

Area of Rectangles, Triangles, Parallelograms and Trapezia

Solutions

For AQA GCSE Mathematics (8300) • 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 (1 mark)

A triangle has base 8 cm and perpendicular height 5 cm.

Circle the area of the triangle.

Options: 13 cm², 20 cm², 40 cm², 80 cm²

Area of a triangle = $\frac{1}{2} \times \text{base} \times \text{perpendicular height}$

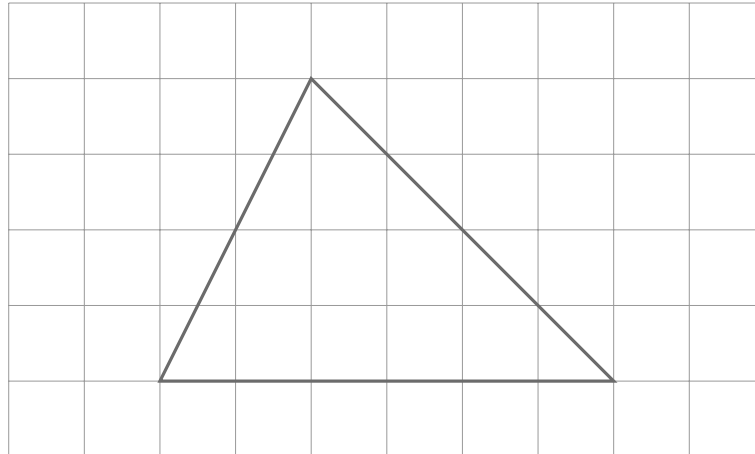
$$\frac{1}{2} \times 8 \times 5 = 20 \text{ cm}^2$$

Answer: 20 cm²

Tip: The most common mistake is forgetting to halve. $8 \times 5 = 40$ is the area of a rectangle, not a triangle.

2 (2 marks)

A triangle is drawn on a centimetre grid.



Work out the area of the triangle.

Count squares on the grid to find the base: 6 cm.

The perpendicular height (straight up from the base) is 4 cm.

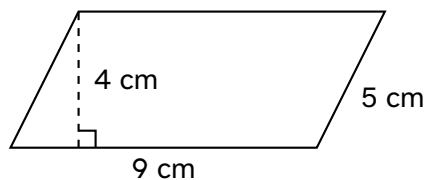
$$\text{Area} = \frac{1}{2} \times 6 \times 4 = 12 \text{ cm}^2$$

Answer: 12 cm²

Marks: 1 mark for $\frac{1}{2} \times 6 \times 4$. 1 mark for 12.

3 (2 marks)

Here is a parallelogram.



Not drawn accurately

Work out the area of the parallelogram.

Area of a parallelogram = base $\times$ perpendicular height

The base is 9 cm.

The perpendicular height is 4 cm (the 5 cm is the sloping side, so don't use it).

$$\text{Area} = 9 \times 4 = 36 \text{ cm}^2$$

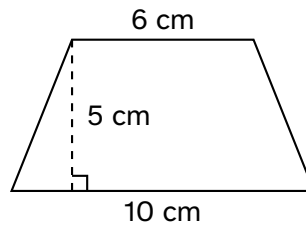
Answer: 36 cm^2

Tip: Use the height that meets the base at a right angle, not the sloping side.

Marks: 1 mark for 9×4 . 1 mark for 36.

4 (2 marks)

Here is a trapezium.



Not drawn accurately

Work out the area of the trapezium.

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

a and b are the parallel sides: 6 cm and 10 cm.

h is the perpendicular height: 5 cm.

Add the parallel sides: $6 + 10 = 16$

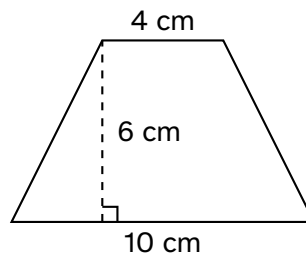
$$\text{Area} = \frac{1}{2} \times 16 \times 5 = 40 \text{ cm}^2$$

Answer: 40 cm^2

Marks: 1 mark for $\frac{1}{2}(6 + 10) \times 5$. 1 mark for 40.

5 (2 marks)

Ellis wants to find the area of this trapezium.



Not drawn accurately

(a) Ellis writes

$$\frac{1}{2} \times 4 + 10 \times 6 = 62 \text{ cm}^2$$

Explain the mistake that Ellis has made.

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

Ellis has only halved the 4. He should add the parallel sides **first**: $4 + 10 = 14$

Then halve and multiply by the height.

