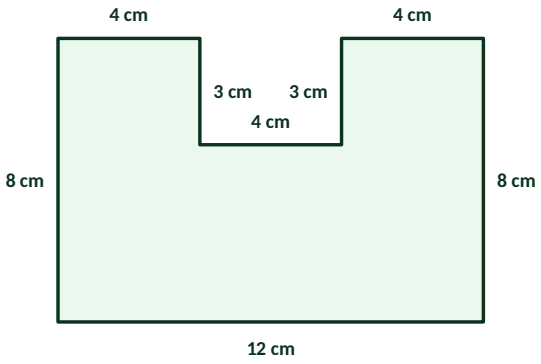
4.2 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



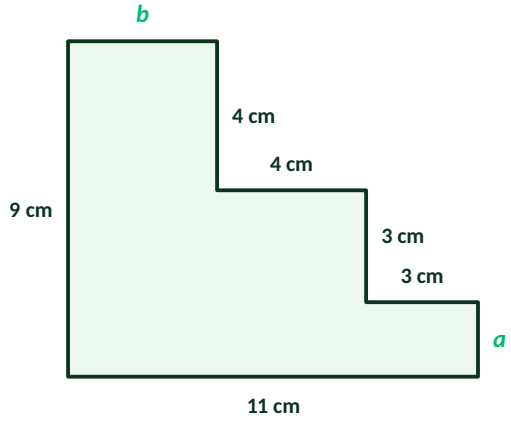
4.3 [3 marks]

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



4.4 [3 marks]

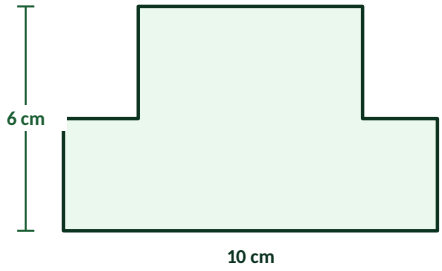
Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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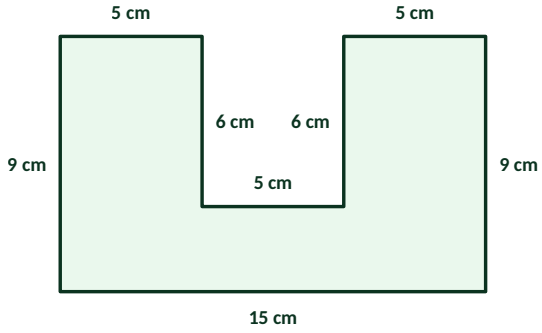
4.5 [3 marks]

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



4.6 [3 marks]

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



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CONCEPT 5

Decimals and mixed units

S See

Lengths are not always whole numbers. Add decimals by lining up the decimal points, just as you do in column addition.

If a diagram uses **different units**, change them all to the **same unit** before you add:

1 cm = 10 mm 1 m = 100 cm 1 km = 1000 m

To change a bigger unit to a smaller unit, **multiply**. To change a smaller unit to a bigger unit, **divide**.

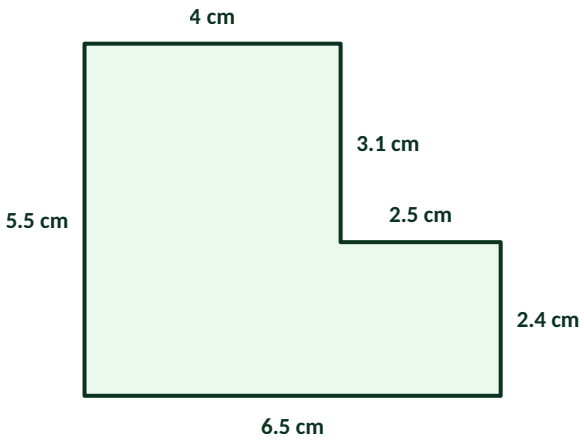
I Investigate

Is 2.5 m + 80 cm equal to 82.5? Explain what has gone wrong and find the correct total.

S Solve: worked examples

Worked example 5.1

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 6.5 + 2.4 + 2.5 + 3.1 + 4 + 5.5

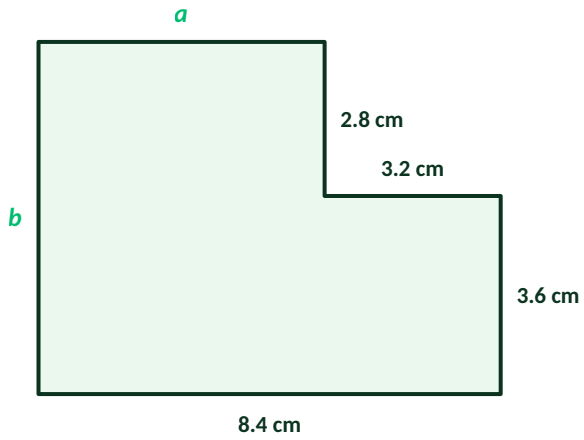
P = 24 cm

ANSWER **Perimeter = 24 cm**

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Worked example 5.2

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

8.4 = 3.2 + a

a = 8.4 − 3.2

a = 5.2 cm

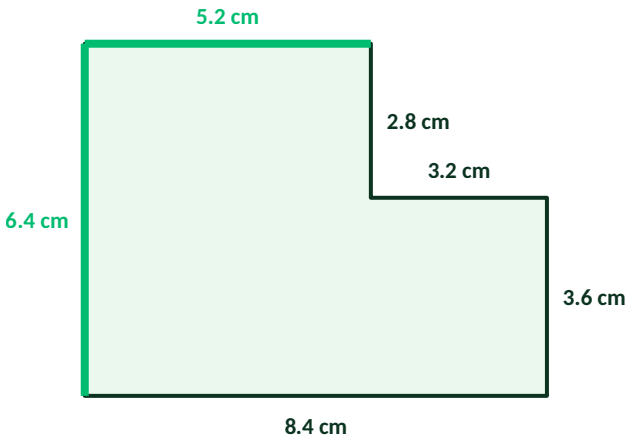
Vertical sides: total going up = total going down

3.6 + 2.8 = b

b = 3.6 + 2.8

b = 6.4 cm

Lengths found



Step 2: Add all the sides, going round the shape once

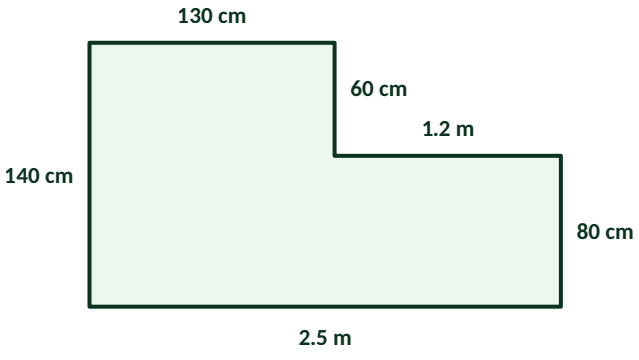
P = 8.4 + 3.6 + 3.2 + 2.8 + 5.2 + 6.4

P = 29.6 cm

ANSWER **Perimeter = 29.6 cm**

Worked example 5.3

Find the perimeter of this shape in metres. All corners are right angles.



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Step 1: Change every length to the same unit

1 m = 100 cm

2.5 m = 2.5 × 100 = 250 cm

1.2 m = 1.2 × 100 = 120 cm

Step 2: Add all the sides, going round the shape once

P = 250 + 80 + 120 + 60 + 130 + 140

P = 780 cm

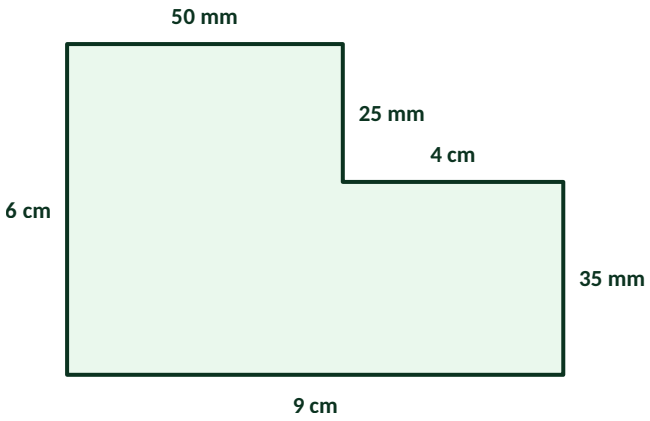
Step 3: Convert the answer to metres

780 cm ÷ 100 = 7.8 m

ANSWER **Perimeter = 7.8 m**

Worked example 5.4

Find the perimeter of this shape in centimetres. All corners are right angles.



