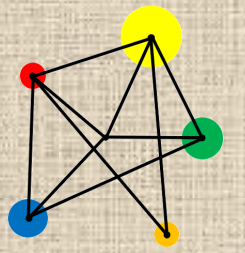
Surface Area



Find the total surface area of a solid.

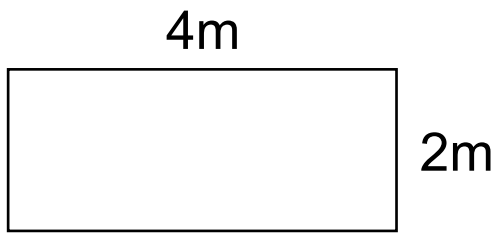
Vocabulary

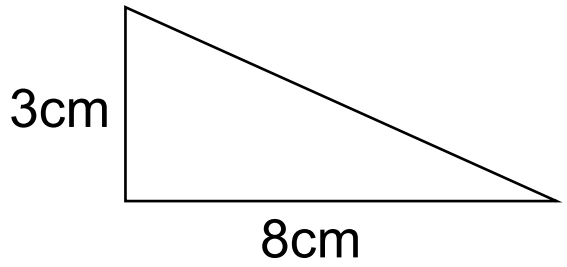
Face

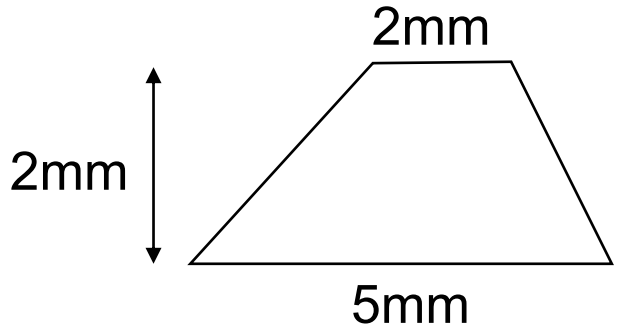
A two-dimensional shape that forms part of the boundary of a solid.

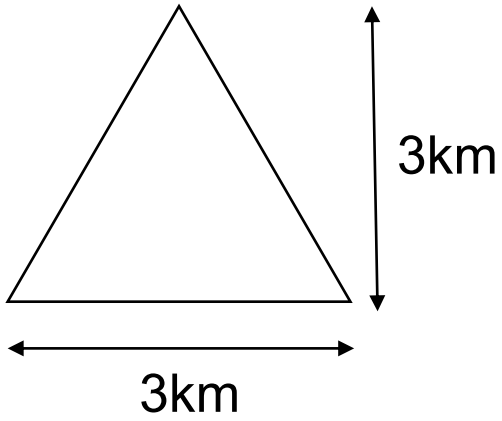
Review

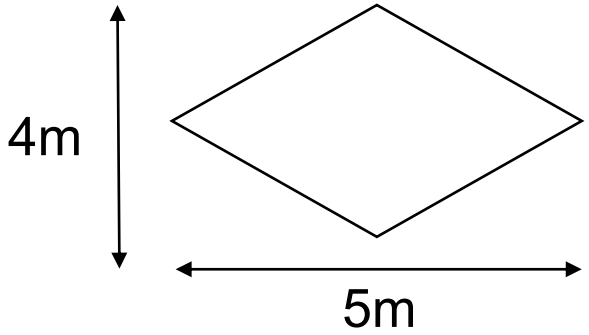
Find the area of each shape:

