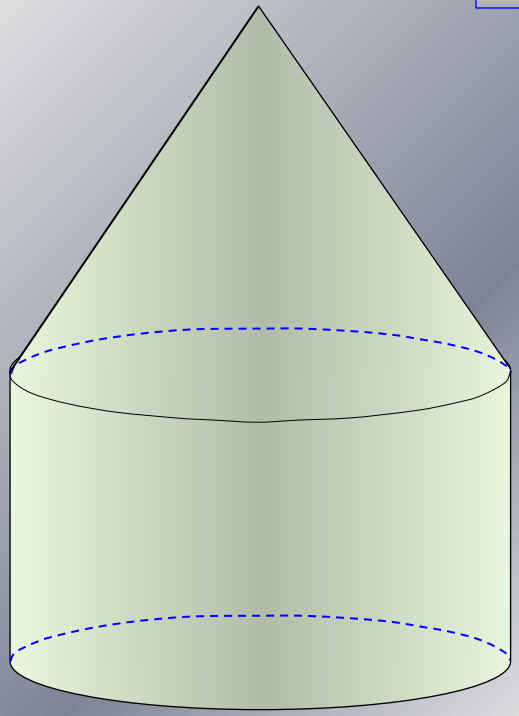
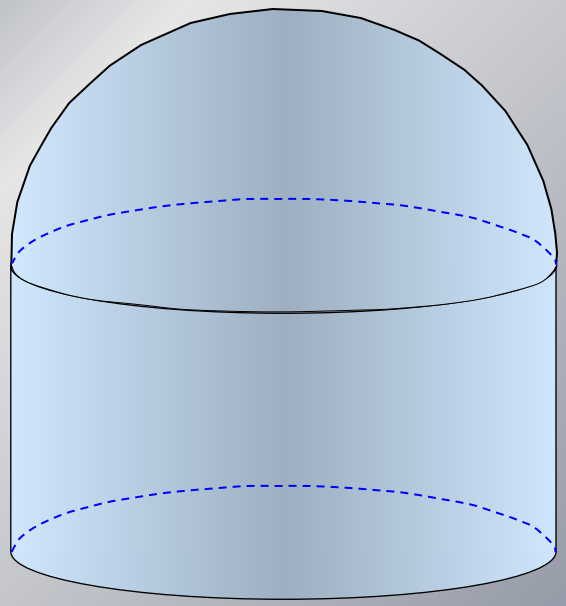
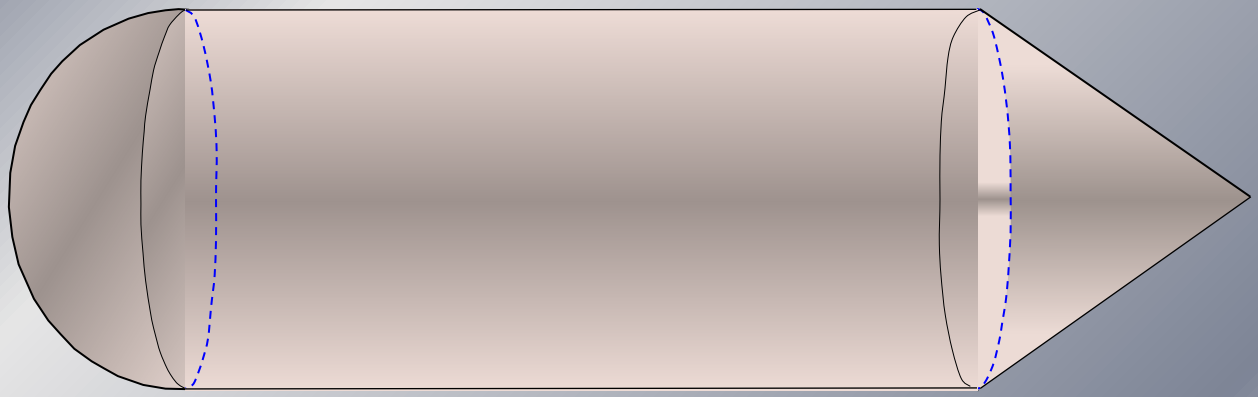
Composite Solids