Step 1: Change every length to the same unit

1 cm = 10 mm

9 cm = 9 × 10 = 90 mm

4 cm = 4 × 10 = 40 mm

6 cm = 6 × 10 = 60 mm

Step 2: Add all the sides, going round the shape once

P = 90 + 35 + 40 + 25 + 50 + 60

P = 300 mm

Step 3: Convert the answer to centimetres

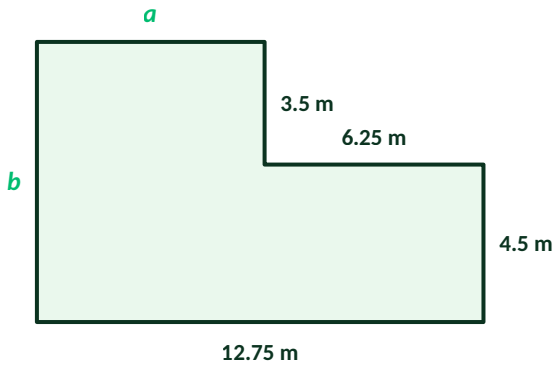
300 mm ÷ 10 = 30 cm

ANSWER **Perimeter = 30 cm**

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Worked example 5.5

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

12.75 = 6.25 + a

a = 12.75 − 6.25

a = 6.5 m

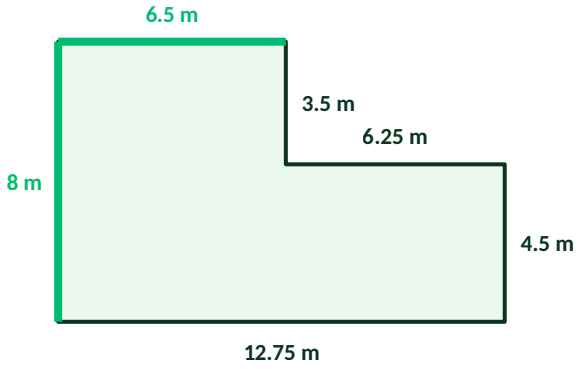
Vertical sides: total going up = total going down

4.5 + 3.5 = b

b = 4.5 + 3.5

b = 8 m

Lengths found



Step 2: Add all the sides, going round the shape once

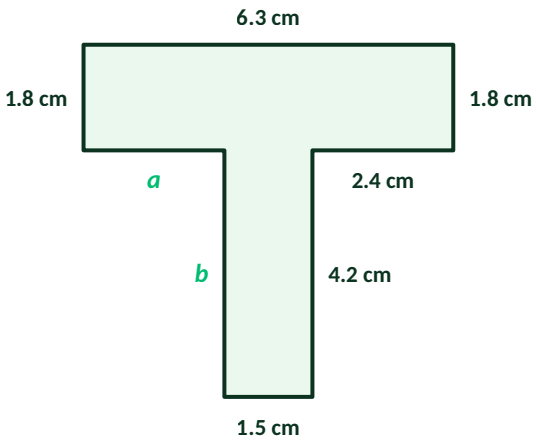
P = 12.75 + 4.5 + 6.25 + 3.5 + 6.5 + 8

P = 41.5 m

ANSWER Perimeter = 41.5 m

Worked example 5.6

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

1.5 + 2.4 + a = 6.3

a = 6.3 − 1.5 − 2.4

a = 2.4 cm

Vertical sides: total going up = total going down

4.2 + 1.8 = 1.8 + b

b = 4.2 + 1.8 − 1.8

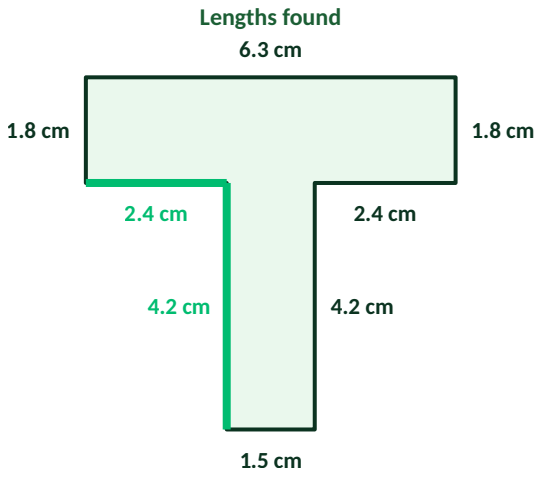
b = 6 − 1.8

b = 4.2 cm

Step 2: Add all the sides, going round the shape once

P = 1.5 + 4.2 + 2.4 + 1.8 + 6.3 + 1.8 + 2.4 + 4.2

P = 24.6 cm



ANSWER Perimeter = 24.6 cm

Watch out

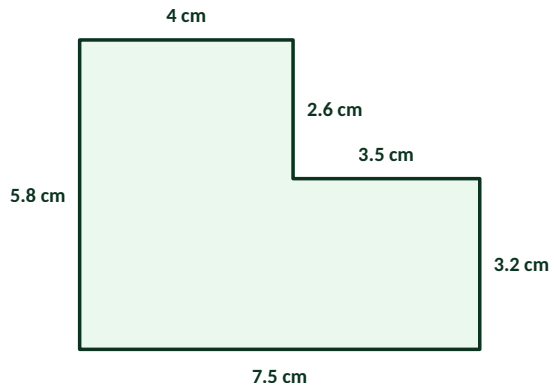
- Never add numbers with different units. Convert first.
- Line up the decimal points when adding decimals.
- Give your answer in the unit the question asks for.

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M Master: practice questions

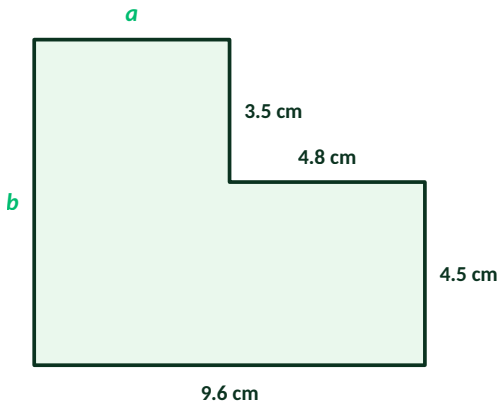
5.1 [2 marks]

Find the perimeter of this compound shape. All corners are right angles.



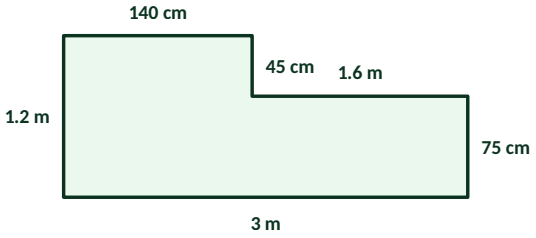
5.2 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



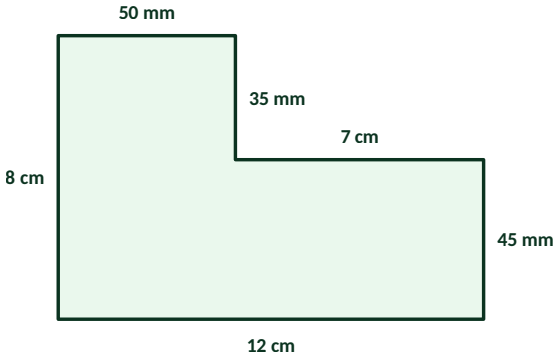
5.3 [3 marks]

Find the perimeter of this shape in metres. All corners are right angles.



5.4 [3 marks]

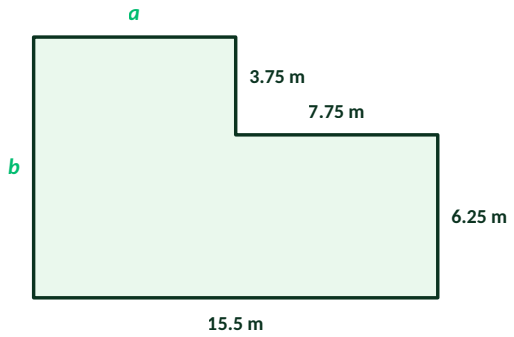
Find the perimeter of this shape in centimetres. All corners are right angles.



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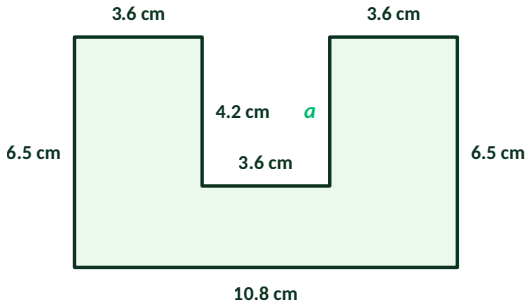
5.5 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



5.6 [3 marks]

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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CONCEPT 6

Problem solving and reasoning

S See

Perimeter questions are not always "find the perimeter". Sometimes you are given the perimeter and must **work backwards** to find a length. Write the perimeter as a sum, make it equal to the total, then solve.

When solving, move a number across the equals sign and **change its sign** (carry over): a + that crosses over becomes −.

$$30 + 2w = 46 \rightarrow 2w = 46 - 30$$

Remember too that shapes with the **same area** can have **different perimeters**.

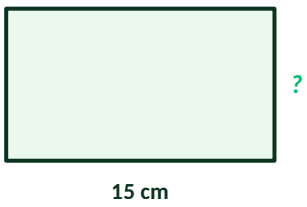
I Investigate

Using 6 squares, each with sides of 1 cm, make as many different rectangles as you can. Which one has the largest perimeter? Which has the smallest?

S Solve: worked examples

Worked example 6.1

A rectangle has a perimeter of 46 cm. Its length is 15 cm. Find its width.



Step 1: Write the perimeter using the formula

P = 2 × length + 2 × width

46 = 2 × 15 + 2w

Step 2: Work out the known part

46 = 30 + 2w

Step 3: Carry over and change the sign

2w = 46 − 30

+30 crosses the equals sign and becomes −30

2w = 16

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Step 4: Divide both sides by 2

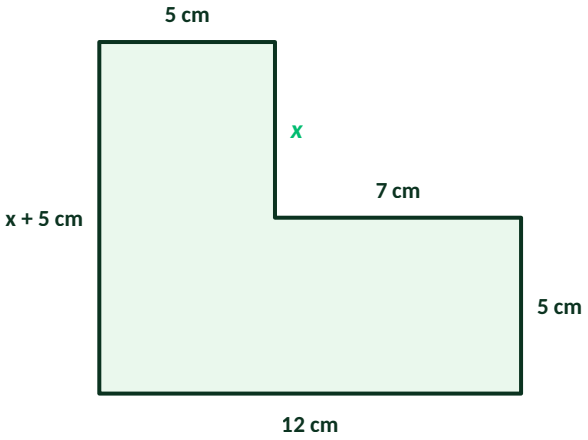
w = 16 ÷ 2

w = 8 cm

ANSWER **Width = 8 cm**

Worked example 6.2

The perimeter of this shape is 44 cm. Find the length marked x. All corners are right angles.



Step 1: Write each side using x

The left side is the two right hand vertical sides added: x + 5.

