

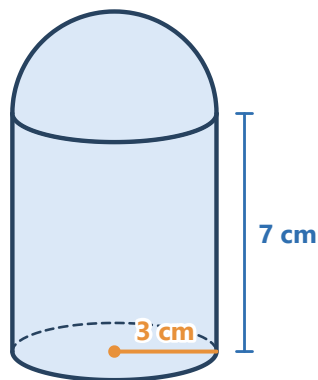
GCSE Maths: Composite solids, frustums and similar solids (Higher): answers

GCSE Maths - Volume, Surface Area and 3D Shapes - Higher - Lesson 19.10

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch19-volume-surface-area-3d/higher/composite-solids-frustums-and-similar-solids/

Exercise 19L Composite solids and working backwards Non-calculator

- 1 The solid is a cylinder with a hemisphere on top. The cylinder has radius 3 cm and height 7 cm. Work out, in terms of π , (a) the volume and (b) the total surface area.



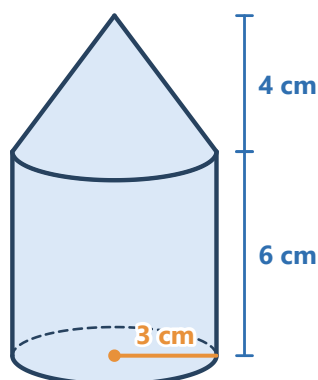
- (a) Volume

Answer: $81\pi \text{ cm}^3$

- (b) Total surface area

Answer: $69\pi \text{ cm}^2$

- 2 A solid is made from a cylinder and a cone. The cylinder has radius 3 cm and height 6 cm. The cone has the same radius and vertical height 4 cm. Work out, in terms of π , (a) the volume and (b) the total surface area.



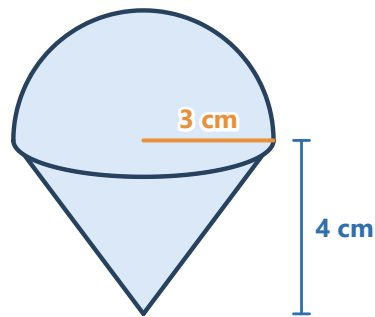
(a) Volume

Answer: $66\pi \text{ cm}^3$

(b) Total surface area

Answer: $60\pi \text{ cm}^2$

- 3 An ice-cream is a cone with a hemisphere on top. The cone has radius 3 cm and vertical height 4 cm. Work out, in terms of π , (a) the volume of the ice-cream, (b) the area of its curved surface (the area that is outside).



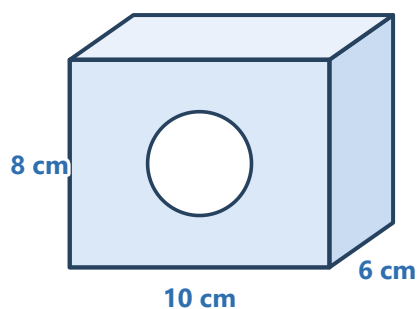
(a) Volume

Answer: $30\pi \text{ cm}^3$

(b) Outside surface area

Answer: $33\pi \text{ cm}^2$

- 4 A cuboid 10 cm by 6 cm by 8 cm has a cylindrical hole of radius 2 cm drilled right through from front to back. Work out the volume of the remaining solid, (a) in terms of π and (b) correct to 3 significant figures.



(a) In terms of π

Answer: $480 - 24\pi \text{ cm}^3$

(b) To 3 significant figures

Answer: 405 cm^3

- 5 A medicine capsule is a cylinder of radius 2 cm and length 6 cm with a hemisphere of radius 2 cm attached to each end. Work out the total volume, correct to 3 significant figures.

Answer: 109 cm^3

- 6 A hollow hemispherical bowl has outer radius 6 cm and inner radius 3 cm. Work out the volume of material used to make the bowl, in terms of π .

Answer: $126\pi \text{ cm}^3$

- 7 A solid is a cylinder of radius 3 cm and height h cm with a hemisphere of radius 3 cm on top. Its total volume is $117\pi \text{ cm}^3$. Work out h .