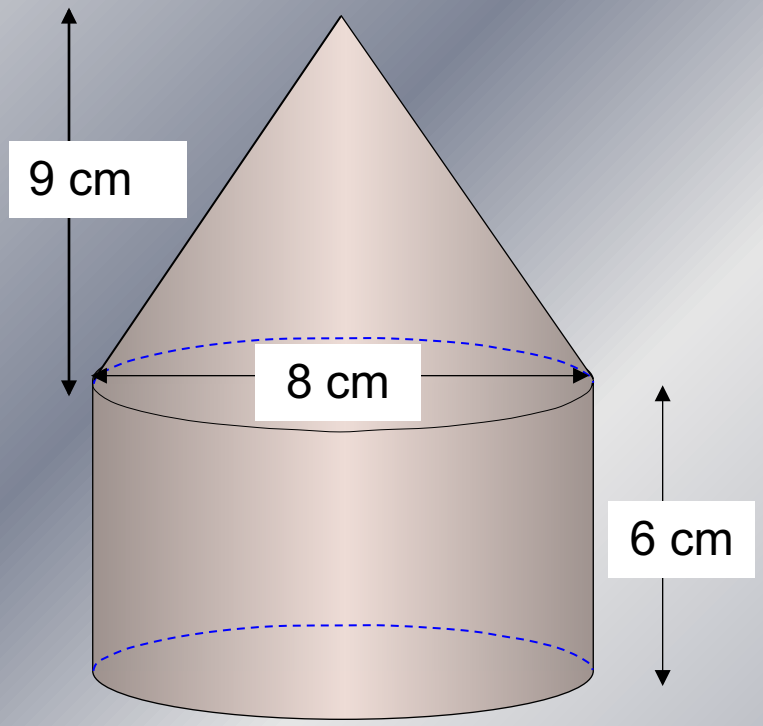




Example Question 1

Composite Solids

An aeronautical engineer designs a small component part made of copper, that is to be used in the manufacturer of an aircraft. The part consists of a cone that sits on top of a cylinder as shown in the diagram below. Find the volume of the part. (Leave your answer in terms of π).



Volume of cone = $1/3\ \pi r^2 h$

$= 1/3 \times \pi \times 4^2 \times 9$

$= 48\pi\ cm^3$

Volume of cylinder = $\pi r^2 h$

$= \pi \times 4^2 \times 6$

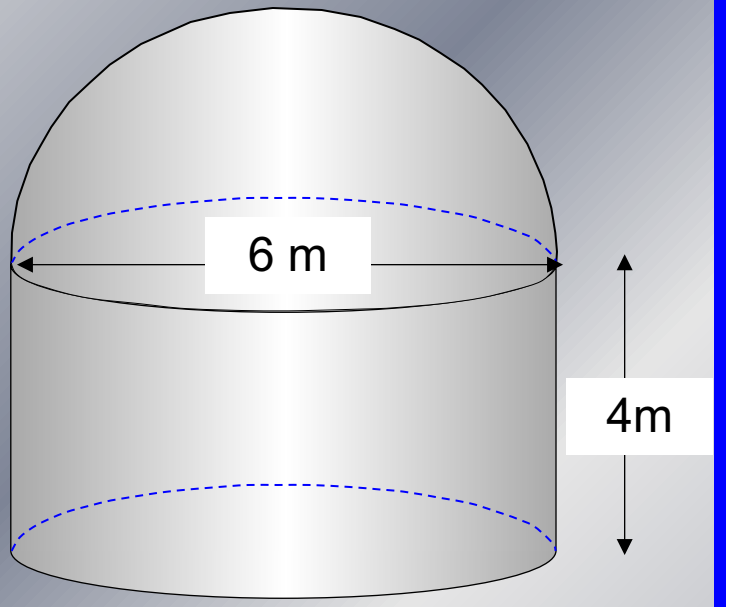
$= 96\pi\ cm^3$

Total volume = $48\pi + 96\pi = \underline{144\pi\ cm^3}$

Example Question 2

Composite Solids

The shape below is composed of a solid metal cylinder capped with a solid metal hemi-sphere as shown. Find the volume of the shape. (to 3 sig fig)