Step 2: Write an expression for the perimeter

P = 12 + 5 + 7 + x + 5 + x + 5

P = 34 + 2x

Step 3: Make it equal to the perimeter you are given

34 + 2x = 44

Step 4: Carry over and change the sign

2x = 44 − 34

+34 crosses the equals sign and becomes −34

2x = 10

Step 5: Divide both sides by 2

x = 10 ÷ 2

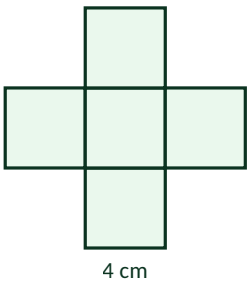
x = 5 cm

ANSWER **x = 5 cm**

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Worked example 6.3

This shape is made from 5 squares. Each square has sides of 4 cm. Find the perimeter of the shape.



Step 1: Count the outside edges

Go round the outline and count every square edge on the outside: 12 edges.
Edges where two squares touch are inside the shape, so they do not count.

Step 2: Multiply by the side length of one square

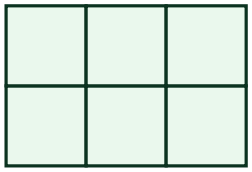
P = 12 × 4
P = 48 cm

ANSWER **Perimeter = 48 cm**

Worked example 6.4



Two rectangles are each made from 6 squares of side 1 cm. What is the difference between their perimeters?



Step 1: Find the perimeter of each arrangement

6 by 1: P = 2 × (6 + 1) = 14 cm
3 by 2: P = 2 × (3 + 2) = 10 cm

Step 2: Compare the largest and smallest

14 − 10
= 4 cm

Step 3: Explain

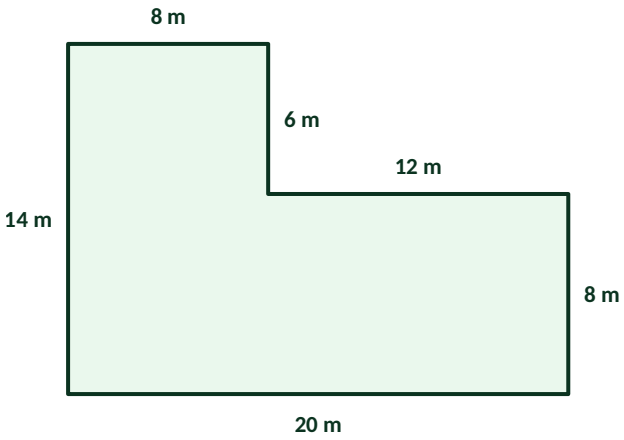
Every arrangement has the same area, but the long thin one has the biggest perimeter. Shapes with the same area can have different perimeters.

ANSWER **Difference = 4 cm**

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Worked example 6.5

A garden has the shape below. A fence is put all the way round it, except for a gate 3 m wide. Fencing costs £4 per metre. How much does the fence cost? All corners are right angles.



Step 1: Find the perimeter of the garden

P = 20 + 8 + 12 + 6 + 8 + 14

P = 68 m

Step 2: Take away the gate

Fence needed = 68 − 3

Fence needed = 65 m

Step 3: Multiply by the price per metre

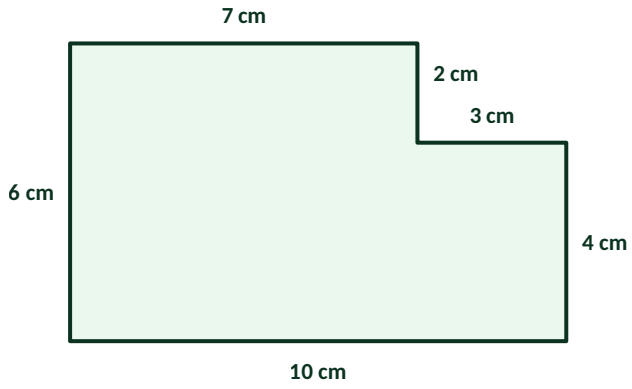
Cost = 65 × £4

Cost = £260

ANSWER **Cost = £260**

Worked example 6.6

A rectangle 10 cm by 6 cm has a rectangle 3 cm by 2 cm cut from one corner, making the shape below. Kemi says the perimeter is now smaller than the rectangle's perimeter. Is she right? Show your working.



Step 1: Perimeter of the original rectangle

P = 2 × (10 + 6) = 2 × 16 = 32 cm

Step 2: Perimeter of the new shape

P = 10 + 4 + 3 + 2 + 7 + 6

P = 32 cm

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Step 3: Compare and explain

Both perimeters are 32 cm. The two sides that were cut away (3 cm and 2 cm) are replaced by two new sides of exactly the same lengths, so Kemi is wrong.

ANSWER **No. Both perimeters are 32 cm**

Watch out

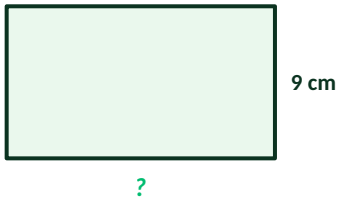
- When working backwards, check by putting your answer back into the perimeter.
- When you carry a number over the equals sign, its sign changes.
- Read word problems carefully: a gate or opening is not fenced.

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M Master: practice questions

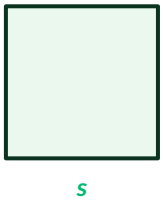
6.1 [3 marks]

A rectangle has a perimeter of 54 cm. Its width is 9 cm. Find its length.



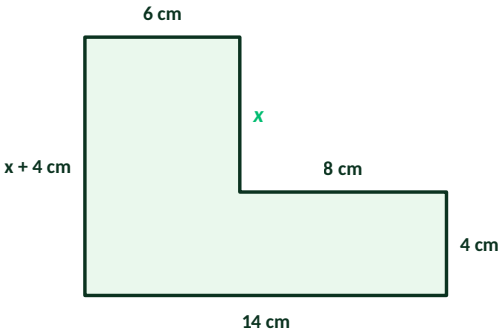
6.2 [2 marks]

A square has a perimeter of 52 cm. Find the length of one side.



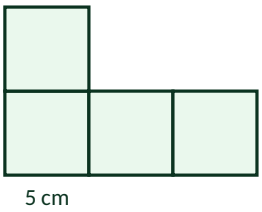
6.3 [3 marks]

The perimeter of this shape is 48 cm. Find the length marked x. All corners are right angles.



6.4 [3 marks]

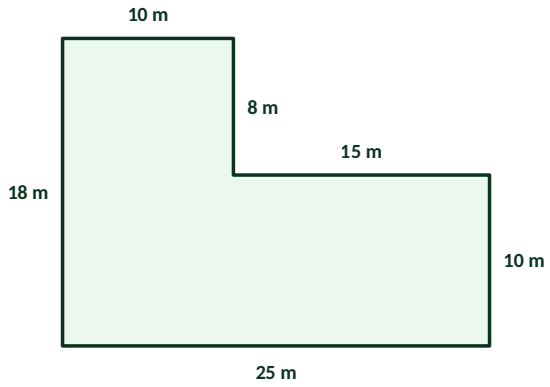
This shape is made from 4 squares. Each square has sides of 5 cm. Find the perimeter of the shape.



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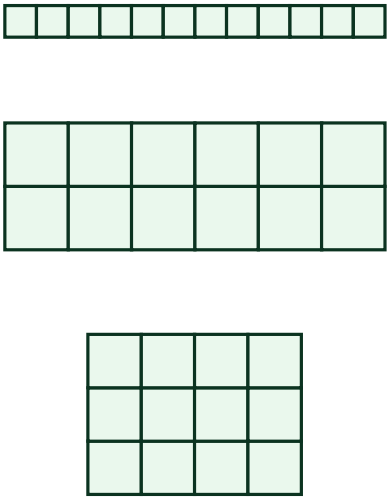
6.5 [4 marks]

A garden has the shape below. A fence is put all the way round it, except for a gate 2 m wide. Fencing costs £5 per metre. How much does the fence cost? All corners are right angles.



6.6 [3 marks]

Three rectangles are each made from 12 squares of side 1 cm: 12 by 1, 6 by 2 and 4 by 3. Find the difference between the largest and smallest perimeters.



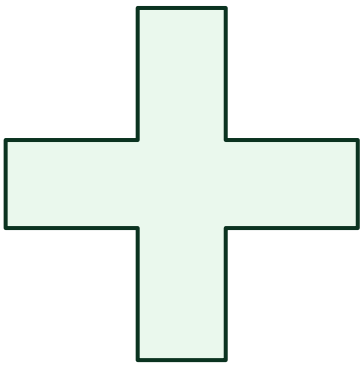
CHALLENGE

Outperform

These questions bring several ideas together. Show all your working.

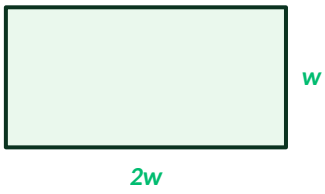
O.1 [4 marks]

A square of side 8 cm has a square of side 3 cm cut from each corner to make a cross. Find the perimeter of the cross. What do you notice?



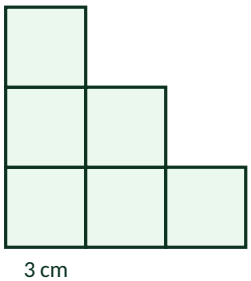
O.2 [4 marks]

The perimeter of a rectangle is 30 cm. Its length is twice its width. Find the length and the width.



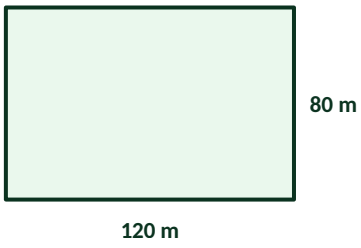
O.3 [3 marks]

A staircase is made from 6 squares, each with sides of 3 cm. Find its perimeter.



O.4 [3 marks]

A rectangular field is 120 m long and 80 m wide. Chidi runs round the edge of the field 3 times. How far does he run? Give your answer in kilometres.



