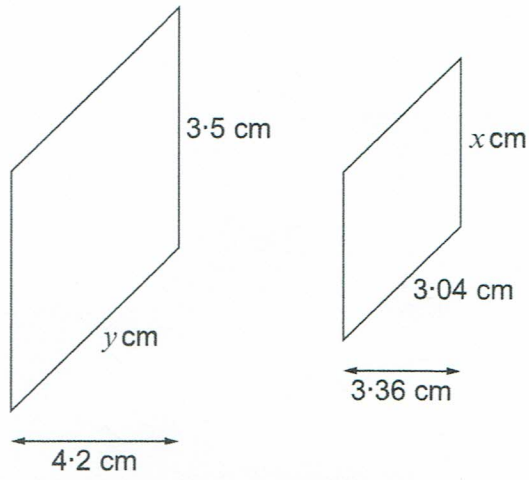
Similar Shapes : Lengths, Areas & Volumes

Examiner only

7. The diagram shows two similar shapes.



Diagrams not drawn to scale

Calculate x and y. [4]

Scale Factor = $\frac{4.2}{3.36} = \frac{7}{6}$ $\frac{5}{4} = 1.25$

x is a reduction of 3·5, $3.5 \div \frac{7}{6} =$ 2·8cm (÷ 1.25)

y is an enlargement of 3·04, $3.04 \times \frac{7}{6} =$ 3·8 cm (× 1.25)

$x =$ 2·8 cm

$y =$ 3·8 cm

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13. Dewi's company is planning a new logo.
The diagram shows two similar versions of the planned logo.

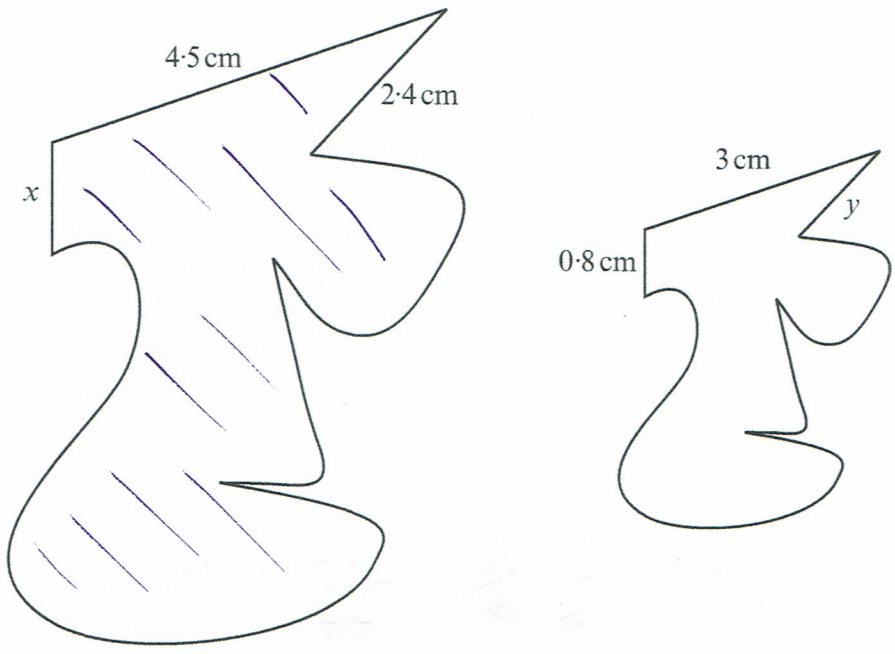

Diagram not drawn to scale

(a) Calculate the lengths of the sides marked x and y.

Scale Factor = 4.5 ÷ 3 = 1.5

x is an enlargement = 0.8 × 1.5 = 1.2cm

y is a reduction = 2.5 ÷ 1.5 = 5/3 cm

$x =$ 1.2 cm

$y =$ 1.6 cm

[4]

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(b) The smaller of the two versions of the logo costs £3.40 to paint with metallic gold paint. Calculate the cost of painting the larger version of the logo with the same metallic gold paint.

for area scale factor becomes $1.5^2 = 2.25$

Cost of painting larger logo = 3.40×2.25
= £7.65

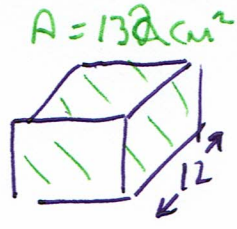
[3]

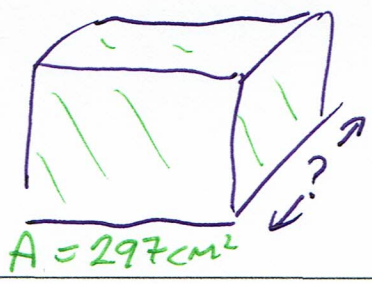
13. A company manufactures two different sized boxes.
Both boxes are cuboids and are similar in shape.
The total surface area of the smaller box is 132 cm^2 and the length of its longest edge is 12 cm.
The total surface area of the larger box is 297 cm^2.
Calculate the length of the longest edge of the larger box.