Volume of hemi-sphere = $2/3\ \pi r^3$

$= 2/3 \times \pi \times 3^3$

$= 18\pi\ m^3$

Volume of cylinder = $\pi r^2 h$

$= \pi \times 3^2 \times 4$

$= 36\pi\ m^3$

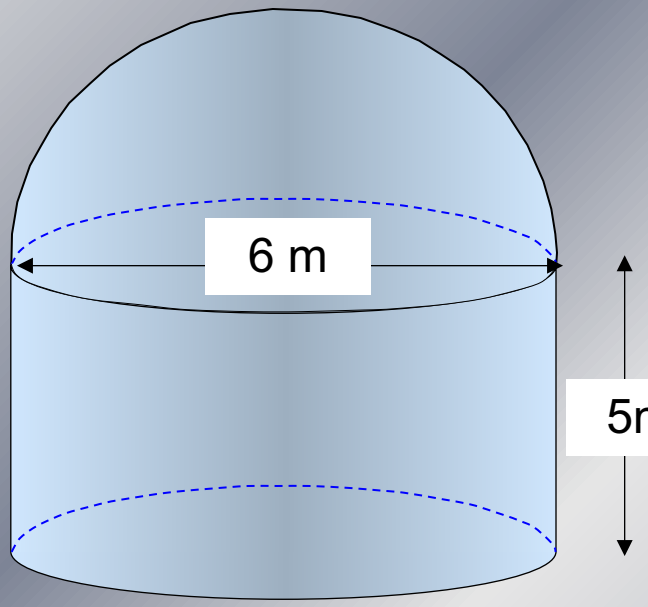
Total volume = $18\pi + 36\pi = 54\pi\ m^3$

$= 170\ m^3$

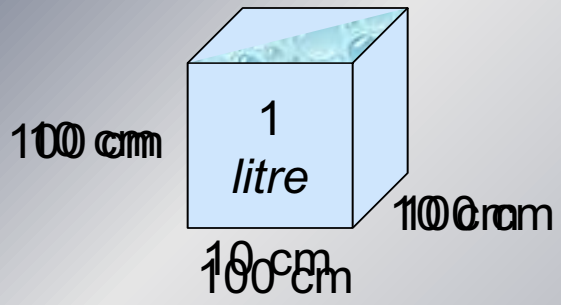
Example Question 3

Composite Solids

The diagram below shows a design for a water tank. The water tank consists of a cylinder capped with a hemi-spherical dome. Find the capacity of the water tank. (Give your answer in litres to 2 sig fig).