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Summary card

Perimeter	Distance all the way round the outside. Units: mm, cm, m, km.
Rectangle	P = 2 × (l + w)
Square	P = 4 × side
Regular shape	P = number of sides × side length
Compound shape	Start at a corner, go round once, add every outside side.
Missing lengths	Total going right = total going left. Total going up = total going down.
Shortcut	No dents: P = 2 × (W + H). Each dent adds 2 × its depth.
Mixed units	Convert first. 1 cm = 10 mm, 1 m = 100 cm, 1 km = 1000 m.
Working backwards	Write the perimeter as a sum, carry numbers over the equals sign (the sign changes), then divide.
Same area	Shapes with the same area can have different perimeters. Long thin shapes have larger perimeters.

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ANSWER KEY

Answer summary

Q	Answer	Marks
1.1	Perimeter = 34 cm	2
1.2	Perimeter = 36 m	2
1.3	Perimeter = 64 mm	2
1.4	Perimeter = 56 cm	2
1.5	Perimeter = 28 cm	2
1.6	Perimeter = 78 cm	2
2.1	Perimeter = 28 cm	2
2.2	Perimeter = 46 cm	2
2.3	Perimeter = 36 cm	2
2.4	Perimeter = 28 cm	2
2.5	Perimeter = 38 cm	2
2.6	Perimeter = 50 cm	2
3.1	Perimeter = 40 cm	3
3.2	Perimeter = 40 cm	3
3.3	Perimeter = 44 cm	3
3.4	Perimeter = 34 cm	3
3.5	Perimeter = 58 cm	3
3.6	Perimeter = 40 cm	3
4.1	Perimeter = 36 cm	3
4.2	Perimeter = 60 cm	2
4.3	Perimeter = 46 cm	3
4.4	Perimeter = 40 cm	3
4.5	Perimeter = 32 cm	3
4.6	Perimeter = 60 cm	3
5.1	Perimeter = 26.6 cm	2
5.2	Perimeter = 35.2 cm	3
5.3	Perimeter = 8.4 m	3
5.4	Perimeter = 40 cm	3
5.5	Perimeter = 51 m	3
5.6	Perimeter = 43 cm	3
6.1	Length = 18 cm	3
6.2	Side = 13 cm	2
6.3	x = 6 cm	3
6.4	Perimeter = 50 cm	3
6.5	Cost = £420	4
6.6	Difference = 12 cm	3
O.1	Perimeter = 32 cm (unchanged)	4
O.2	Length = 10 cm, width = 5 cm	4
O.3	Perimeter = 36 cm	3
O.4	Distance = 1.2 km	3

Total: 108 marks. Full worked solutions follow.

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Full worked solutions

Concept 1 || Perimeter of simple shapes

Question 1.1 — 2 marks

Find the perimeter of this rectangle.



Step 1: Write the length of every side

Opposite sides of a rectangle are equal, so the sides are 11, 6, 11 and 6.

Step 2: Add all four sides

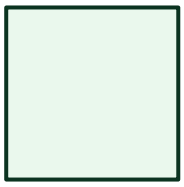
P = 11 + 6 + 11 + 6

P = 34 cm

ANSWER Perimeter = 34 cm

Question 1.2 — 2 marks

Find the perimeter of this square.



Step 1: All four sides of a square are equal

Each side is 9 m.

Step 2: Multiply by 4

P = 4 × 9

P = 36 m

ANSWER Perimeter = 36 m

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Question 1.3 — 2 marks

Find the perimeter of this rectangle.



Step 1: Write the length of every side

Opposite sides of a rectangle are equal, so the sides are 20, 12, 20 and 12.

Step 2: Add all four sides

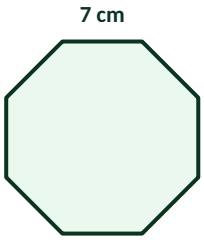
P = 20 + 12 + 20 + 12

P = 64 mm

ANSWER Perimeter = 64 mm

Question 1.4 — 2 marks

Find the perimeter of this regular octagon.



Step 1: Count the sides

A regular octagon has 8 equal sides, each 7 cm.

Step 2: Multiply the number of sides by the side length

P = 8 × 7

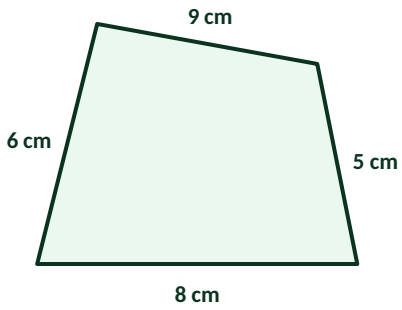
P = 56 cm

ANSWER Perimeter = 56 cm

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Question 1.5 — 2 marks

Find the perimeter of this quadrilateral.



Step 1: Add every side, going round once

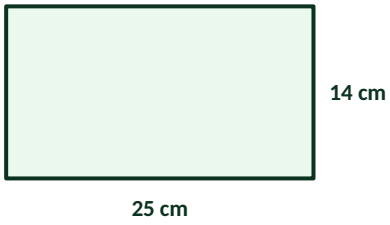
P = 8 + 5 + 9 + 6

P = 28 cm

ANSWER Perimeter = 28 cm

Question 1.6 — 2 marks

Find the perimeter of this rectangle.



Step 1: Write the length of every side

Opposite sides of a rectangle are equal, so the sides are 25, 14, 25 and 14.

Step 2: Add all four sides

P = 25 + 14 + 25 + 14

P = 78 cm

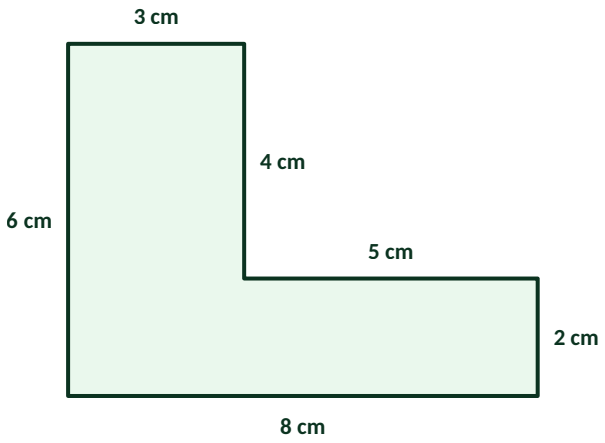
ANSWER Perimeter = 78 cm

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Concept 2 || Compound shapes with every side given

Question 2.1 — 2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

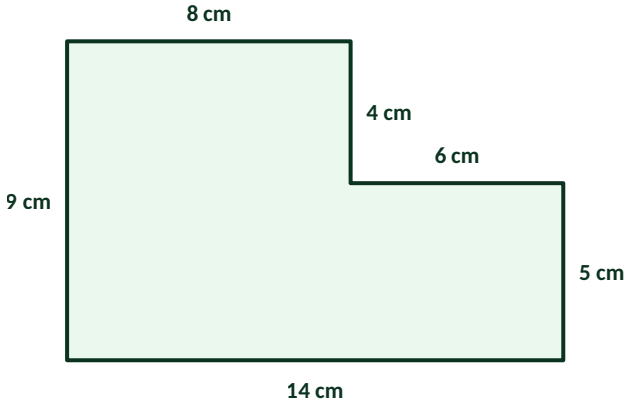
P = 8 + 2 + 5 + 4 + 3 + 6

P = 28 cm

ANSWER Perimeter = 28 cm

Question 2.2 — 2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 14 + 5 + 6 + 4 + 8 + 9

P = 46 cm

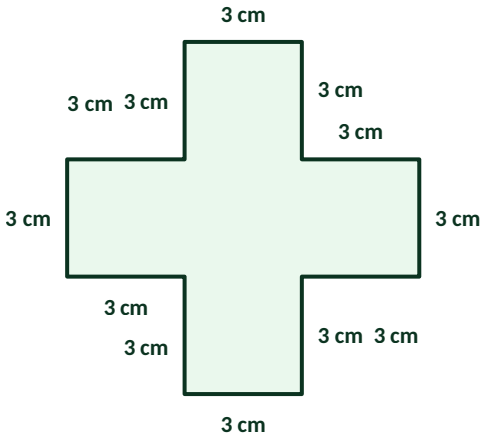
ANSWER Perimeter = 46 cm

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Question 2.3

2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3

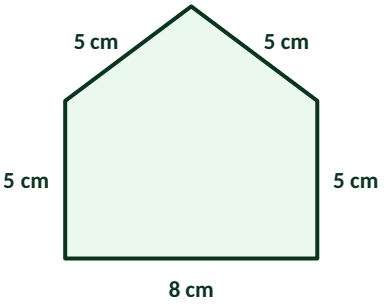
P = 36 cm

ANSWER Perimeter = 36 cm

Question 2.4

2 marks

This shape is a rectangle with a triangle on top. Find its perimeter.