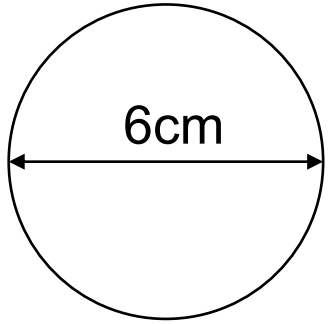






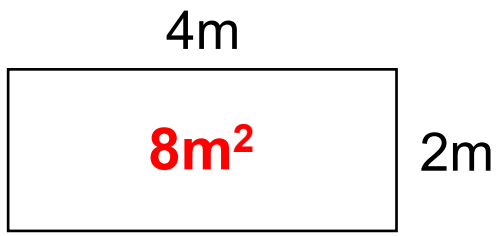


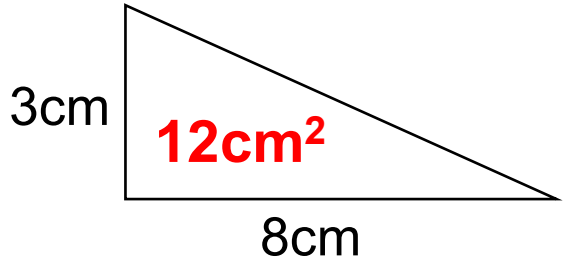


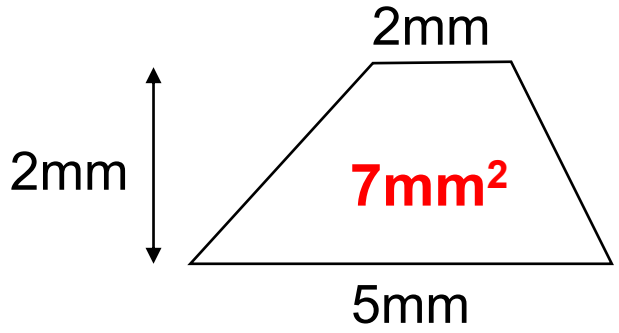


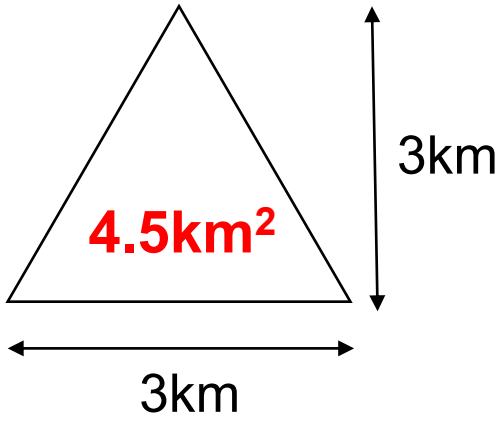
Solutions

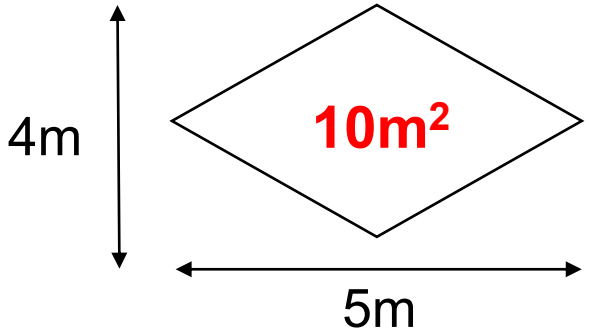
Find the area of each shape:

