

C5.2 Area and perimeter

Name: _____ Class: _____ Date: _____ Total: 20 marks

KEY WORDS height 高 • triangle 三角形 • trapezium 梯形 • perimeter 周长 • base 底

Objective

Use area and perimeter to solve Core IGCSE Mathematics problems.

You must be able to:

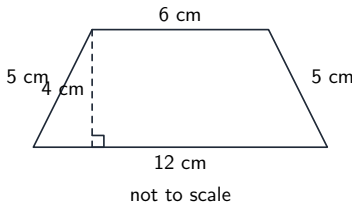
- Choose area formulas using perpendicular heights
- Distinguish boundary length from enclosed area
- Compare equal-area shapes and interpret units

1 Key knowledge and worked examples

■ Key knowledge: Area and perimeter

Perimeter is the distance around the boundary; area measures the region inside. Rectangle: $A = lw$, $P = 2(l + w)$. Triangle: $A = bh/2$. Parallelogram: $A = bh$, using perpendicular height, not the sloping side. Trapezium: $A = (a + b)h/2$, where a, b are the parallel sides. Add all boundary edges for a nonrectangular perimeter.

■ Worked example: Area and perimeter



A trapezium has parallel sides 6 and 12 cm, perpendicular height 4 cm and other sides 5 and 5 cm.

- Area: $A = (a + b)h/2 = (6 + 12)4/2 = 36 \text{ cm}^2$.
- Perimeter: $P = 6 + 12 + 5 + 5 = 28 \text{ cm}$.
- A triangle of base 9 cm and height 6 cm has $A = bh/2 = 9(6)/2 = 27 \text{ cm}^2$.

■ Method check

Equal areas do not imply equal perimeters. A perimeter follows the outside boundary once; an area measures the enclosed region.

2 Practice

2.1 Find the area and perimeter of a $7 \times 4 \text{ cm}$ rectangle. [2]

2.2 Find the area of a triangle with base 12 cm and perpendicular height 5 cm. [2]

2.3 A parallelogram has base 8 cm, perpendicular height 3 cm and sloping side 4 cm. Find its area. [2]

2.4 A trapezium has parallel sides 7 and 13 cm and height 6 cm. Find its area. [2]

3 Exam-style questions

3.1 Apply the area and perimeter methods below. Show working and include units where appropriate.

(a) A rectangle is 12 m by 7 m. Find its perimeter. [2]

(b) A triangular garden has base 12 m and perpendicular height 4 m. Find its area. [2]

(c) A parallelogram has the same area as that triangle and base 8 m. Find its perpendicular height. [2]

3.2 A rectangle measures 12 m by 8 m. A square has the same area.

(a) Find the rectangle's area and perimeter. [3]

(b) Find the square side and perimeter, giving the perimeter to one decimal place. Which shape needs less boundary fencing? [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- $A = lw = 7(4) = \mathbf{28}$ cm²; $P = 2(7 + 4) = \mathbf{22}$ cm.

2.2

- $A = bh/2 = 12(5)/2 = \mathbf{30}$ cm².

2.3

- Use perpendicular height: $A = bh = 8(3) = \mathbf{24}$ cm².

2.4

- $A = (a + b)h/2 = (7 + 13)6/2 = \mathbf{60}$ cm².

3.1

(a)

- $P = 2(l + w) = 2(12 + 7) = \mathbf{38}$ m.

(b)

- $A = bh/2 = 12(4)/2 = \mathbf{24}$ m².

(c)

- $A = bh$ gives $h = A/b = 24/8 = \mathbf{3}$ m.

3.2

(a)

- Use $A = lw = 12(8) = \mathbf{96}$ m².
- Perimeter $P = 2(l + w) = 2(12 + 8) = \mathbf{40}$ m.

(b)

- Equal area gives $s = \sqrt{96}$ m.
- Square perimeter $P_s = 4\sqrt{96} \approx \mathbf{39.2}$ m.
- The square needs less fencing, since its perimeter is below 40 m.