

Similar Shapes Area Volume

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Two similar triangles have corresponding sides in the ratio 2 : 3. The smaller has area 20 cm². Find the area of the larger.

Step 1 · Length scale factor

$$k = 3/2 = 1.5$$

Step 2 · Area scale factor

$$k^2 = 2.25$$

Step 3 · Multiply

$$20 \times 2.25 = 45 \text{ cm}^2$$

Answer: 45 cm²

Check: Area ratio 4 : 9 = 20 : 45 ✓

2. Now try one with the steps

Two similar jugs are 8 cm and 12 cm tall. The small jug holds 320 ml. How much does the large jug hold?

Step 1 · $k = 12 \div 8$

Step 2 · Capacity is a volume: k^3

Step 3 · Multiply

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. The length scale factor between two similar shapes is 3. What is the area scale factor? [1]

2. The length scale factor between two similar solids is 3. What is the volume scale factor? [1]

3. The area scale factor is 16. What is the length scale factor? [1]

4. The volume scale factor is 125. What is the length scale factor? [1]

5. A rectangle of area 12 cm^2 is enlarged by length scale factor 2. Find the new area, in cm^2 . [1]

6. Two similar shapes have areas 10 cm^2 and 90 cm^2 . A side of the smaller is 4 cm. Find the matching side of the larger, in cm. [2]

7. A solid has volume 40 cm^3 . A similar solid is 3 times Find its volume, in cm^3 . [2]

8. Two similar solids have volumes 8 cm^3 and 125 cm^3 . Find the ratio of their lengths. [2]

9. For the solids in question 8, find the ratio of their surface areas. [2]

10. Two similar cans are 10 cm and 15 cm tall. The smaller has surface area 120 cm^2 . Find the surface area of the larger, in cm^2 . [2]

11. Two similar statues are 20 cm and 50 cm tall and made of the same metal. The smaller has mass 1.6 kg. Find the mass of the larger, in kg. [3]

12. Two similar cones have volumes 54 cm^3 and 250 cm^3 . The smaller is 6 cm tall. How tall is the larger, in cm? [3]

13. Two similar solids have surface areas in the ratio 4 : 9. The larger has volume 540 cm^3 . Find the volume of the smaller, in cm^3 . [3]

14. A map has scale 1 : 50 000. A lake covers 3 cm^2 on the map. Find its real area, in km^2 . [3]

15. A model car is built to a scale of 1 : 20. The real car needs 12 m^2 of paint. How much paint area does the model need, in cm^2 ? [3]

4. Before you hand it in

Lengths doubled, so the area doubled

Area factor = k^2 . Doubling lengths multiplies the area by 4.

Volumes 8 : 125 $\rightarrow$ length ratio 8 : 125 or $\sqrt[3]{8}$: $\sqrt[3]{125}$

Volume factor = k^3 , so take the CUBE root: 2 : 5.

Area ratio 4 : 9, so volume ratio 16 : 81

Go back to lengths first: $k = 2 : 3$, then cube: 8 : 27.

Map area: $3 \text{ cm}^2 \times 50\,000 = 150\,000 \text{ cm}^2$

Square the length factor: 1 cm^2 on the map is $50\,000^2 \text{ cm}^2 = 0.25 \text{ km}^2$, so 3 cm^2 is 0.75 km^2 .