Step 1: Add every side, going round once

P = 8 + 5 + 5 + 5 + 5

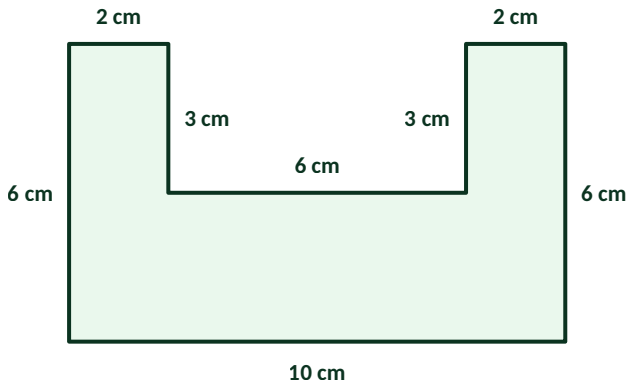
P = 28 cm

ANSWER Perimeter = 28 cm

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Question 2.5 — 2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

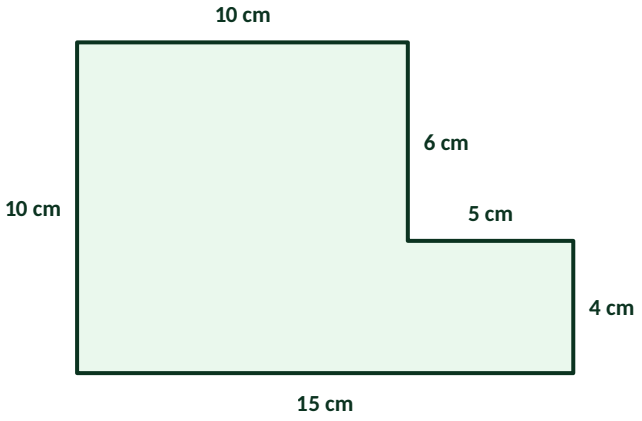
P = 10 + 6 + 2 + 3 + 6 + 3 + 2 + 6

P = 38 cm

ANSWER Perimeter = 38 cm

Question 2.6 — 2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 15 + 4 + 5 + 6 + 10 + 10

P = 50 cm

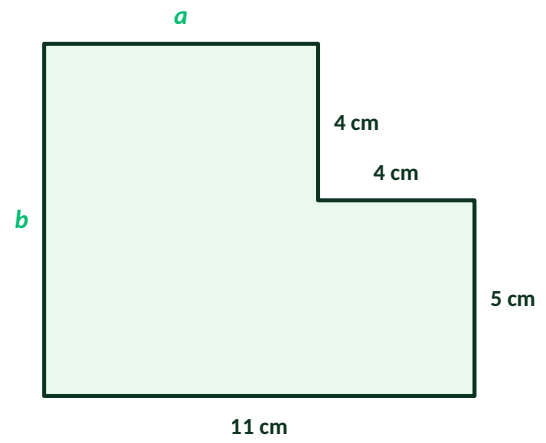
ANSWER Perimeter = 50 cm

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Concept 3 || Finding missing lengths

Question 3.1 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

11 = 4 + a

a = 11 − 4

a = 7 cm

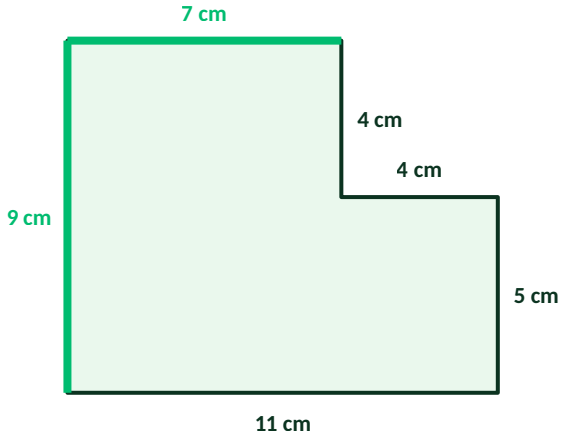
Vertical sides: total going up = total going down

5 + 4 = b

b = 5 + 4

b = 9 cm

Lengths found



Step 2: Add all the sides, going round the shape once

P = 11 + 5 + 4 + 4 + 7 + 9

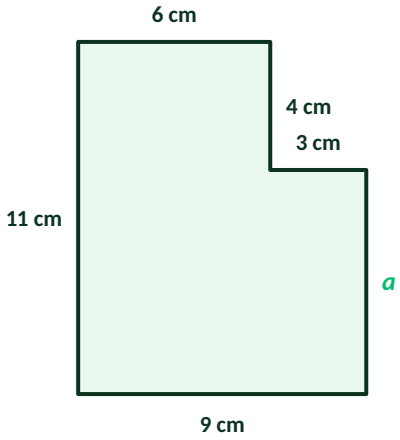
P = 40 cm

ANSWER Perimeter = 40 cm

Question 3.2

3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Vertical sides: total going up = total going down

a + 4 = 11

a = 11 − 4

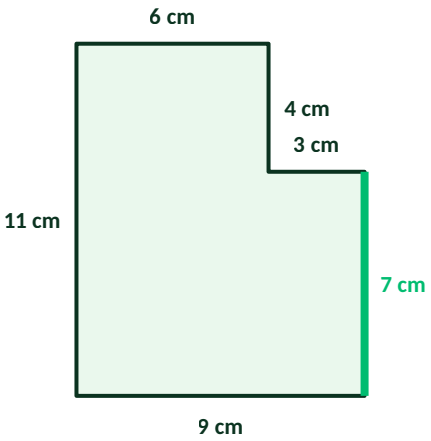
a = 7 cm

Step 2: Add all the sides, going round the shape once

P = 9 + 7 + 3 + 4 + 6 + 11

P = 40 cm

Lengths found

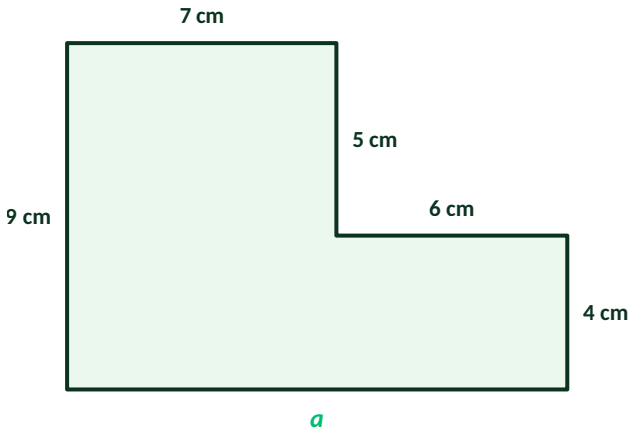


ANSWER Perimeter = 40 cm

Question 3.3

3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

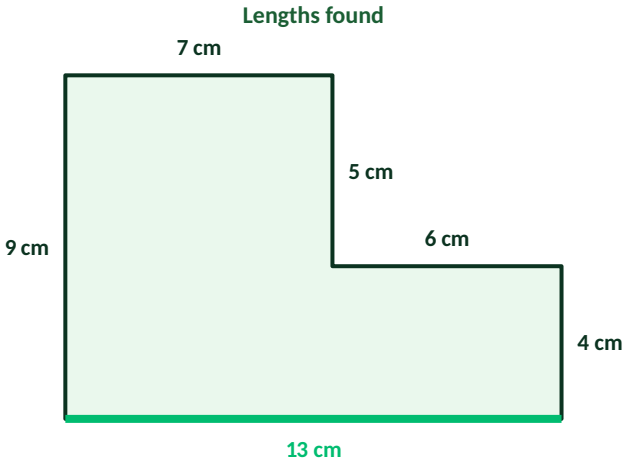
a = 6 + 7

a = 13 cm

Step 2: Add all the sides, going round the shape once

P = 13 + 4 + 6 + 5 + 7 + 9

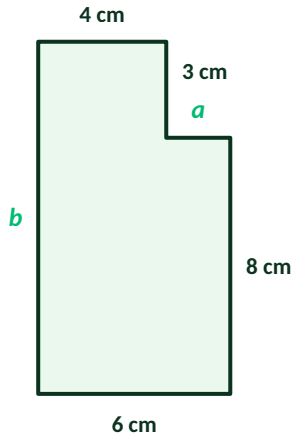
P = 44 cm



ANSWER Perimeter = 44 cm

Question 3.4 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

6 = a + 4

a = 6 − 4

a = 2 cm

Vertical sides: total going up = total going down

8 + 3 = b

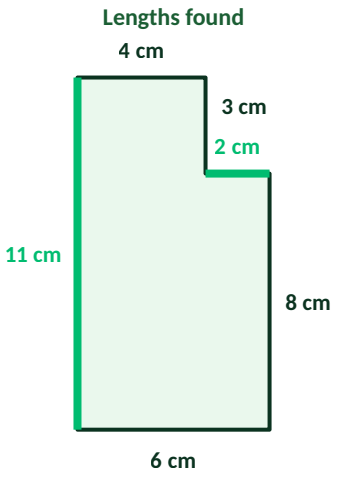
b = 8 + 3

b = 11 cm

Step 2: Add all the sides, going round the shape once

P = 6 + 8 + 2 + 3 + 4 + 11

P = 34 cm

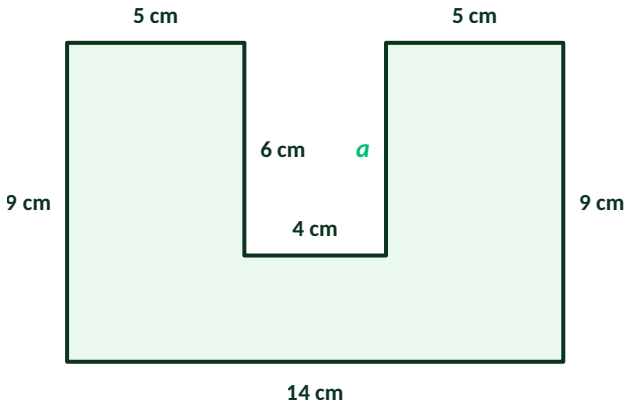


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ANSWER Perimeter = 34 cm

Question 3.5 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Vertical sides: total going up = total going down

