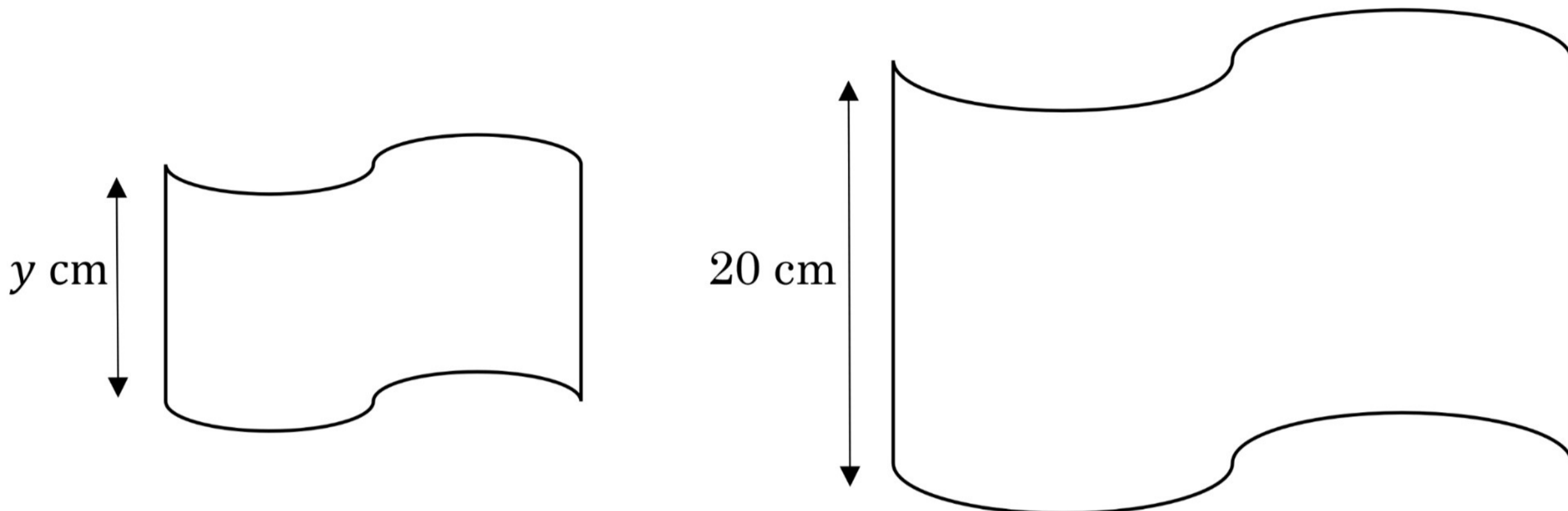


Similar Shapes Area & Volume Exam Practice



Q1. The following two shapes are similar. The areas of the shapes are 45 cm^2 and 281.25 cm^2 . Find the length marked y .