Answer: 11 cm

- 8 A solid is a cone on top of a cylinder. Both have radius 6 cm. The cylinder has height 10 cm. The total volume is $396\pi \text{ cm}^3$. Work out the vertical height of the cone.

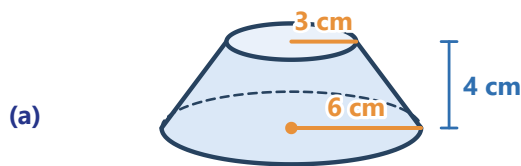
Answer: 3 cm

- 9 A cylinder of radius 3 cm and height 7 cm has a hemisphere of radius 3 cm stuck on top. Without using the formula for the whole solid, explain why its surface area ($69\pi \text{ cm}^2$) is less than the sum of the surface areas of the separate solid cylinder and solid hemisphere.

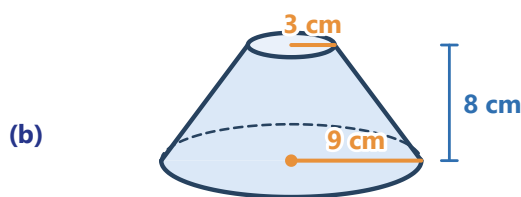
Answer: $87\pi - 69\pi = 18\pi = 2 \times 9\pi$: two circles of area 9π are hidden

Exercise 19M Frustums and similar solids Non-calculator

- 1 Work out the volume of each frustum. Give your answers in terms of π .



Answer: $84\pi \text{ cm}^3$



Answer: $312\pi \text{ cm}^3$

- 2 A bucket is the shape of a frustum. The base has radius 10 cm, the top has radius 15 cm and the height is 20 cm. Work out the capacity of the bucket, (a) in cm^3 to 3 significant figures and (b) in litres to 3 significant figures.

- (a) Capacity in cm^3

Answer: 9950 cm^3

- (b) Capacity in litres

Answer: 9.95 litres

3 Two similar solids have lengths in the ratio shown. Work out each missing quantity.

(a)

Two similar cones have heights 4 cm and 6 cm. The smaller has volume 40 cm^3 . Find the volume of the larger.

Answer: 135 cm^3

(b)

Two similar bottles have surface areas 100 cm^2 (height 5 cm) and a height of 8 cm. Find the surface area of the larger bottle.

Answer: 256 cm^2

(c)

Two similar statues, made of the same metal, are 10 cm and 15 cm tall. The smaller has mass 250 g. Find the mass of the larger.

Answer: 843.75 g

(d)

Two similar jugs have heights 20 cm and 30 cm. The smaller holds 400 ml. Find the capacity of the larger.

Answer: 1350 ml

(e)

Two similar solids have heights 6 cm and 9 cm. The larger has volume 540 cm^3 . Find the volume of the smaller.

Answer: 160 cm^3

4 The lengths of two similar solids are in the ratio 6 : 15. Write down the ratio of their volumes.

Answer: 8 : 125

5 Two similar solids have volumes 27 cm^3 and 64 cm^3 . Work out (a) the ratio of their lengths and (b) the ratio of their surface areas.

(a) Ratio of lengths

Answer: 3 : 4

(b) Ratio of surface areas

Answer: 9 : 16

6 The larger of two similar solids has 8 times the volume of the smaller. How many times larger is its surface area?

Answer: 4 times

7 A cone is cut into two pieces by a plane parallel to its base, at one third of the height from the top (apex). The small cone that is cut off is similar to the whole cone. Show that the frustum is $\frac{26}{27}$ of the volume of the whole cone.

Answer: $1 - \frac{1}{27} = \frac{26}{27}$

8 A scale model of a ship is made at a scale of 1 : 50. The model has a hull surface area of 0.4 m^2 and holds 0.02 m^3 of water. Work out (a) the surface area and (b) the volume of the real ship, in m^2 and m^3 .

(a) Surface area of the real ship

Answer: 1000 m^2

(b) Volume of the real ship

Answer: 2500 m^3

- 9 A frustum is made by removing the top of a cone. The large cone has radius 12 cm and height 18 cm. The small cone removed has radius 4 cm. Work out the volume of the frustum, in terms of π .

Answer: $832\pi \text{ cm}^3$