1 000 000 cm^3



Capacity of hemi-sphere = $2/3\ \pi r^3$

$= 2/3 \times \pi \times 3^3$

$= 18\pi\ m^3$

Capacity of cylinder = $\pi r^2 h$

$= \pi \times 3^2 \times 5$

$= 45\pi\ m^3$

Total capacity = $18\pi + 45\pi = 63\pi\ m^3$

$= 63\ 000\ 000\pi\ cm^3$

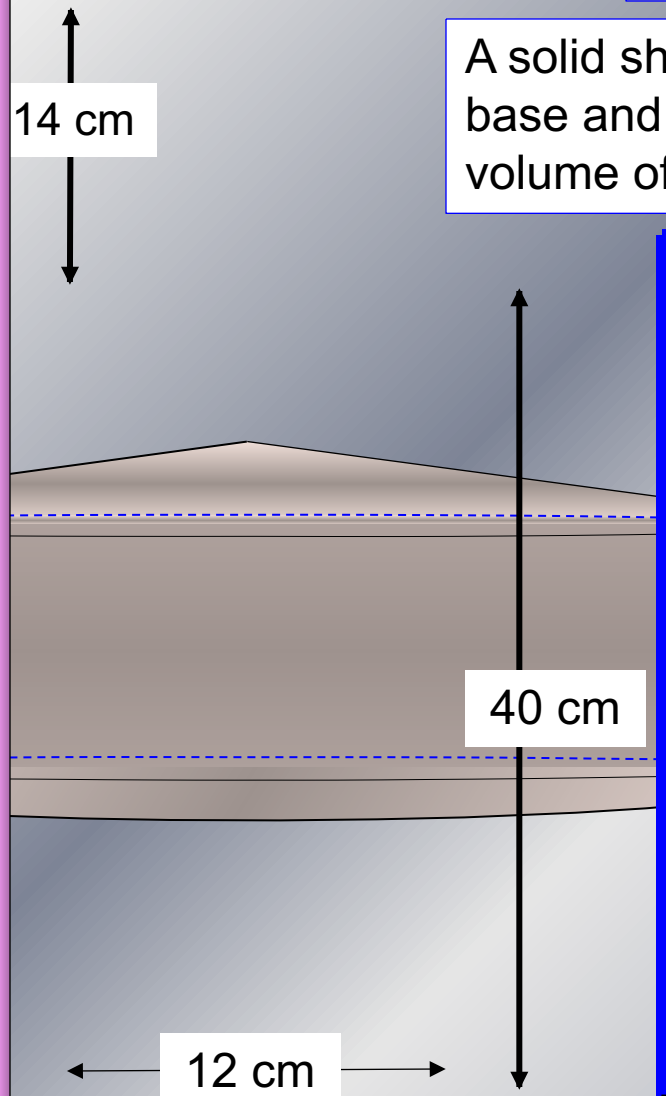
$= 63\ 000\pi$ litres

= 200 000 litres (2 sig fig)

Example Question 4

Composite Solids

A solid shape is composed of a cylinder with a hemi-spherical base and a conical top as shown in the diagram. Calculate the volume of the shape. (answer to 2 sig fig)



Volume of cone = $1/3 \times \pi r^2 h$

$= 1/3 \times \pi \times 6^2 \times 14$

$= 168\pi$ cm^3

Volume of cylinder = $\pi r^2 h$

$= \pi \times 6^2 \times 40$

$= 1440\pi$ cm^3

Volume of hemi-sphere = $2/3\ \pi r^3$

$= 2/3 \times \pi \times 6^3$

$= 144\pi$ cm^3

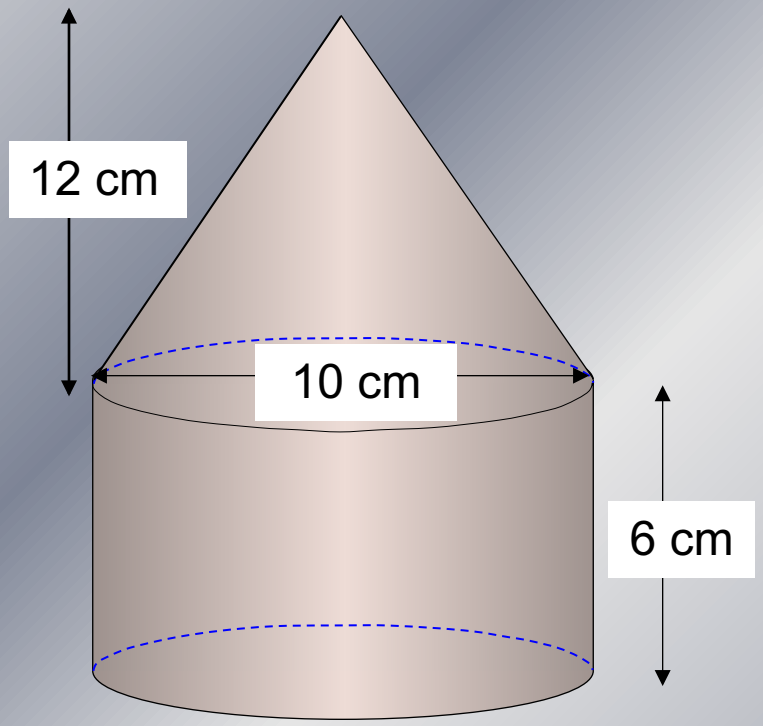
Total volume = $168\pi + 1440\pi + 144\pi = 1752\pi$ cm^3