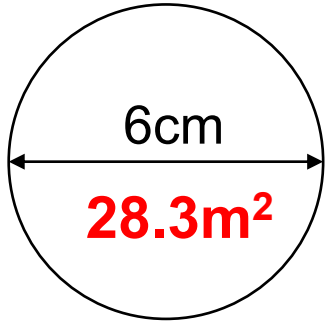






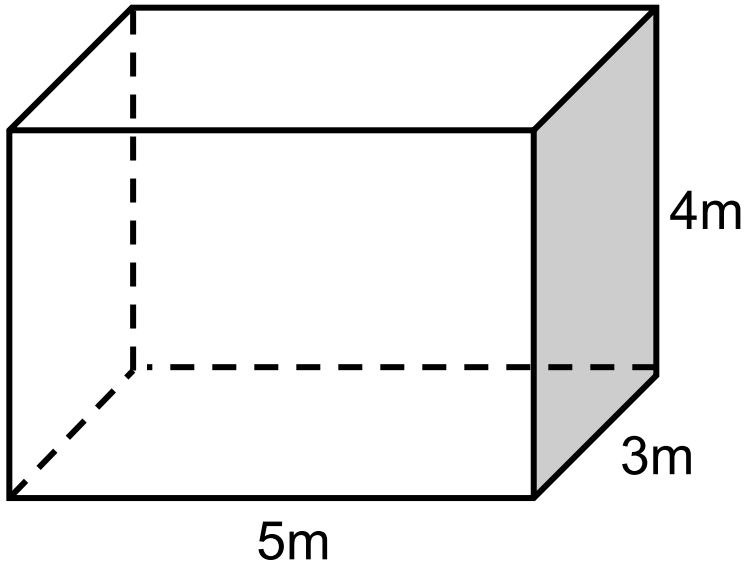


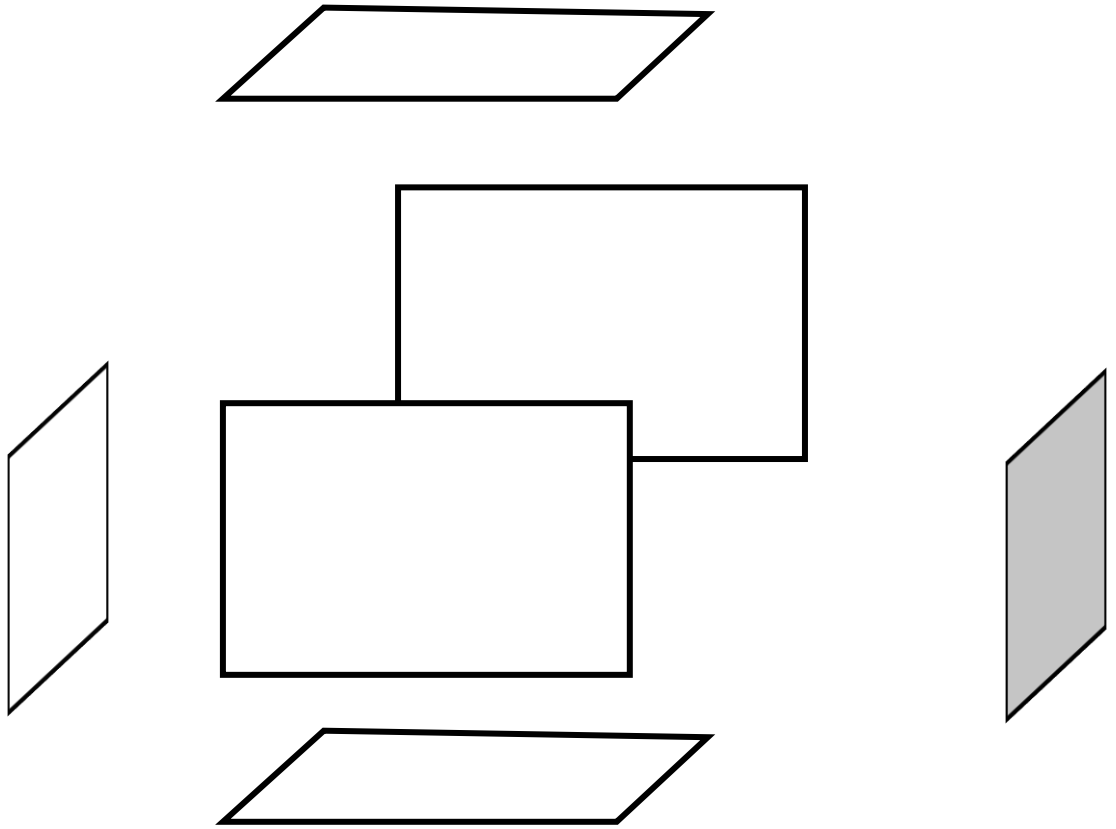




Example

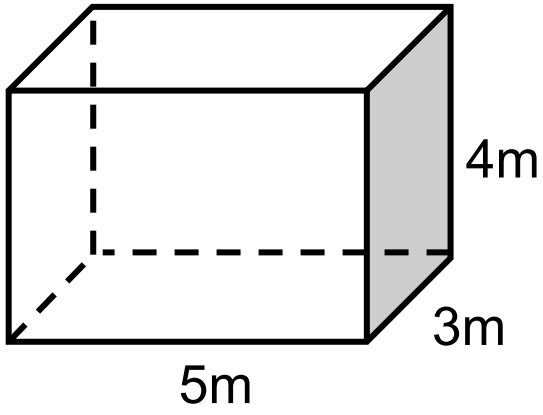
A cuboid has six faces.
The faces are all rectangles.

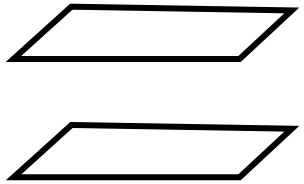




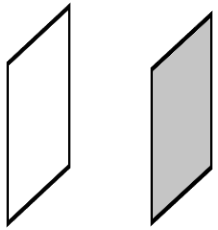
The **surface area** of a cuboid is the area of all the faces added together.