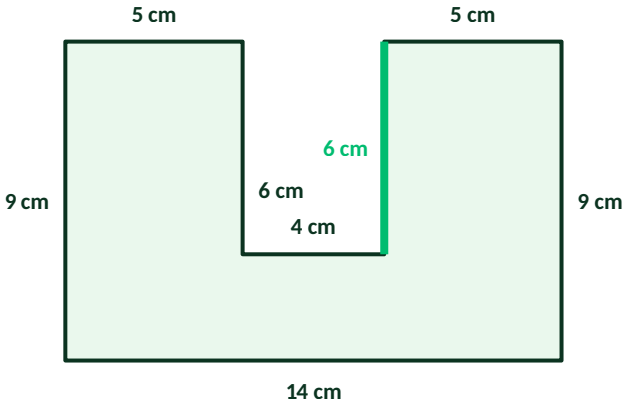
9 + 6 = a + 9

a = 9 + 6 − 9

a = 15 − 9

a = 6 cm

Lengths found



Step 2: Add all the sides, going round the shape once

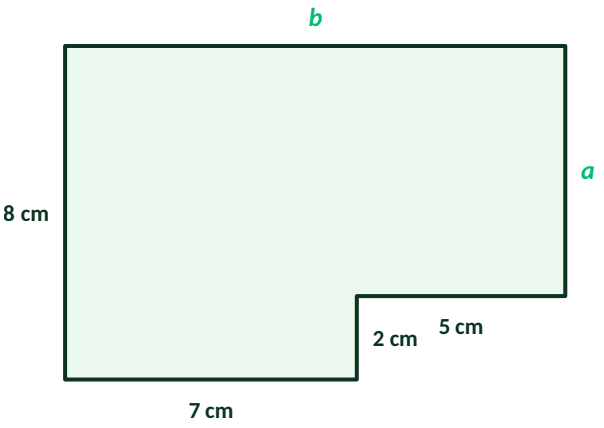
P = 14 + 9 + 5 + 6 + 4 + 6 + 5 + 9

P = 58 cm

ANSWER Perimeter = 58 cm

Question 3.6 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

7 + 5 = b

b = 7 + 5

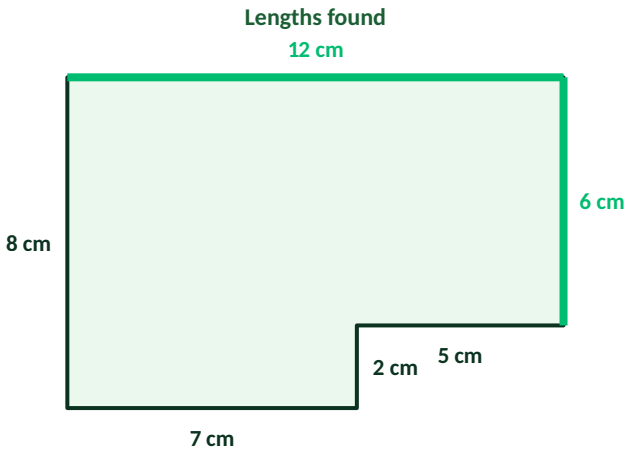
b = 12 cm

Vertical sides: total going up = total going down

2 + a = 8

a = 8 − 2

a = 6 cm



Step 2: Add all the sides, going round the shape once

P = 7 + 2 + 5 + 6 + 12 + 8

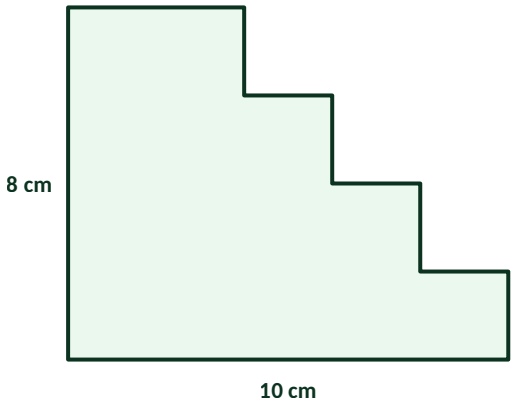
P = 40 cm

ANSWER Perimeter = 40 cm

Concept 4 || The rectangle shortcut and shapes with dents

Question 4.1 3 marks

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 10 cm (the full length across)

Height = 8 cm (the full height)

Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (10 + 8)

P = 2 × 18

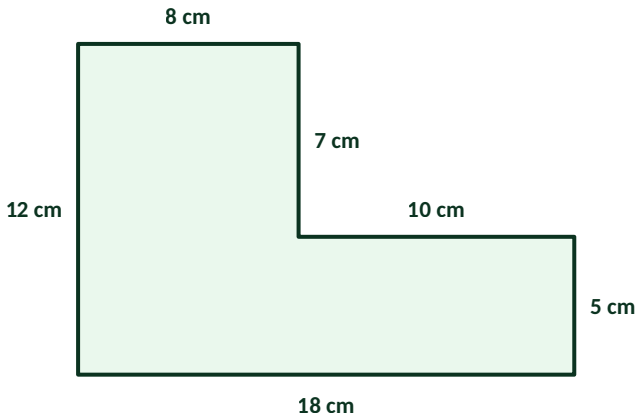
P = 36 cm

ANSWER Perimeter = 36 cm

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Question 4.2 — 2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

P = 18 + 5 + 10 + 7 + 8 + 12

P = 60 cm

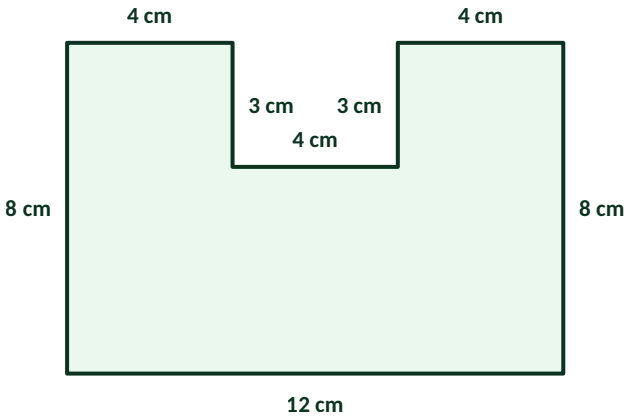
Step 2: Check with the rectangle shortcut

P = 2 × (18 + 12) = 2 × 30 = 60 cm ✓

ANSWER **Perimeter = 60 cm**

Question 4.3 — 3 marks

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 12 cm (the full length across)

Height = 8 cm (the full height)

Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (12 + 8)

P = 2 × 20

P = 40 cm

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Step 3: Add the extra sides inside each dent

A dent 3 cm deep adds 2 × 3 = 6 cm

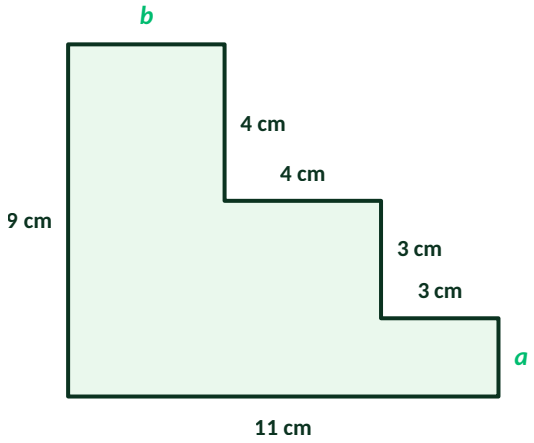
P = 40 + 6

P = 46 cm

ANSWER **Perimeter = 46 cm**

Question 4.4 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

11 = 3 + 4 + b

b = 11 − 3 − 4

b = 4 cm

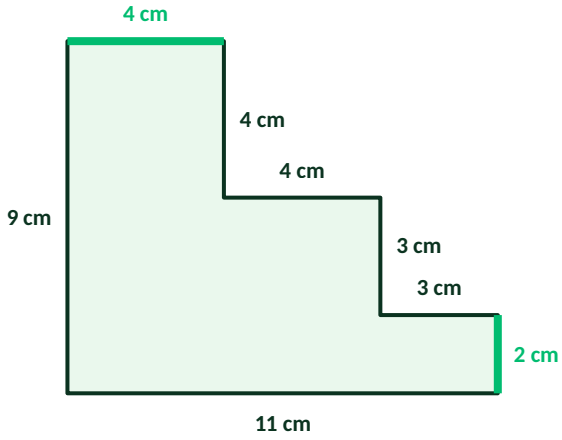
Vertical sides: total going up = total going down

a + 3 + 4 = 9

a = 9 − 3 − 4

a = 2 cm

Lengths found



Step 2: Add all the sides, going round the shape once

P = 11 + 2 + 3 + 3 + 4 + 4 + 4 + 9

P = 40 cm

Step 3: Check with the rectangle shortcut

P = 2 × (11 + 9) = 2 × 20 = 40 cm ✓

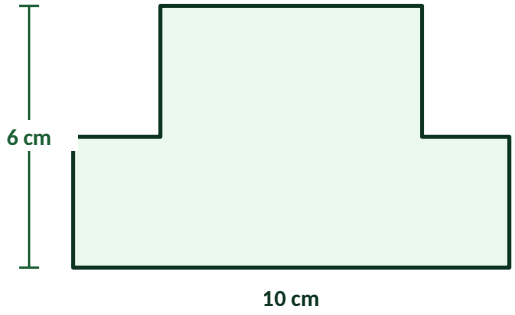
ANSWER **Perimeter = 40 cm**

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Question 4.5

3 marks

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 10 cm (the full length across)

Height = 6 cm (the full height)

Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (10 + 6)

P = 2 × 16

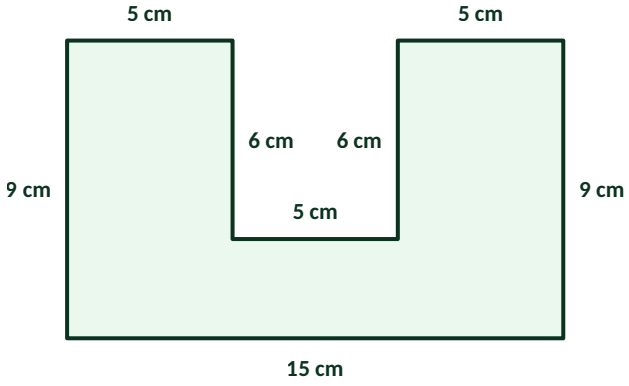
P = 32 cm

ANSWER **Perimeter = 32 cm**

Question 4.6

3 marks

Use the rectangle shortcut to find the perimeter of this shape. All corners are right angles.