$$\bullet \text{ area scale factor} = \frac{281.25}{45}$$

$$= 6.25$$

$$\Rightarrow \text{length scale factor} = \sqrt{6.25}$$

$$= 2.5$$

$$\bullet \quad y \times 2.5 = 20$$

$$\Rightarrow y = \frac{20}{2.5}$$

$$\Rightarrow y = 8$$

Answer: 8 cm

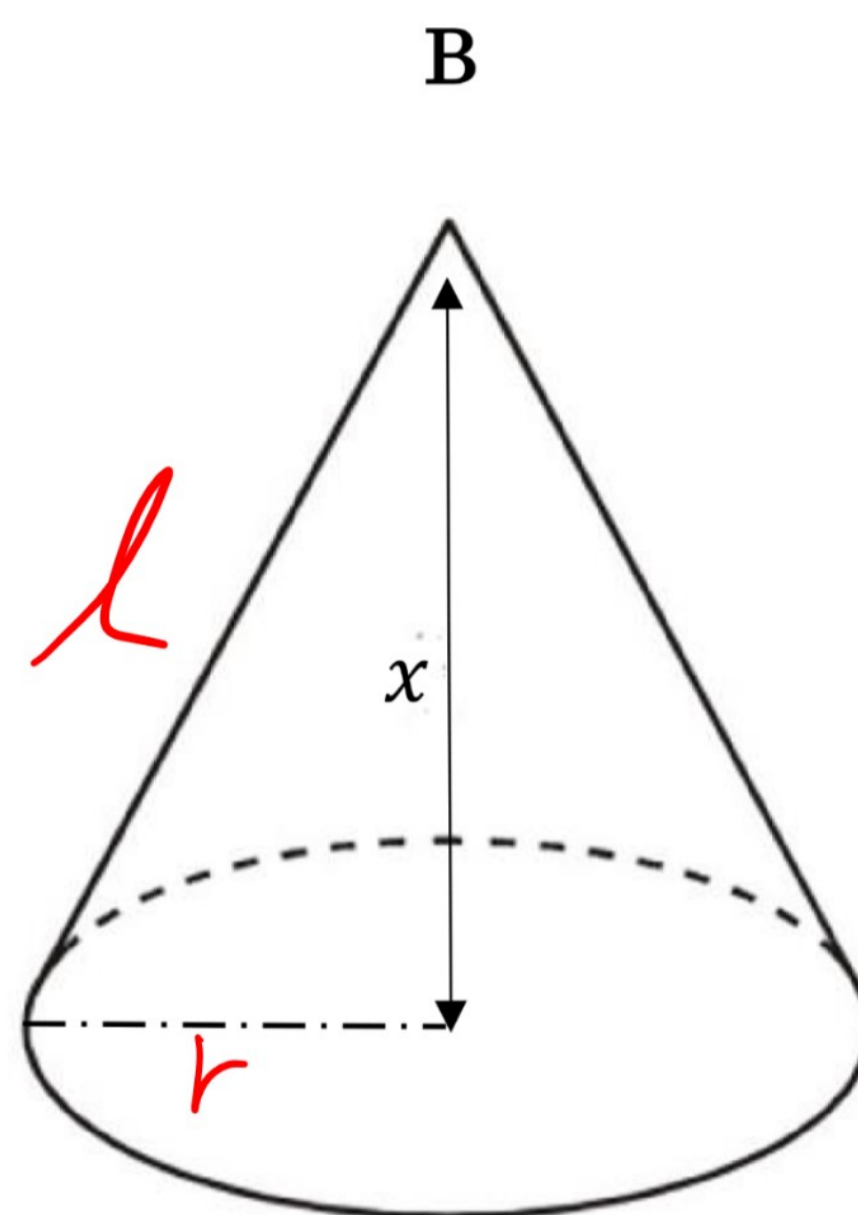
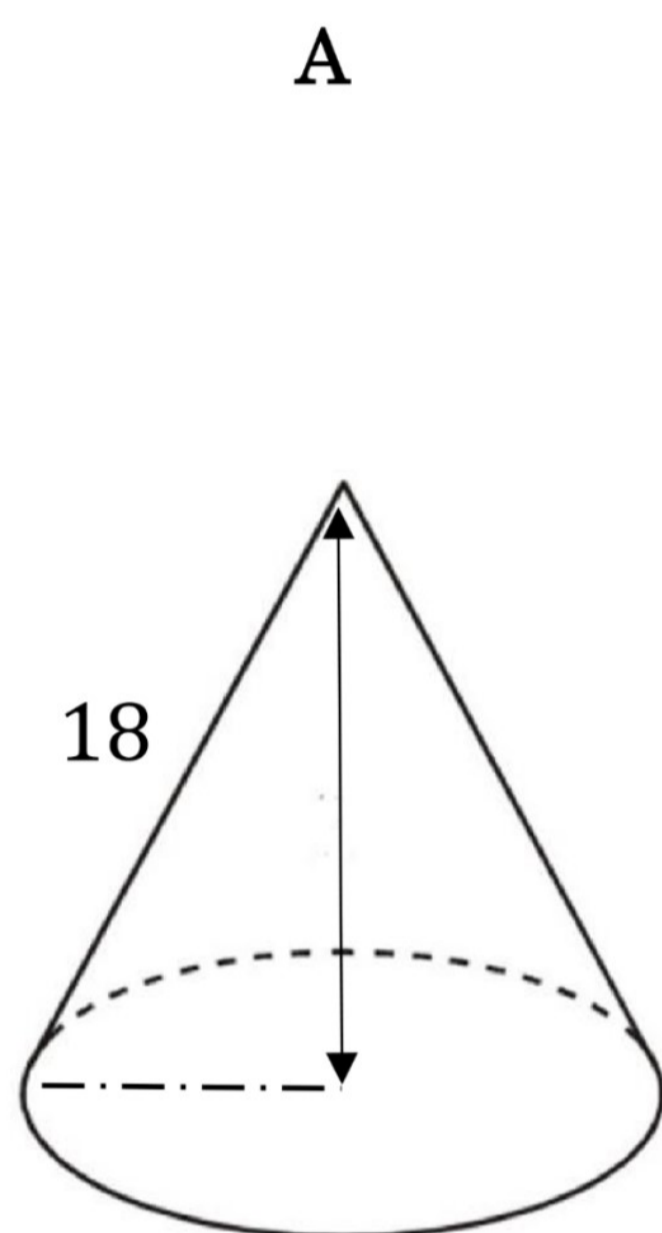
(3 marks)