$= \underline{5500 \text{ cm}^3}$

Question 1

Composite Solids

An aeronautical engineer designs a small component part made of copper, that is to be used in the manufacturer of an aircraft. The part consists of a cone that sits on top of a cylinder as shown in the diagram below. Find the volume of the part. (Leave your answer in terms of π).



Volume of cone = $1/3\ \pi r^2 h$

$= 1/3 \times \pi \times 5^2 \times 12$

$= 100\pi\ cm^3$

Volume of cylinder = $\pi r^2 h$

$= \pi \times 5^2 \times 6$

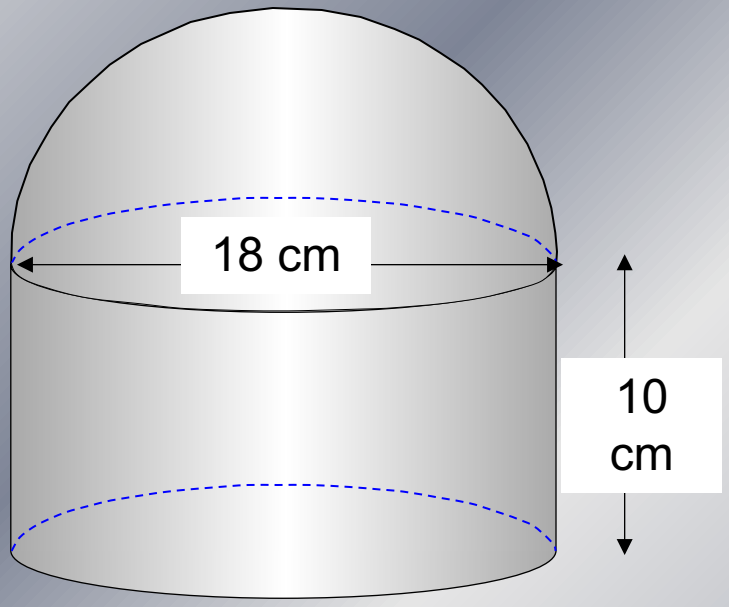
$= 150\pi\ cm^3$

Total volume = $100\pi + 150\pi = \underline{250\pi\ cm^3}$

Question 2

Composite Solids

The shape below is composed of a solid metal cylinder capped with a solid metal hemi-sphere as shown. Find the volume of the shape. (to 2 sig fig)



