



Area and volume scale factors

About 50 minutes Calculator allowed 46 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** Key Stage 3 [2 marks]
- Triangle ABC is similar to triangle DEF , with A matching D , B matching E and C matching F . $AB = 6$ cm, $DE = 15$ cm and $EF = 10$ cm. Find BC .
- Answer

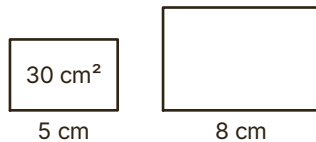
- Answer
- A3** Key Stage 3 [2 marks] **A4** Key Stage 3 [2 marks]
- Expand and simplify $4(x - 9) - 3(x + 3)$.
- Answer

B Examples, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

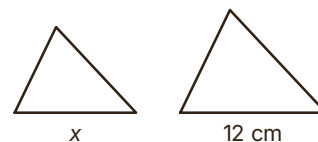
These two rectangles are similar. Work out the area of the larger rectangle.



Not drawn accurately

Hint Find the length scale factor, then square it for area.

- B1** [3 marks] These two triangles are similar. Their areas are 45 cm^2 and 80 cm^2 . Work out the length x .

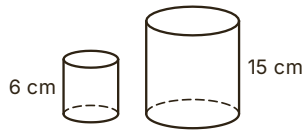


Not drawn accurately

Answer

EXAMPLE 2

These two cylinders are similar. The smaller has a volume of 40 cm^3 . Work out the volume of the larger.

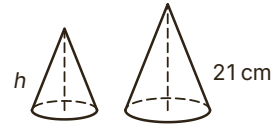


Not drawn accurately

Hint Find the length scale factor, then cube it for volume.

B2 These two cones are similar. [3 marks]

Their volumes are 192 cm^3 and 648 cm^3 . Work out the height h of the smaller cone.



Not drawn accurately

Answer

c Practice

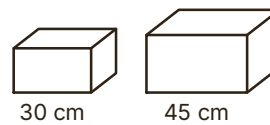
C1 Two similar candles are made of the same wax. The smaller has a mass of 216 g. Work out the mass of the larger, in grams. [3 marks]



Not drawn accurately

Answer

C2 Two similar boxes are painted all over. It takes 0.4 litres of paint to paint the smaller box. How much paint is needed for the larger? [2 marks]



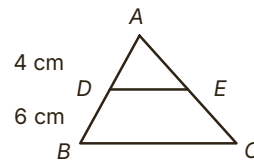
Not drawn accurately

Answer

C3 Two similar solids have volumes in the ratio 8 : 125. Write down the ratio of their surface areas. [2 marks]

Answer

C4 DE is parallel to BC . The area of triangle ABC is 75 cm^2 . Work out the area of triangle ADE . [3 marks]



Not drawn accurately

Answer

C5 A map has a scale of 1 : 25 000. A lake has an area of 6 cm^2 on the map. Work out the real area of the lake, in km^2 . [3 marks]

Answer

C6 Two similar solids have volumes 80 cm^3 and 270 cm^3 . The larger has a surface area of 207 cm^2 . Work out the surface area of the smaller. [3 marks]

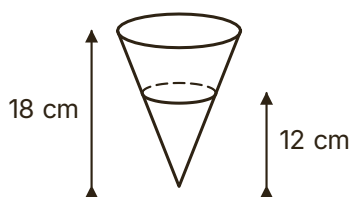
Answer

D Exam-style questions

D1 A model van is made to a scale of 1 : 20. The real van's load space is 1.6 m^3 . Tom says, "The model's load space is $1.6 \div 20 = 0.08 \text{ m}^3$." [4 marks]

Explain why Tom is wrong, and work out the model's load space in cm^3 .

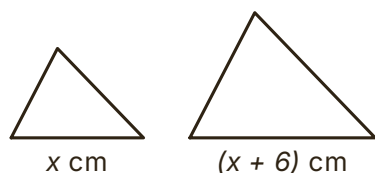
D2 A cone-shaped glass, point down, is 18 cm deep and holds 810 cm^3 when full. It has water 12 cm deep in it. How much more water will fill it? You must show your working. [4 marks]



Not drawn accurately

Answer

D3 These similar triangles have areas 18 cm^2 and 50 cm^2 . Work out x . You must show your working. [4 marks]



Not drawn accurately

Answer

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 A solid is enlarged so that its volume goes up by 72.8%. By what percentage does its surface area go up? [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write the volume change as a multiplier.
Hint 2 Volume factor 1.728; find the length factor.
Hint 3 Length factor $\sqrt[3]{1.728} = 1.2$; square it.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- | | | | |
|---------------------------------|-----------------------|-----------------------|-----------------------|
| I can scale an area by k^2 . | ☐ | ☐ | ☐ |
| I can scale a volume by k^3 . | ☐ | ☐ | ☐ |
| I can work back to a length. | ☐ | ☐ | ☐ |