Q2. Two shapes, A and B shown below, are similar, and the radius and the perpendicular height are in the ratio 3 : 5.

The volume of the shapes are 240 cm^3 and 414.72 cm^3 .

• Surface area of a cone = $\frac{1}{3} \pi r l$



a) Find the length marked x

Vol. scale factor = $\frac{414.72}{240}$
 $= 1.728$

\therefore length scale factor = $\sqrt[3]{1.728}$
 $= 1.2$ Answer: 21.6 cm
(4 marks)

$x = 18 \times 1.2 \Rightarrow x = 21.6$

b) Find the surface area of shape B to 1 decimal place.

$3:5 \Rightarrow r = \frac{21.6}{5} \times 3 \Rightarrow r = 12.96$
 $\Rightarrow l = \sqrt{12.96^2 + 21.6^2} = 24.81$ Answer: 336.8 cm^2
 $S.A = \frac{1}{3} \pi r l \Rightarrow S.A. = 336.76...$ (2 marks)



Q3. Three 3-d shapes are similar and can be described as follows:

The lengths of P to the lengths of Q are 3 : 2

The lengths of Q to the lengths of R are 6 : 11.

a) Find the ratio of the volume of shape P to shape R

P Q R

3 : 2

6 : 11

9 : 6 : 11

is the length ratios of P, Q, R

∴ volume ratios are $9^3 : 6^3 : 11^3$ (729 : 216 : 1331)

So $729^P : 1331^R$

Answer: 729 : 1331

(2 marks)

b) The volume of shape R is 450 cm³. Find the volume of shape Q to 1 d.p.

from (a), vol. scale factor of R to Q is 1331 : 216

1331 : 216

450 V_Q

$$\Rightarrow V_Q = \frac{450}{1331} \times 216$$

$$= 73.02\dots$$

Answer: 73.0 cm³

(2 marks)



Q4. Let S_1, S_2, S_3, \dots be similar 3d shapes. The volume of S_1 is 500 cm^3 .

Let A_1, A_2, A_3, \dots be the surface of these shapes.

Suppose that the surface area of $\frac{A_{k+1}}{A_k} = c$ where c is a constant for all k .

Given that the surface area of A_1 is 80 cm^2 and the surface area of A_7 is 911.25 , find the volume of shape S_{12} to 1 decimal place.

• from the information,

$$A_1 \times k = A_2, A_2 = k \times A_3, \dots, A_6 \times k = A_7$$

$$\Rightarrow A_1 \times k^6 = A_7$$

$$\Rightarrow 80 \times k^6 = 911.25$$

$$\Rightarrow k^6 = \frac{911.25}{80}$$

$$\Rightarrow k = (11.390625)^{1/6}$$

$$\Rightarrow k = 1.5, \text{ or } \frac{3}{2}$$

• \therefore area scale factor between each pair of successive shapes is $\frac{3}{2}$

\Rightarrow length scale factor between each pair of successive shapes is $\left(\frac{3}{2}\right)^{1/2}$

\Rightarrow volume scale factor between each pair of successive shapes is $\left(\frac{3}{2}\right)^{3/2} (= \alpha)$

Answer: 402231.2 cm³

$$\therefore \text{volume of } S_{12} = \text{vol } S_1 \times \alpha^{11}$$

(5 marks)

$$= 500 \times \left(\frac{3}{2}\right)^{33/2} \therefore 402231.2 \text{ cm}^3$$