Volume of hemi-sphere = $2/3\ \pi r^3$

$= 2/3 \times \pi \times 9^3$

$= 486\pi\ cm^3$

Volume of cylinder = $\pi r^2 h$

$= \pi \times 9^2 \times 10$

$= 810\pi\ m^3$

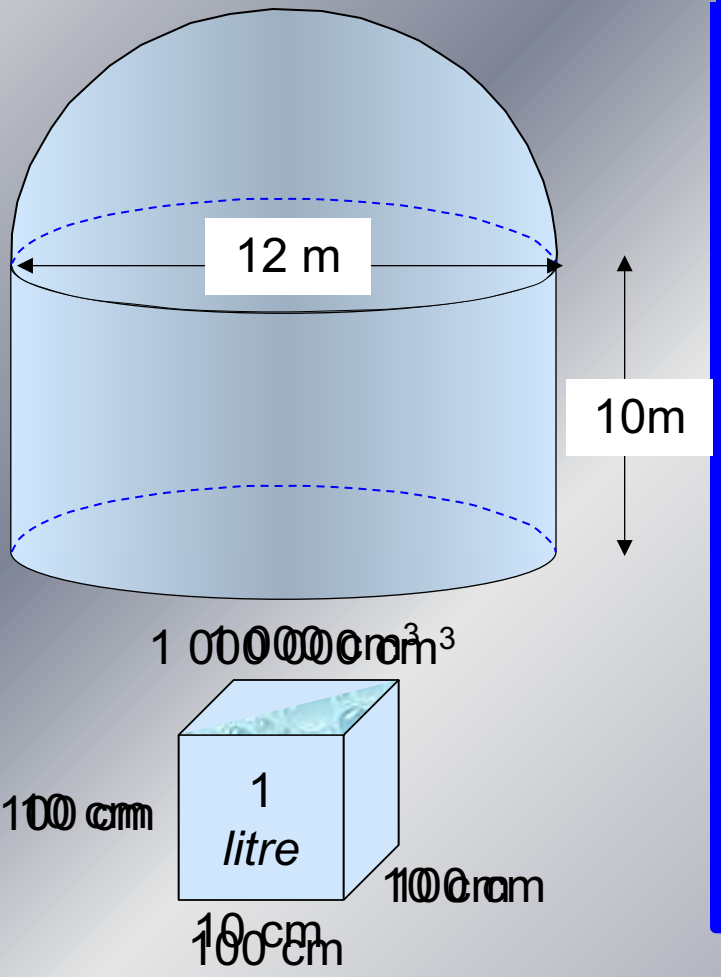
Total volume = $486\pi + 810\pi = 1296\pi\ cm^3$

$= 4100\ cm^3$

Question 3

Composite Solids

The diagram below shows a design for a water tank. The water tank consists of a cylinder capped with a hemi-spherical dome. Find the capacity of the water tank. (Give your answer in litres to 3 sig fig).



