

C4.4 Similarity

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS similar 相似 • scale factor 比例因子 • triangle 三角形 • edge 棱
 • corresponding angles 同位角

Objective

Use similarity to solve Core IGCSE Mathematics problems.

You must be able to:

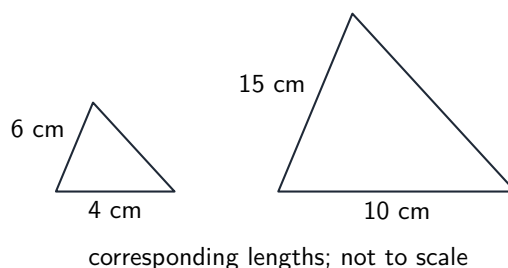
- Match corresponding vertices and lengths
- Use a length scale factor in both directions
- Check that all corresponding side ratios agree

1 Key knowledge and worked examples

■ Key knowledge: Similarity

Similar shapes have equal corresponding angles and equal ratios of corresponding lengths. Match sides in the same relative position; do not match only by appearance. Find the length scale factor $k = \text{new length}/\text{original length}$ and multiply every original length by k . In reverse, divide by k . Core similarity calculations are about lengths, not area or volume factors.

■ Worked example: Similarity



Two similar triangles have corresponding sides 4 cm and 10 cm.

- The enlargement factor is $k = 10/4 = 2.5$.
- An original side 6 cm becomes $L = kl = 2.5(6) = 15$ cm.
- A new side 20 cm corresponds to $l = L/k = 20/2.5 = 8$ cm.
- Check all corresponding side ratios are the same.

■ Method check

The scale factor acts on every length. Check corresponding sides rather than matching whichever numbers happen to be given.

2 Practice

2.1 Corresponding sides are 3 cm and 12 cm. Find the scale factor from small to large. [2]

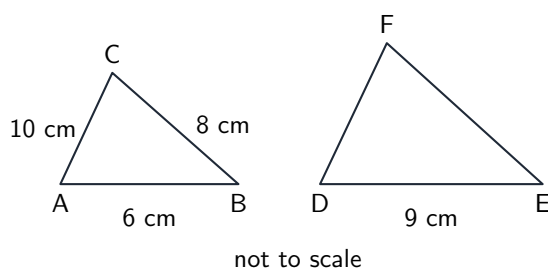
2.2 With scale factor 3, a 7 cm side becomes what length? [2]

2.3 A 24 cm side is in a larger shape of scale factor 4. Find the corresponding smaller side. [2]

2.4 Rectangles are 4×6 cm and 6×9 cm. Are they similar? Show the ratios. [2]

3 Exam-style questions

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

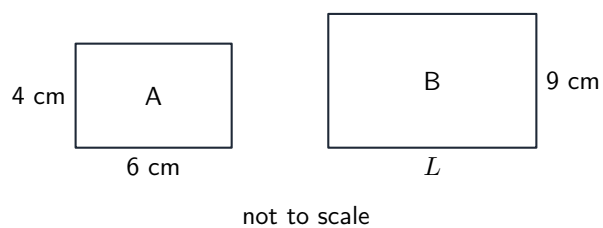


(a) Similar triangles ABC and DEF have corresponding vertices in order. $AB = 6\text{ cm}$, $BC = 8\text{ cm}$, $AC = 10\text{ cm}$ and $DE = 9\text{ cm}$. Find the scale factor. [2]

(b) Find EF and DF . [2]

(c) Find the perimeter of DEF and compare it with the perimeter of ABC . [2]

3.2 Similar rectangles A and B have corresponding shorter sides 4 cm and 9 cm. The longer side of A is 6 cm.



(a) Find the length scale factor from A to B and the longer side of B. [3]

(b) A third rectangle has sides 6 cm and 12 cm. Decide whether it is similar to A, supporting your decision with both side ratios. [3]

Solutions

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

2.1

- $k = 12/3 = \mathbf{4}$.

2.2

- $L = kl = 3(7) = \mathbf{21}$ cm.

2.3

- $l = L/k = 24/4 = \mathbf{6}$ cm.

2.4

- $6/4 = 1.5$ and $9/6 = 1.5$ with equal right angles, so **yes**.

3.1

(a)

- AB corresponds to DE: $k = 9/6 = \mathbf{1.5}$.

(b)

- $EF = 1.5(8) = \mathbf{12}$ cm; $DF = 1.5(10) = \mathbf{15}$ cm.

(c)

- $P_{DEF} = 9 + 12 + 15 = \mathbf{36}$ cm; $P_{ABC} = 24$ cm, so the perimeter is **1.5 times** as large.

3.2

(a)

- Use $k = \text{new/original} = 9/4 = \mathbf{2.25}$.
- Longer side $L = kl = 2.25(6) = \mathbf{13.5}$ cm.

(b)

- Shorter-side ratio $k_s = 6/4 = 1.5$.
- Longer-side ratio $k_l = 12/6 = 2$.
- They differ, so the third rectangle is **not similar** to A.