

Area and Volume Scale Factors *extend*

1



Two similar shapes have areas of 16 cm^2 and 25 cm^2 . A length on the smaller shape is $x \text{ cm}$. The matching length on the larger shape is $(x + 3) \text{ cm}$. Find x .

$$\text{length scale factor} = \sqrt{\frac{25}{16}} = \frac{5}{4}$$

$$5x = 4(x + 3), x = 12$$

$$x = 12$$

Answer

2



Two statues are similar and made of the same metal. The smaller one has a mass of 2.4 kg . The larger one has 9 times the surface area. Find the mass of the larger statue.

$$\text{length scale factor} = \sqrt{9} = 3$$

$$\text{mass: } 2.4 \times 3^3 = 2.4 \times 27$$

$$64.8 \text{ kg}$$

Answer

3



Two paint tins are similar. The larger tin holds 3.375 times as much paint. The smaller tin is 12 cm tall and its label has an area of 60 cm^2 . Find the height of the larger tin and the area of its label.

$$\text{length scale factor} = \sqrt[3]{3.375} = 1.5$$

$$12 \times 1.5 = 18, 60 \times 1.5^2 = 135$$

$$18 \text{ cm}, 135 \text{ cm}^2$$

Answer

4



A3 and A4 sheets of paper are similar, and an A3 sheet has twice the area of an A4 sheet. An A4 sheet is 297 mm long. Find the length scale factor from A4 to A3 as a surd, and the length of an A3 sheet to the nearest mm.

$$\text{area} \times 2, \text{ so length} \times \sqrt{2}$$

$$297 \times \sqrt{2} = 420.0$$

$$\sqrt{2}, 420 \text{ mm}$$

Answer

5



A solid is enlarged to a similar solid with a volume 33.1% greater. By what percentage is its surface area greater?

$$\text{volume} \times 1.331, \text{ length} \times \sqrt[3]{1.331} = 1.1$$

$$\text{area} \times 1.1^2 = 1.21$$

$$21\%$$

Answer

6



Solids A , B and C are similar. The surface areas of A and B are in the ratio $4 : 9$. The volumes of B and C are in the ratio $27 : 64$. The volume of A is 80 cm^3 . Find the volume of C .

$$\text{lengths } A : B = 2 : 3, B : C = 3 : 4$$

$$A : C = 1 : 2, \text{ so } 80 \times 2^3$$

$$640 \text{ cm}^3$$

Answer

7



A map has a scale of $1 : 25\,000$. A lake covers 3.2 cm^2 on the map. Find the real area of the lake in km^2 .

$$1 \text{ cm on the map is } 0.25 \text{ km}$$

$$3.2 \times 0.25^2 = 3.2 \times 0.0625$$

$$0.2 \text{ km}^2$$

Answer

8



Two similar solids have surface areas A_1 and A_2 and volumes V_1 and V_2 .

Prove that $(\frac{V_1}{V_2})^2 = (\frac{A_1}{A_2})^3$

$$\frac{A_1}{A_2} = \frac{1}{k^2}, \frac{V_1}{V_2} = \frac{1}{k^3}$$

$$(\frac{1}{k^3})^2 = \frac{1}{k^6} = (\frac{1}{k^2})^3$$

$$\text{both equal } \frac{1}{k^6}$$

Proof