Capacity of hemi-sphere = $2/3\ \pi r^3$

$= 2/3 \times \pi \times 6^3$

$= 144\pi\ m^3$

Capacity of cylinder = $\pi r^2 h$

$= \pi \times 6^2 \times 10$

$= 360\pi\ m^3$

Total capacity = $144\pi + 360\pi = 504\pi\ m^3$

$= 504\ 000\ 000\pi\ cm^3$

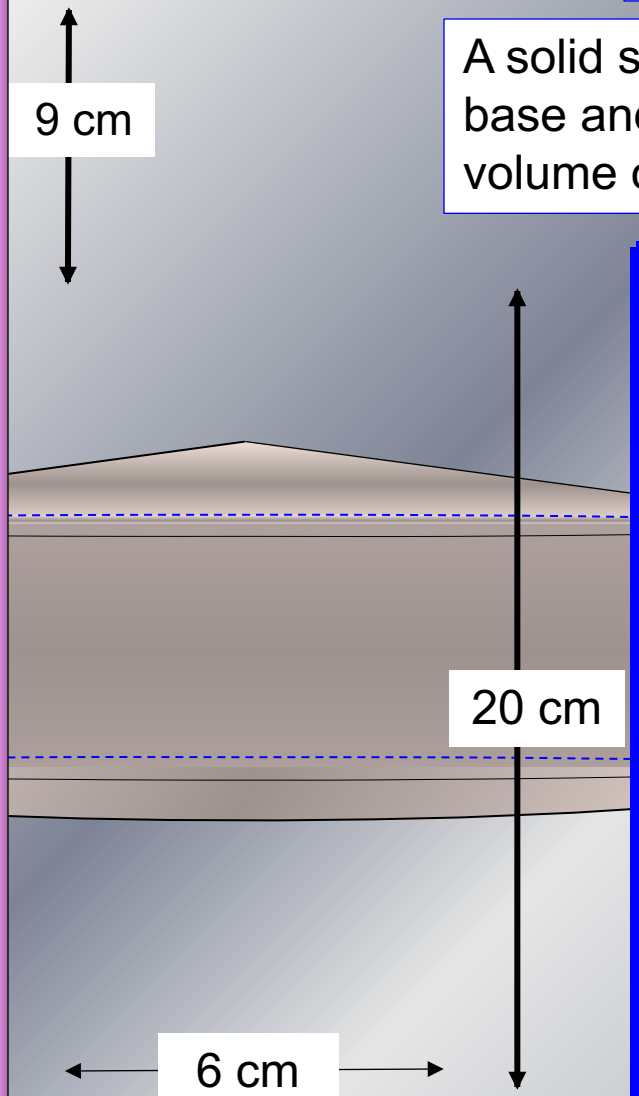
$= 504\ 000\pi$ litres

= 1 580 000 litres (3 sig fig)

Question 4

Composite Solids

A solid shape is composed of a cylinder with a hemi-spherical base and a conical top as shown in the diagram. Calculate the volume of the shape. (answer to 2 sig fig)



Volume of cone = $1/3 \times \pi r^2 h$

$= 1/3 \times \pi \times 3^2 \times 9$

$= 27\pi \text{ cm}^3$

Volume of cylinder = $\pi r^2 h$

$= \pi \times 3^2 \times 20$

$= 180\pi \text{ cm}^3$

Volume of hemi-sphere = $2/3\ \pi r^3$

$= 2/3 \times \pi \times 3^3$

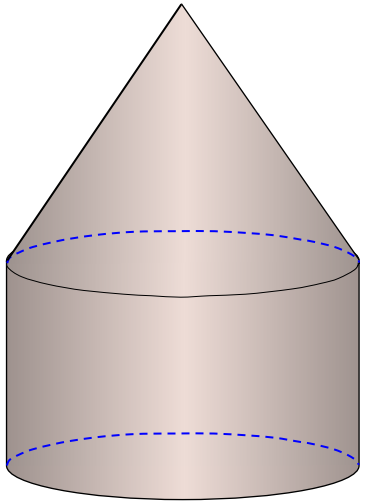
$= 18\pi \text{ cm}^3$

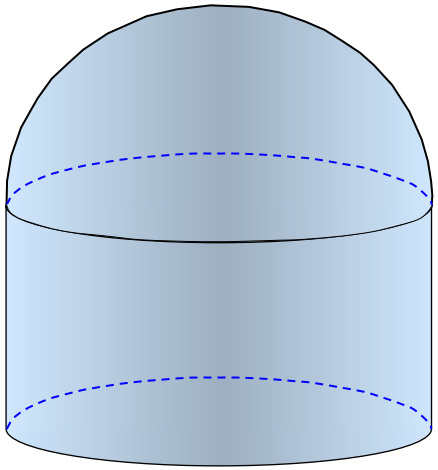
Total volume = $27\pi + 180\ \pi + 18\pi = 225\ \pi \text{ cm}^3$