Scale factor for area = $297 \div 132 = 2.25$
scale factor for length = $\sqrt{2.25} = 1.5$

So length on larger box = $12 \times 1.5 = 18$ cm

[4]





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12. Tara has two **similar** star badges, as shown below.
The front of each badge is coated in gold paint.

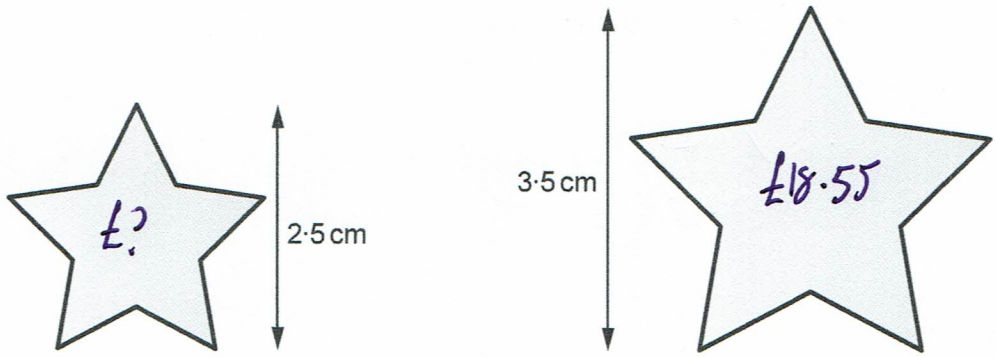

Diagram not drawn to scale

The value of the gold paint on the larger star badge is £18.55.
Calculate the value of the gold paint on the smaller star badge.
You must show all your working. [4]

Scale factor of length = $\frac{3.5}{2.5}$ = 1.4

Scale factor of area = 1.4^2 = 1.96

Cost of paint for smaller star = 18.55 ÷ 1.96

= £9.46

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16. The diagram shows two **similar** shapes.

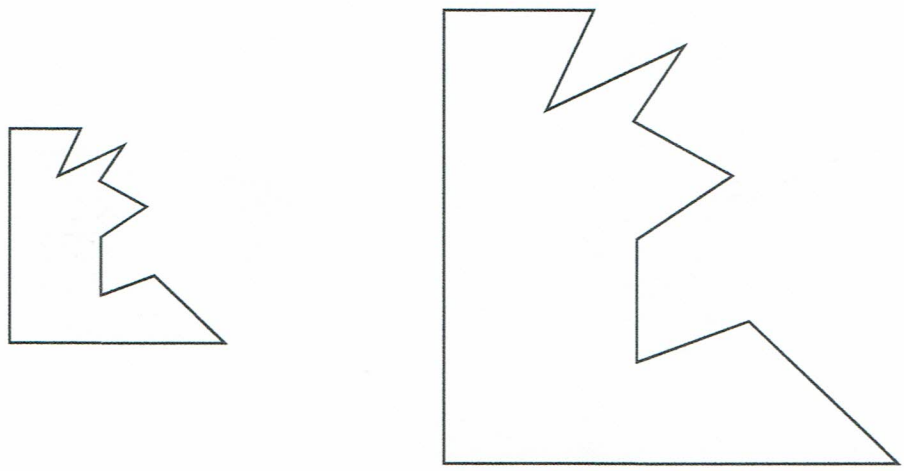

Diagram not drawn to scale.

Each length on the larger shape is three times the corresponding length on the smaller shape.
The area of the larger shape is 90 cm^2. Find the area of the smaller shape.

