

# Similarity

Q1. The length ratio between two similar solids is 2 : 5.

**a** What is the area ratio between the solids?

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**b** What is the volume ratio between the solids?

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Q2. The length ratio between two similar solids is 4 : 7.

**a** What is the area ratio between the solids?

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**b** What is the volume ratio between the solids?

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Q3. The volume ratio between two similar solids is 54 : 250.

**a** What is the area ratio between the solids?

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**b** What is the length ratio between the solids?

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Q4. The area ratio between two similar solids is 32 : 98.

**a** What is the length ratio between the solids?

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**b** What is the volume ratio between the solids?

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Q5. The length ratio between two similar solids is 2 : 3.

**a** What is the area ratio between the solids?

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**b** What is the mass ratio between the solids?

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Q6. A shape has an area of  $15 \text{ cm}^2$ . What is the area of a similar shape whose lengths are three times the corresponding lengths of the first shape?

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Q7. A toy brick has a surface area of  $14 \text{ cm}^2$ . What would be the surface area of a similar toy brick whose lengths are?

**a** twice the corresponding lengths of the first brick?

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**b** three times the corresponding lengths of the first brick?

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Q8. A sheepskin rug covers  $12 \text{ ft}^2$  of floor. What area would be covered by rugs with these lengths?

**a** twice the corresponding lengths of the first rug

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**b** half the corresponding lengths of the first rug

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Q9. A brick has a volume of  $300 \text{ cm}^3$ . What would be the volume of a similar brick whose lengths are

**a** twice the corresponding lengths of the first brick?

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**b** three times the corresponding lengths of the first brick?

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Q10. Thirty cubic centimetres of clay were used to make a model sheep. What volume of clay would be needed to make a similar model sheep with these lengths?

**a** five times the corresponding lengths of the first model

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**b** one half of the corresponding lengths of the first model

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Q11. A can of paint, 6 cm high, holds a half a litre of paint. How much paint would go into a similar can which is 12 cm high?

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Q12. It takes 1 litre of paint to fill a can of height 10 cm. How much paint does it take to fill a similar can of height 45 cm?

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Q13. It takes 1.5 litres of paint to fill a can of height 12 cm.

**a** How much paint does it take to fill a similar can whose dimensions are  $1 \frac{1}{2}$  times the corresponding dimensions of the first can?

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**b** Which of the information given is not needed to be able to answer part a?

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Q14. To make a certain dress, it took  $2.4 \text{ m}^2$  of material. How much material would a similar dress need if its lengths were

**a** 1.5 times the corresponding lengths of the first dress?

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**b** three quarters of the corresponding lengths of the first dress?

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Q15. A model statue is 10 cm high and has a volume of  $100 \text{ cm}^3$ . The real statue is 2.4 m high. What is the volume of the real statue? Give your answer in  $\text{m}^3$ .

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Q16. A small can of paint costs 75p. What is the cost of a larger similar can whose circumference is twice that of the smaller can? Assume that the cost is based only on the volume of paint in the can.

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Q17. A triangle has sides of 3, 4 and 5 cm. Its area is  $6 \text{ cm}^2$ . How long are the sides of a similar triangle that has an area of  $24 \text{ cm}^2$ ?

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Q18. A ball with a radius of  $r$  cm has a volume of  $10 \text{ cm}^3$ . What is the radius of a ball with a volume of  $270 \text{ cm}^3$ ?

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Q19. Calculate the volume of each of these spheres. Give your answers in terms of  $\pi$ .

**a** Radius 3 cm

**b** Radius 6 cm

**c** Diameter 20 cm

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Q20. Calculate the surface area of each of these spheres. Give your answers in terms of  $\pi$ .

**a** Radius 3 cm

**b** Radius 5 cm

**c** Diameter 14 cm

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Q21. Calculate the volume and the surface area of a sphere with a diameter of 50 cm.

A sphere fits exactly into an open cubical box of side 25 cm. Calculate the following.

**a** the surface area of the sphere

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**b** the volume of the sphere

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Q22. A metal sphere of radius 15 cm is melted down and recast into a solid cylinder of radius 6 cm. Calculate the height of the cylinder.

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Q23. Lead has a density of  $11.35 \text{ g/cm}^3$ . Calculate the maximum number of shot (spherical lead pellets) of radius 1.5 mm which can be made from 1 kg of lead.

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Q24. Calculate, correct to one decimal place, the radius of a sphere  
a whose surface area is  $150 \text{ cm}^2$

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b whose volume is  $150 \text{ cm}^3$ .

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Q25. A firm produces three sizes of similarly shaped labels for its products. Their areas are  $150 \text{ cm}^2$ ,  $250 \text{ cm}^2$  and  $400 \text{ cm}^2$ . The  $250 \text{ cm}^2$  label just fits around a can of height 8 cm. Find the heights of similar cans around which the other two labels would just fit.

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Q26. A firm makes similar gift boxes in three different sizes: small, medium and large. The areas of their lids are as follows. small:  $30 \text{ cm}^2$ , medium:  $50 \text{ cm}^2$ , large:  $75 \text{ cm}^2$

The medium box is 5.5 cm high. Find the heights of the other two sizes.

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Q27. A cone, height 8 cm, can be made from a piece of card with an area of  $140 \text{ cm}^2$ . What is the height of a similar cone made from a similar piece of card with an area of  $200 \text{ cm}^2$ ?

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Q28. It takes 5.6 litres of paint to paint a chimney which is 3 m high. What is the tallest similar chimney that can be painted with 8 litres of paint?

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Q29. A man takes 45 minutes to mow a lawn 25 m long. How long would it take him to mow a similar lawn only 15 m long?

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Q30. A piece of card,  $1200 \text{ cm}^2$  in area, will make a tube 13 cm long. What is the length of a similar tube made from a similar piece of card with an area of  $500 \text{ cm}^2$ ?

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