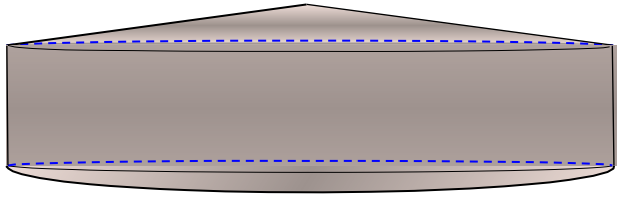
$= \underline{710 \text{ cm}^3}$

Example Questions

Surface Area

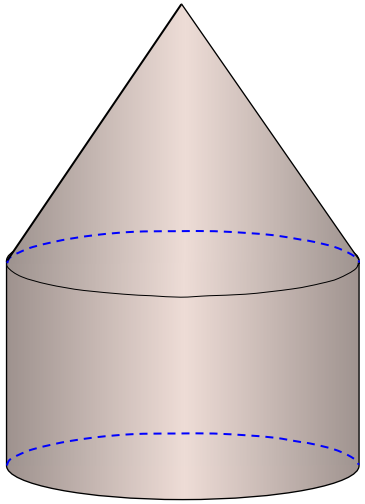


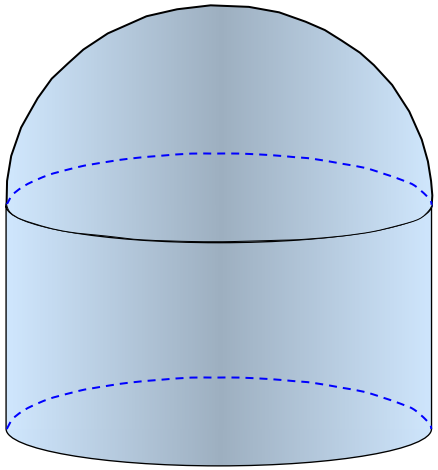


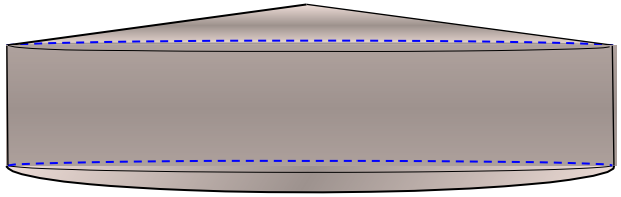


Questions

Surface Area

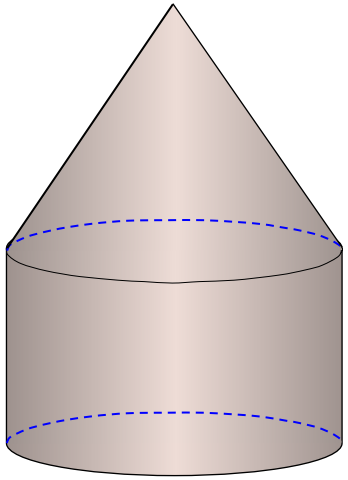


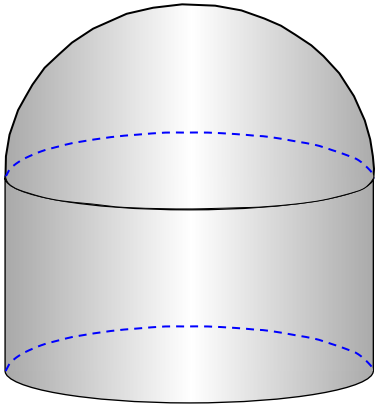


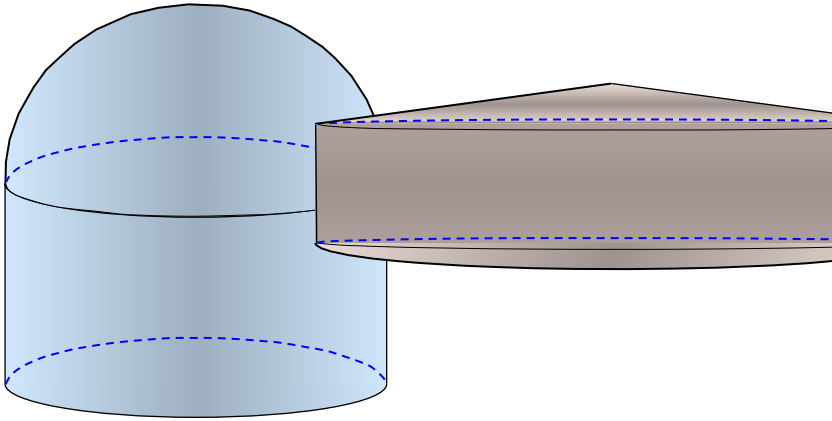


Example Questions

Volume/Capacity







Questions

Volume/Capacity