Step 1: Find the width and height of the surrounding rectangle

Width = 15 cm (the full length across)

Height = 9 cm (the full height)

Step 2: Use the rectangle formula

P = 2 × (W + H)

P = 2 × (15 + 9)

P = 2 × 24

P = 48 cm

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Step 3: Add the extra sides inside each dent

A dent 6 cm deep adds 2 × 6 = 12 cm

P = 48 + 12

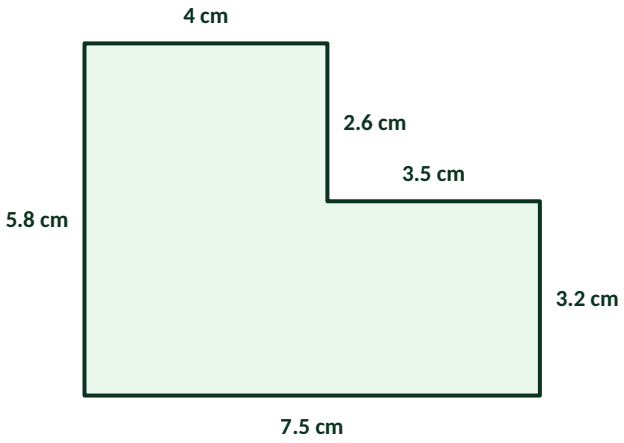
P = 60 cm

ANSWER **Perimeter = 60 cm**

Concept 5 || Decimals and mixed units

Question 5.1 — 2 marks

Find the perimeter of this compound shape. All corners are right angles.



Step 1: Add all the sides, going round the shape once

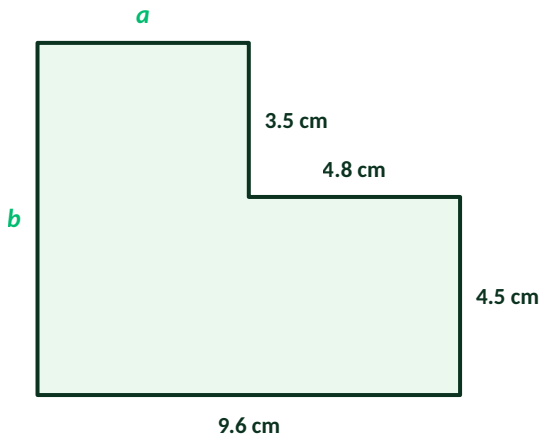
P = 7.5 + 3.2 + 3.5 + 2.6 + 4 + 5.8

P = 26.6 cm

ANSWER **Perimeter = 26.6 cm**

Question 5.2 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

9.6 = 4.8 + a

a = 9.6 − 4.8

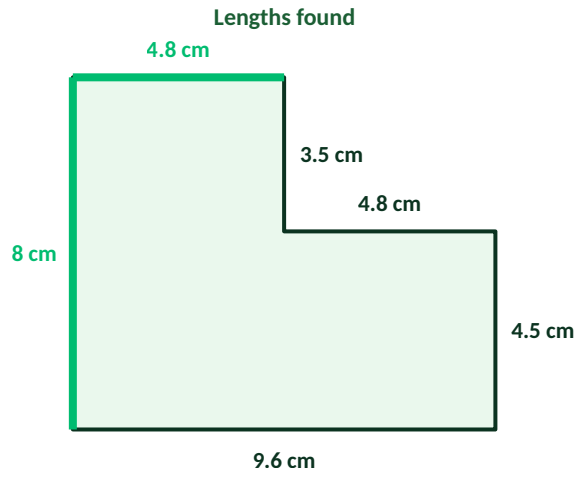
a = 4.8 cm

Vertical sides: total going up = total going down

4.5 + 3.5 = b

b = 4.5 + 3.5

b = 8 cm



Step 2: Add all the sides, going round the shape once

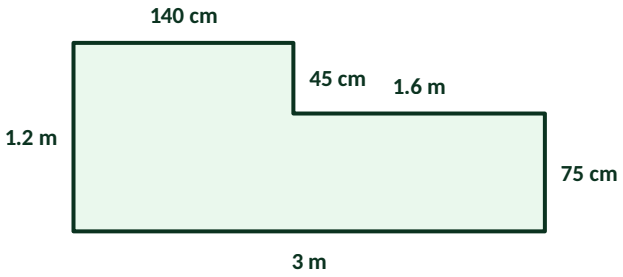
P = 9.6 + 4.5 + 4.8 + 3.5 + 4.8 + 8

P = 35.2 cm

ANSWER **Perimeter = 35.2 cm**

Question 5.3 — 3 marks

Find the perimeter of this shape in metres.
All corners are right angles.



Step 1: Change every length to the same unit

1 m = 100 cm

3 m = 3 × 100 = 300 cm

1.6 m = 1.6 × 100 = 160 cm

1.2 m = 1.2 × 100 = 120 cm

Step 2: Add all the sides, going round the shape once

P = 300 + 75 + 160 + 45 + 140 + 120

P = 840 cm

Step 3: Convert the answer to metres

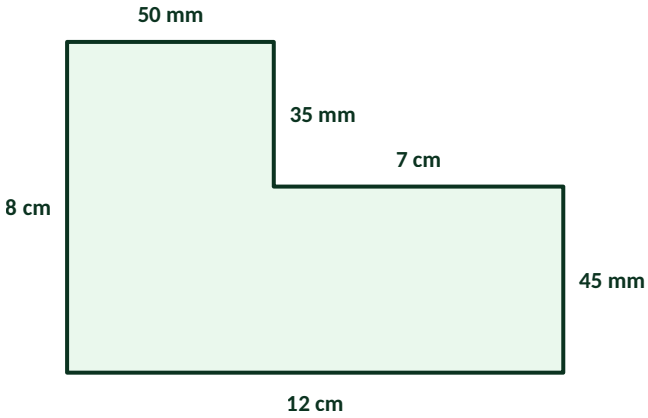
840 cm ÷ 100 = 8.4 m

ANSWER **Perimeter = 8.4 m**

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Question 5.4 — 3 marks

Find the perimeter of this shape in centimetres. All corners are right angles.



Step 1: Change every length to the same unit

1 cm = 10 mm

12 cm = 12 × 10 = 120 mm

7 cm = 7 × 10 = 70 mm

8 cm = 8 × 10 = 80 mm

Step 2: Add all the sides, going round the shape once

P = 120 + 45 + 70 + 35 + 50 + 80

P = 400 mm

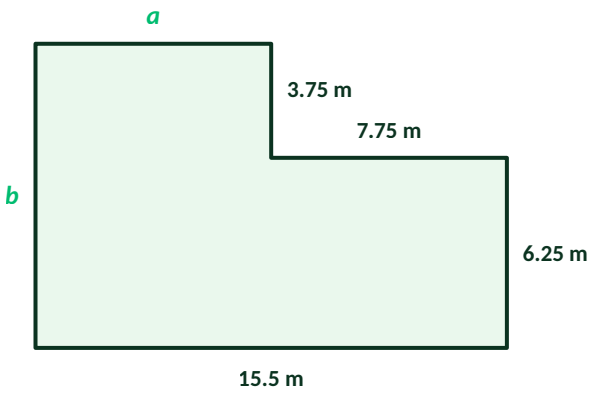
Step 3: Convert the answer to centimetres

400 mm ÷ 10 = 40 cm

ANSWER Perimeter = 40 cm

Question 5.5 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



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Step 1: Find the missing lengths

Horizontal sides: total going right = total going left

15.5 = 7.75 + a

a = 15.5 − 7.75

a = 7.75 m

Vertical sides: total going up = total going down

6.25 + 3.75 = b

b = 6.25 + 3.75

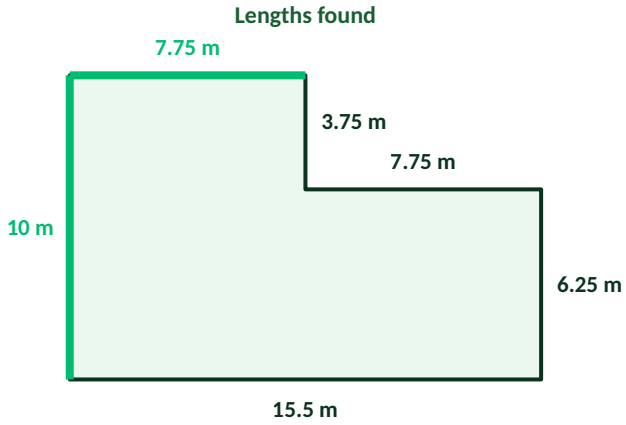
b = 10 m

Step 2: Add all the sides, going round the shape once

P = 15.5 + 6.25 + 7.75 + 3.75 + 7.75 + 10

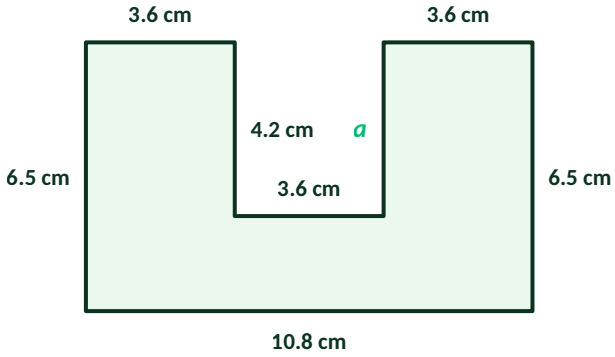
P = 51 m

ANSWER Perimeter = 51 m



Question 5.6 — 3 marks

Find the lengths marked with letters, then find the perimeter of the shape. All corners are right angles.



