

Similarity - Lesson 3

Similar Shapes (Finding k)

LI

- Solve more complex problems involving similar shapes.

SC

- Find linear scale factor (k) by square or cube rooting.

When told the $ASF(k^2)$, square root it to get k

When told the $VSF(k^3)$, cube root it to get k

Reminder

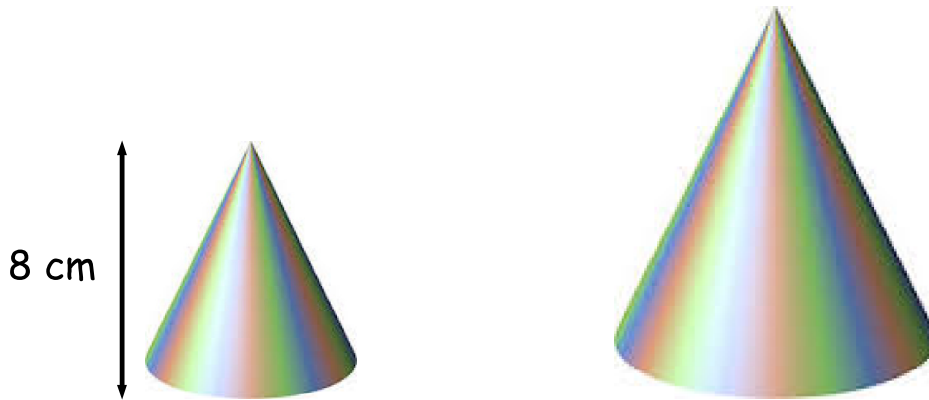
$$L_{\text{NEW}} = k \times L_{\text{OLD}}$$

$$A_{\text{NEW}} = k^2 \times A_{\text{OLD}}$$

$$V_{\text{NEW}} = k^3 \times V_{\text{OLD}}$$

Example 1

The following two cones are similar in shape :



If the smaller cone is made from 180 cm^2 of paper and the larger one from 290 cm^2 of paper, find the height of the larger cone (to 2 d.p.).

Enlargement

$$\text{ASF} = k^2 = \frac{290}{180} \approx 1.611\ 111\ \dots$$

$$k = \sqrt{1.611\ 111\ \dots} \approx 1.269\ \dots$$

$$L_{\text{NEW}} = k \times L_{\text{OLD}}$$

$$L_{\text{NEW}} = 1.269\ \dots \times 8$$

$$L_{\text{NEW}} = 10.154\ \dots$$

$$\therefore L_{\text{NEW}} = 10.15 \text{ cm (2 d.p.)}$$

Example 2

Two tins of paint are similar in shape, as are their labels. They hold 1.4 litres and 2 litres, respectively.



The area of the label on the large tin is 101 cm^2 . Calculate the area of the label on the small tin (to 1 d.p.).

Reduction

$$\text{VSF} = k^3 = \frac{1.4}{2} = 0.7$$

$$k = \sqrt[3]{0.7} \approx 0.887 \dots$$

$$k^2 = (0.887 \dots)^2 \approx 0.788 \dots$$

$$A_{\text{NEW}} = k^2 \times A_{\text{OLD}}$$

$$A_{\text{NEW}} = 0.788 \dots \times 101$$

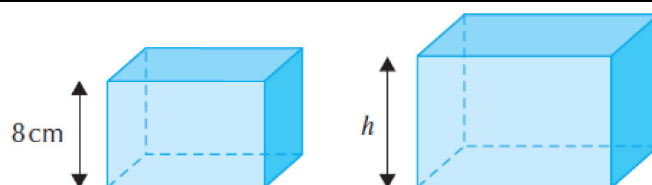
$$A_{\text{NEW}} = 79.62 \dots$$

$$\therefore A_{\text{NEW}} = 79.6 \text{ cm}^2 \text{ (1 d.p.)}$$

Questions

- 1 A piece of card, 800 cm^2 in area, will make a tube 9 cm long. What is the length of a similar tube made from a similar piece of card with an area of 1000 cm^2 ? Give your answer to 1 decimal place.

- 2 The containers are similar-shaped.

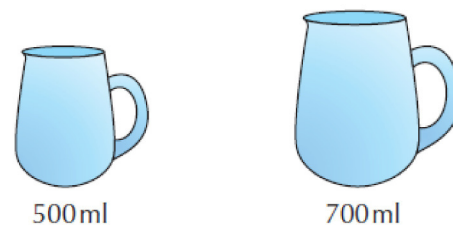


The total surface area of the small box is 400 cm^2 . The large box has a surface area of 900 cm^2 . Calculate its height, h . Give your answer to 1 decimal place.

- 3 The volume of two similar-shaped canisters are 300 ml and 450 ml, respectively. The height of the small canister is 12 cm. Calculate the height of the large canister. Give your answer to 1 decimal place.

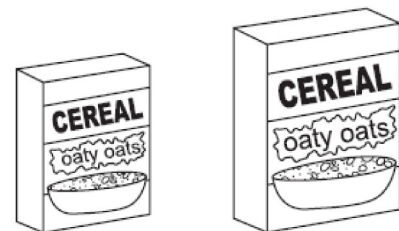
- 4 Two water jugs are similar-shaped. They hold 500 ml and 700 ml, respectively.

The area of the base of the large jug is 35 cm^2 . Calculate the area of the base of the small jug. Give your answer to 1 decimal place.



- 5 Two cereal boxes are similar in shape.

The areas of the logos on the front of the box are 25 cm^2 and 30 cm^2 , respectively. The volume of the large box is 1200 cm^3 . Calculate the volume of the small box. Give your answer to 1 decimal place.



Answers

1 length = 10.1cm

2 $h = 12.0\text{cm}$

3 height = 13.7cm

4 area = 28.0cm^2

5 volume = 912.9cm^3