Scale factor for length = 3

Scale factor for area = $3^2 = 9$

Area of smaller shape = $90 \div 9 = 10\ cm^2$

[3]

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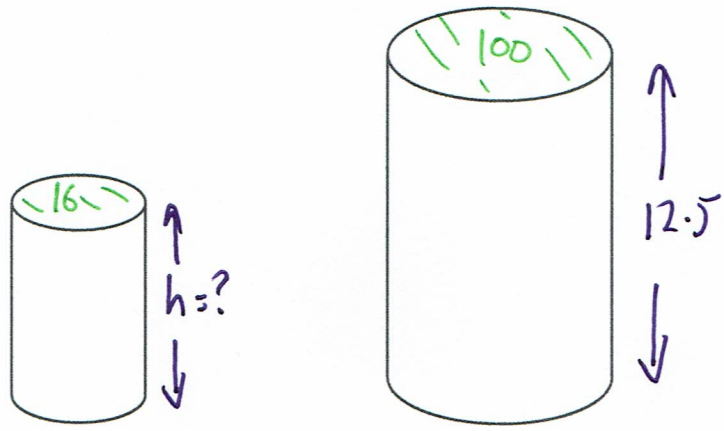
19. The diagram shows two similar cylinders.



Diagrams not drawn to scale.

The areas of the ends of the smaller and larger cylinders are 16 cm^2 and 100 cm^2 respectively. Given that the height of the larger cylinder is 12·5 cm, find the height of the smaller cylinder.

Area scale factor $= \frac{100}{16}$

$\therefore$ Length scale factor $= \sqrt{\frac{100}{16}} = \frac{10}{4} = 2.5$

[3]

Smaller height $= 12.5 \div 2.5$

$= 125 \div 25$

$= 5$ cm

17. The diagram shows two **similar** tetrahedrons.

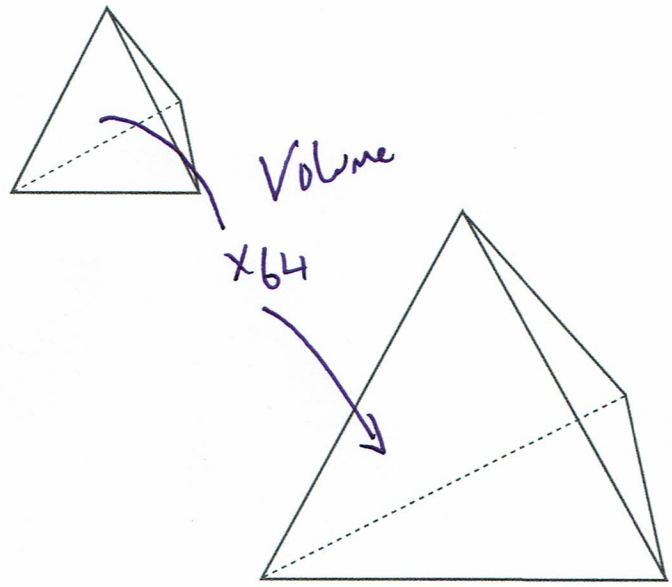


Diagram not drawn to scale.

The lengths of an edge of the larger tetrahedron is four times the length of the corresponding edge of the smaller tetrahedron. The volume of the smaller tetrahedron is 3·8 cm^3. Calculate the volume of the larger tetrahedron.

length scale factor = 4

Volume scale factor = 4^3 = 16 x 4 = 64

Volume of larger tetrahedron = 3·8 x 64 = 243·2 cm^3

[3]

16
x4
64
2

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15. Two **similar** rugby balls are shown below.

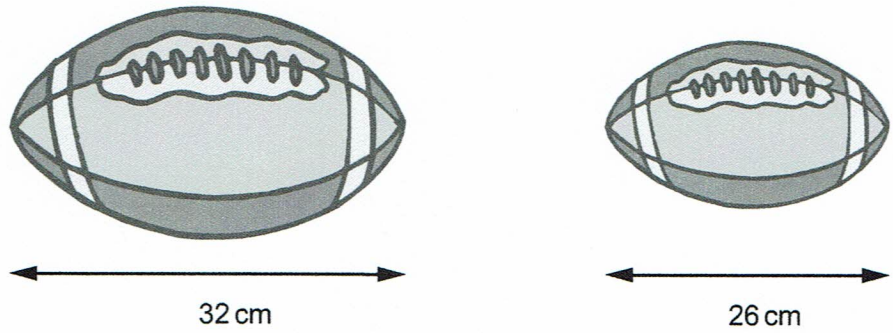

Diagram not drawn to scale

The volume of the larger rugby ball is 500 cm^3.
Calculate the volume of the smaller rugby ball. [3]

length scale factor $= 32 \div 26 = \frac{16}{13}$

Volume scale factor $= \left(\frac{16}{13}\right)^3 = \frac{4096}{2197}$

Volume of smaller ball $= 500 \div \left(\frac{4096}{2197}\right) = 268.2\,cm^3$