eClassroom

GCSE Mathematics

Similar Shapes

Questions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation

Worked Examples

[Fluency]

Two rectangles are similar. The first is 5 cm × 8 cm. The longer side of the second is 12 cm. Find the shorter side.

Scale factor = 12 ÷ 8 = 1.5

Shorter side = 5 × 1.5 = **7.5 cm**

[Reasoning]

Two similar triangles have areas 16 cm² and 25 cm². Find the ratio of their corresponding sides.

Area ratio = 16:25. Length ratio = √16:√25 = **4:5**

[Problem Solving]

A model car has scale 1:24. The model is 16 cm long. Find the real length in metres.

Real length = 16 × 24 = 384 cm = **3.84 m**

[Fluency]

1. Two similar triangles have sides in ratio 3:6.

Write down the scale factor from the smaller to the larger.

(1 mark)

[Fluency]

2. Two similar rectangles: the first measures 5 cm × 8 cm. The longer side of the second is 12 cm.

Find the shorter side of the second rectangle.

(2 marks)

[Fluency]

3. Two triangles have angles 40°, 60°, 80° and 40°, 60°, 80°.

Are they similar? Give a reason.

(1 mark)

[Fluency]

4. A shape is enlarged with scale factor 3. The original area is 12 cm².

Find the area of the enlarged shape.

(2 marks)

[Fluency]

5. A map has scale 1:50 000.

Two towns are 3 cm apart on the map. Find the real distance in km.

(2 marks)

[Reasoning]

6. Two similar cylinders have heights 4 cm and 10 cm.

The volume of the smaller cylinder is 48 cm^3.

Find the volume of the larger cylinder.

(3 marks)

[Reasoning]

7. Two similar triangles share a common vertex. The smaller triangle has sides 4 cm and x cm.

The larger has corresponding sides 10 cm and 15 cm.

Find x.

(2 marks)

[Reasoning]

8. Two similar shapes have a length scale factor of k.

Write down the ratio of their:

(a) Surface areas. (1) **(b)** Volumes. (1)

(2 marks)

[Problem Solving]

9. Two similar cones have slant heights of 6 cm and 9 cm.

The volume of the smaller cone is 80 cm^3.

Find the volume of the larger cone.

(3 marks)

[Problem Solving]

10. A photograph is 15 cm by 10 cm. It is enlarged so the longer side becomes 24 cm.

(a) Find the new shorter side. (2)

(b) Explain why the original and enlarged photographs are similar. (1)

(3 marks)

Section B — Higher

Worked Examples

[Fluency]

Two similar cylinders have volume ratio 8:27. Find the ratio of their heights and surface areas.

Volume ratio $k^3=8:27 \rightarrow k=2:3$ (length ratio)

Height ratio = **2:3**; SA ratio = $2^2:3^2$ = **4:9**

[Reasoning]

Two similar containers have surface areas 120 cm² and 270 cm². The smaller holds 2 litres. Find the capacity of the larger.

SA ratio=120:270=4:9 → length ratio=2:3 → volume ratio=8:27

Volume of larger = 2×27/8 = **6.75 litres**

[Problem Solving]

Show that triangles ABC and ADE are similar if DE is parallel to BC.

Angle A is common. ∠ADE=∠ABC (corresponding angles, DE■BC).

By AA, triangles ABC and ADE are similar. ✓

[Fluency]

1. Two similar containers have volumes 8 cm³ and 64 cm³.

(a) Find the ratio of their lengths. (1)

(b) Find the ratio of their surface areas. (1)

(2 marks)

[Fluency]

2. The volume ratio of two similar shapes is 27:64.

(a) Find the length ratio. (1)

(b) Find the area ratio. (1)

(2 marks)

[Fluency]

3. Two similar triangles have sides in ratio 3:(x+1) and 5:(x+3).

Find the value of x.

(3 marks)

[Reasoning]

4. Two similar containers have surface areas 120 cm² and 270 cm².
The smaller container has capacity 2 litres.
Find the capacity of the larger container.

(4 marks)

[Reasoning]

5. A rectangle has length:width = 5:3. It is enlarged so that the perimeter is 64 cm.
Find the dimensions of the enlarged rectangle.

(3 marks)

[Reasoning]

6. Two similar pyramids have heights in ratio 2:5.
The larger pyramid has volume 250 cm³.
Find the volume of the smaller pyramid.

(3 marks)

[Problem Solving]

7. Three similar triangles are nested so their longest sides are 2 cm, 4 cm and 6 cm.
The area of the smallest is A cm².
Find the shaded area between the 2nd and 3rd triangles in terms of A.

(3 marks)

[Problem Solving]

8. A map has scale 1:25 000.
Two towns are 8.4 cm apart on the map.
Find the real distance in km.

(2 marks)

[Problem Solving]

9. A sphere has volume 288π cm³. It is enlarged with scale factor 3/2.
Find the volume of the enlarged sphere. Give your answer in terms of π.

(3 marks)

[Problem Solving]

10. Two similar trapezoids have areas in ratio 9:25.

(a) Find the ratio of their perimeters. (1)

(b) The perimeter of the smaller is 30 cm. Find the perimeter of the larger. (2)

(3 marks)