Answer: He did not add the parallel sides first (he only halved the 4, not $4 + 10$)

Tip: Say exactly what is wrong: the $\frac{1}{2}$ must multiply $(4 + 10)$, not just the 4. “He used the wrong formula” is not enough.

(b) Work out the correct area of the trapezium.

$$\frac{1}{2} \times (4 + 10) \times 6$$

$$= \frac{1}{2} \times 14 \times 6 = 42 \text{ cm}^2$$

Answer: 42 cm^2

6 (2 marks)

A square has sides of length 6 cm.

A rectangle has the same area as the square.

The length of the rectangle is 9 cm.

Work out the width of the rectangle.

Area of the square: $6 \times 6 = 36 \text{ cm}^2$

The rectangle also has area 36 cm^2 .

Length $\times$ width = 36

$9 \times$ width = 36

Width = $36 \div 9 = 4 \text{ cm}$

Answer: 4 cm

Tip: This question is about **area**, not perimeter. Don't use $4 \times 6 = 24$.

Marks: 1 mark for 36. 1 mark for 4.

7 (2 marks)

A rectangular garden is 12 m long and 7 m wide.

A path 1 m wide runs along the whole of one of the 12 m sides.

The rest of the garden is lawn.

Work out the area of the lawn.

The path takes 1 m off the width of the garden.

The lawn is 12 m long and $7 - 1 = 6 \text{ m}$ wide.

Area of the lawn: $12 \times 6 = 72 \text{ m}^2$

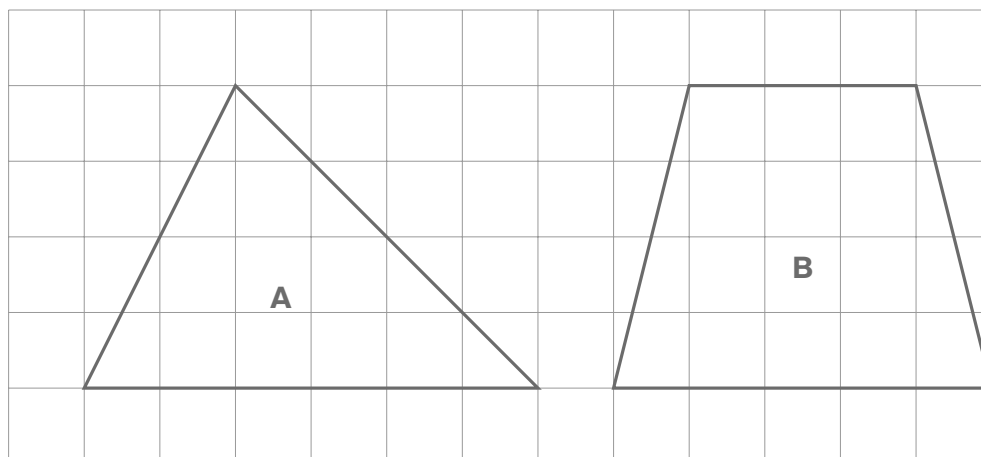
(Or: garden $12 \times 7 = 84$, path $12 \times 1 = 12$, lawn $84 - 12 = 72$)

Answer: 72 m^2

Marks: 1 mark for 12×6 (or $84 - 12$). 1 mark for 72.

8 (3 marks)

Shape A and shape B are drawn on a centimetre grid.



Kim says,

‘The area of shape B is double the area of shape A.’

Is Kim correct?

You must show your working.

Shape A is a triangle with base 6 cm and perpendicular height 4 cm.

$$\text{Area of A} = \frac{1}{2} \times 6 \times 4 = 12 \text{ cm}^2$$

Shape B is a trapezium with parallel sides 5 cm and 3 cm, and height 4 cm.

$$\text{Area of B} = \frac{1}{2} \times (5 + 3) \times 4 = 16 \text{ cm}^2$$

Double the area of A is $2 \times 12 = 24 \text{ cm}^2$, not 16 cm^2 .

So Kim is not correct.

Answer: No: A is 12 cm^2 and B is 16 cm^2 (double A would be 24 cm^2)

Tip: Measure the height of each shape straight up from its base, not along a sloping side.
Count squares to check your areas.

Marks: 1 mark for 12 (area of A). 1 mark for 16 (area of B). 1 mark for No with both areas.

9 (2 marks)

The line AB is one of the parallel sides of a trapezium.

The trapezium has perpendicular height 4 cm and area 20 cm^2

Complete the trapezium on the centimetre grid.