Step 1: Find the missing lengths

Vertical sides: total going up = total going down

6.5 + 4.2 = a + 6.5

a = 6.5 + 4.2 − 6.5

a = 10.7 − 6.5

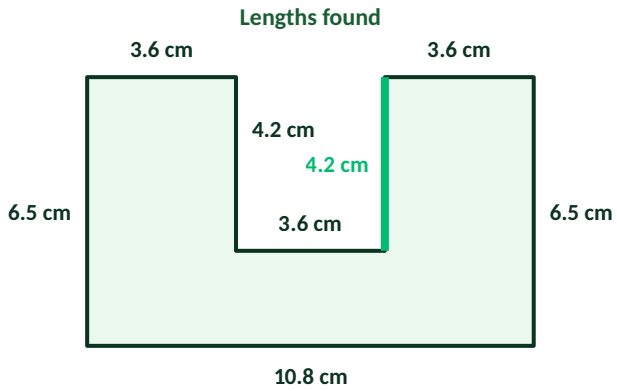
a = 4.2 cm

Step 2: Add all the sides, going round the shape once

P = 10.8 + 6.5 + 3.6 + 4.2 + 3.6 + 4.2 + 3.6 + 6.5

P = 43 cm

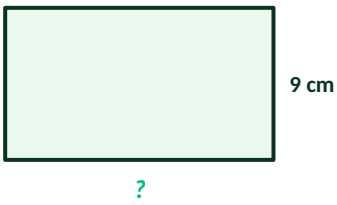
ANSWER Perimeter = 43 cm



Concept 6 || Problem solving and reasoning

Question 6.1 — 3 marks

A rectangle has a perimeter of 54 cm. Its width is 9 cm. Find its length.



Step 1: Write the perimeter using the formula

$P = 2 \times \text{width} + 2 \times \text{length}$

$54 = 2 \times 9 + 2l$

Step 2: Work out the known part

$54 = 18 + 2l$

Step 3: Carry over and change the sign

$2l = 54 - 18$

+18 crosses the equals sign and becomes −18

$2l = 36$

Step 4: Divide both sides by 2

$l = 36 \div 2$

$l = 18$ cm

ANSWER Length = 18 cm

Question 6.2 — 2 marks

A square has a perimeter of 52 cm. Find the length of one side.



Step 1: Use the square formula

$P = 4 \times \text{side}$

$4 \times s = 52$

Step 2: Divide by 4

$s = 52 \div 4$

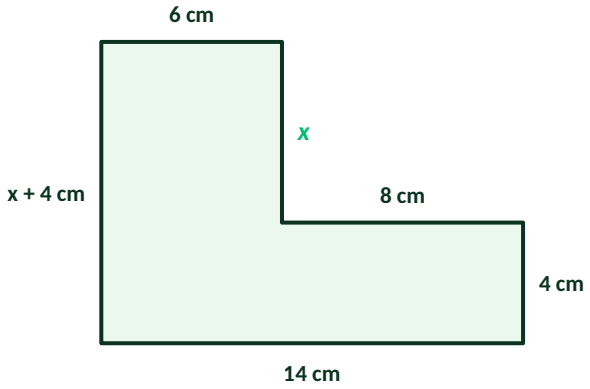
$s = 13$ cm

ANSWER Side = 13 cm

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Question 6.3 — 3 marks

The perimeter of this shape is 48 cm. Find the length marked x. All corners are right angles.



Step 1: Write each side using x

The left side is the two right hand vertical sides added: x + 4.

Step 2: Write an expression for the perimeter

P = 14 + 4 + 8 + x + 6 + x + 4

P = 36 + 2x

Step 3: Make it equal to the perimeter you are given

36 + 2x = 48

Step 4: Carry over and change the sign

2x = 48 − 36

+36 crosses the equals sign and becomes −36

2x = 12

Step 5: Divide both sides by 2

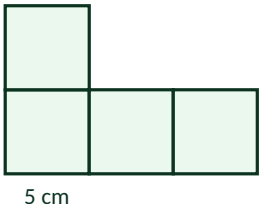
x = 12 ÷ 2

x = 6 cm

ANSWER **x = 6 cm**

Question 6.4 — 3 marks

This shape is made from 4 squares. Each square has sides of 5 cm. Find the perimeter of the shape.



Step 1: Count the outside edges

Go round the outline and count every square edge on the outside: 10 edges.

Edges where two squares touch are inside the shape, so they do not count.

Step 2: Multiply by the side length of one square

P = 10 × 5

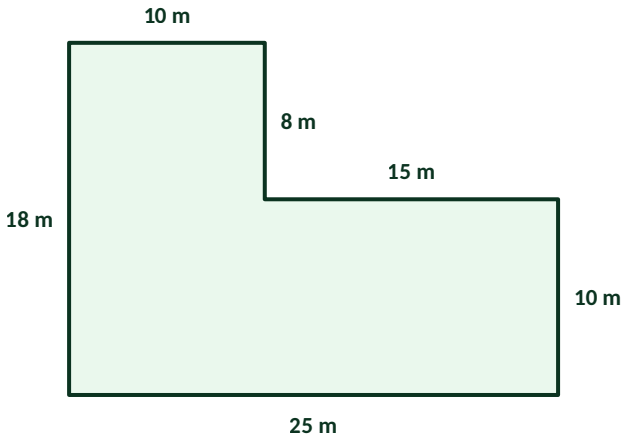
P = 50 cm

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ANSWER Perimeter = 50 cm

Question 6.5 — 4 marks

A garden has the shape below. A fence is put all the way round it, except for a gate 2 m wide. Fencing costs £5 per metre. How much does the fence cost? All corners are right angles.



Step 1: Find the perimeter of the garden

P = 25 + 10 + 15 + 8 + 10 + 18

P = 86 m

Step 2: Take away the gate

Fence needed = 86 − 2

Fence needed = 84 m

Step 3: Multiply by the price per metre

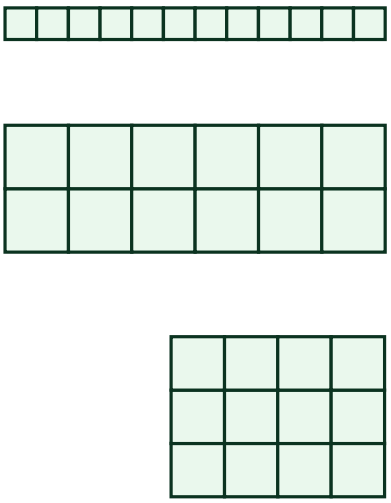
Cost = 84 × £5

Cost = £420

ANSWER Cost = £420

Question 6.6 — 3 marks

Three rectangles are each made from 12 squares of side 1 cm: 12 by 1, 6 by 2 and 4 by 3. Find the difference between the largest and smallest perimeters.



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Step 1: Find the perimeter of each arrangement

12 by 1: P = 2 × (12 + 1) = 26 cm

6 by 2: P = 2 × (6 + 2) = 16 cm

4 by 3: P = 2 × (4 + 3) = 14 cm

Step 2: Compare the largest and smallest

26 − 14

= 12 cm

Step 3: Explain

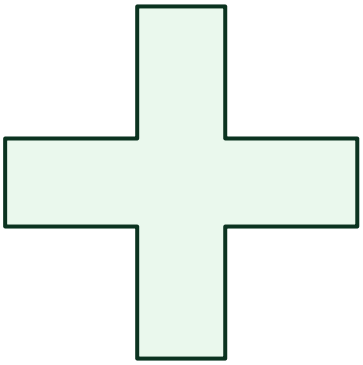
Every arrangement has the same area, but the long thin one has the biggest perimeter. Shapes with the same area can have different perimeters.

ANSWER **Difference = 12 cm**

Outperform

Question O.1 **4 marks**

A square of side 8 cm has a square of side 3 cm cut from each corner to make a cross. Find the perimeter of the cross. What do you notice?



Step 1: Find the lengths of all 12 sides

Each side of the big square is 8 cm. Removing 3 cm from each end leaves 8 − 3 − 3 = 2 cm in the middle.

So the shape has 4 sides of 2 cm and 8 sides of 3 cm.

Step 2: Add them

P = 4 × 2 + 8 × 3

P = 8 + 24

P = 32 cm

Step 3: Compare with the original square

Original square: 4 × 8 = 32 cm. The perimeter has not changed.

ANSWER **Perimeter = 32 cm (unchanged)**

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Question O.2 — 4 marks

The perimeter of a rectangle is 30 cm. Its length is twice its width. Find the length and the width.



Step 1: Write the length using the width

Length = 2w, width = w

Step 2: Write the perimeter

P = 2 × (2w + w)

P = 2 × 3w = 6w

Step 3: Make it equal to 30 and solve

6w = 30

w = 30 ÷ 6

w = 5 cm

Step 4: Find the length

Length = 2 × 5

Length = 10 cm

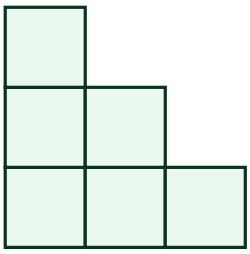
Step 5: Check

P = 2 × (10 + 5) = 2 × 15 = 30 cm ✓

ANSWER **Length = 10 cm, width = 5 cm**

Question O.3 — 3 marks

A staircase is made from 6 squares, each with sides of 3 cm. Find its perimeter.



Step 1: Spot the shape

The staircase has no dents, so its perimeter equals the surrounding rectangle.

Step 2: Find the width and height

Width = 3 squares = 3 × 3 = 9 cm

Height = 3 squares = 3 × 3 = 9 cm

Step 3: Use the shortcut

P = 2 × (9 + 9) = 2 × 18

P = 36 cm

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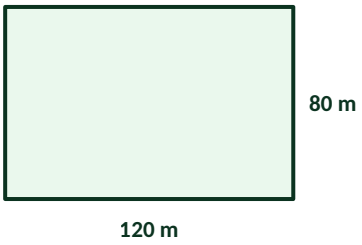
Step 4: Check by counting edges

12 outside edges × 3 cm = 36 cm ✓

ANSWER **Perimeter = 36 cm**

Question O.4 — 3 marks

A rectangular field is 120 m long and 80 m wide. Chidi runs round the edge of the field 3 times. How far does he run? Give your answer in kilometres.



Step 1: Find the perimeter of the field

P = 2 × (120 + 80) = 2 × 200

P = 400 m

Step 2: Three laps

3 × 400 = 1200 m

Step 3: Convert to kilometres

1 km = 1000 m

1200 ÷ 1000

= 1.2 km

ANSWER **Distance = 1.2 km**

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