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

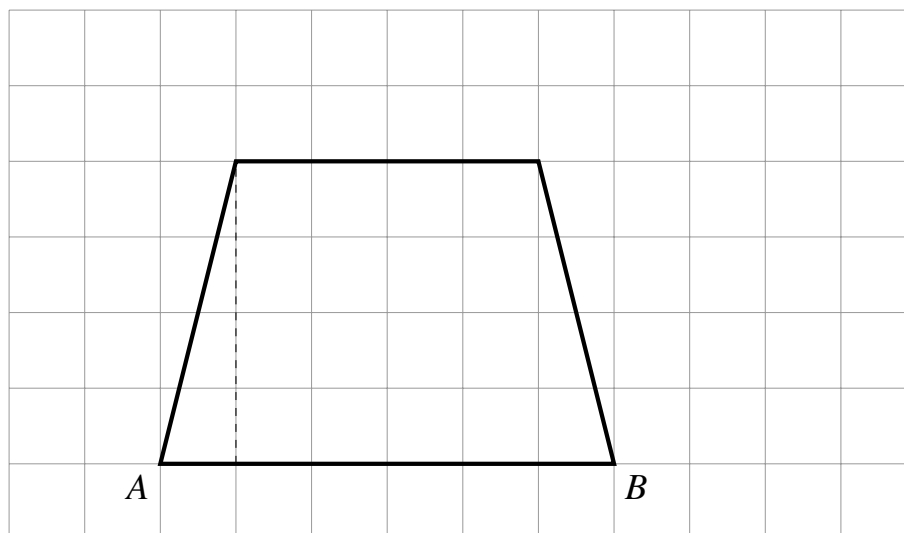
$$AB = 6 \text{ cm and } h = 4 \text{ cm, so } \frac{1}{2}(6 + b) \times 4 = 20$$

$$2(6 + b) = 20, \text{ so } 6 + b = 10$$

The other parallel side is $b = 4 \text{ cm}$.

Draw a line 4 cm long, parallel to AB and 4 squares above it. Join the ends to A and B .

For example:



Answer: A trapezium with the other parallel side 4 cm long, 4 cm from AB

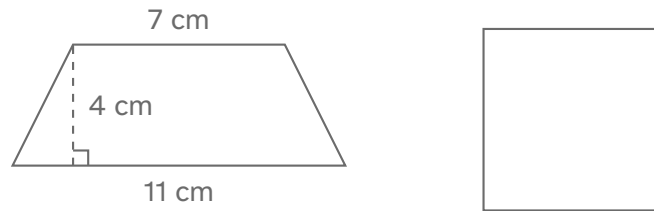
Tip: The top side must be parallel to AB (horizontal here). Check your answer:

$$\frac{1}{2} \times (6 + 4) \times 4 = 20 \checkmark$$

Marks: 1 mark for working out that the other parallel side is 4 cm. 1 mark for a correct trapezium.

10 (3 marks)

The diagram shows a trapezium and a square.



Not drawn accurately

The square has the same area as the trapezium.

Work out the perimeter of the square.

Area of the trapezium: $\frac{1}{2} \times (7 + 11) \times 4$

$= \frac{1}{2} \times 18 \times 4 = 36 \text{ cm}^2$

The square also has area 36 cm^2 .

Side of the square: $\sqrt{36} = 6 \text{ cm}$

Perimeter of the square: $4 \times 6 = 24 \text{ cm}$

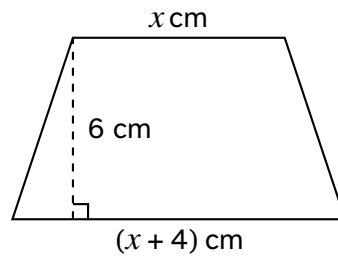
Answer: 24 cm

Tip: The question asks for the **perimeter** of the square, not its area. Find the side length first.

Marks: 1 mark for $\frac{1}{2}(7 + 11) \times 4$ or 36. 1 mark for a side of 6 cm. 1 mark for 24.

11 (3 marks)

Here is a trapezium.



Not drawn accurately

The area of the trapezium is 54 cm^2

Work out the value of x .

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

The parallel sides are x and $x + 4$, and the height is 6.

$$\frac{1}{2}(x + x + 4) \times 6 = 54$$

$$\frac{1}{2} \times 6 = 3, \text{ so } 3(2x + 4) = 54$$

$$6x + 12 = 54$$

$$6x = 42$$

$$x = 7$$

$$\text{Check: } \frac{1}{2}(7 + 11) \times 6 = 54 \quad \checkmark$$

Answer: $x = 7$

Marks: 1 mark for setting up $\frac{1}{2}(x + x + 4) \times 6 = 54$. 1 mark for $6x + 12 = 54$. 1 mark for $x = 7$.