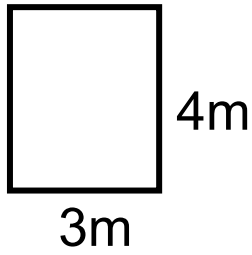
Example



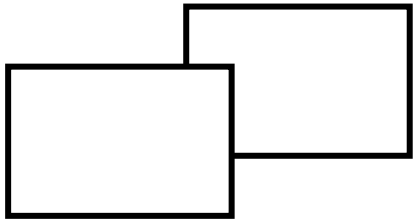


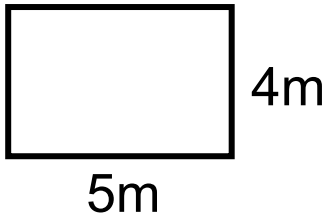
$15m^2 \times 2 = 30m^2$





$12m^2 \times 2 = 24m^2$





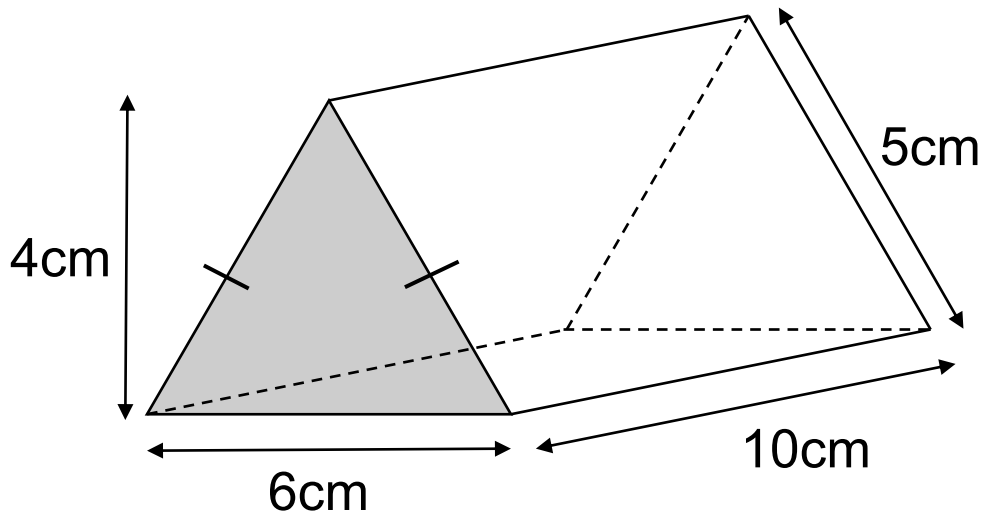
$20m^2 \times 2 = 40m^2$

Total surface area = 30 + 24 + 40

= **94m²**

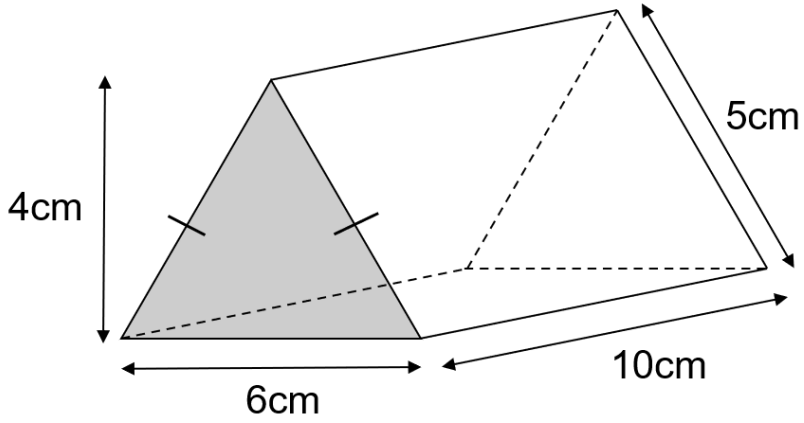
Example 2

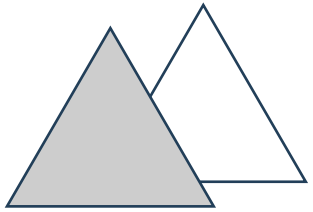
Find the total surface area of this prism.



Solution

Find the total surface area of this prism.





$12cm^2 \times 2 = 24cm^2$

$50cm^2 \times 2 = 100cm^2$

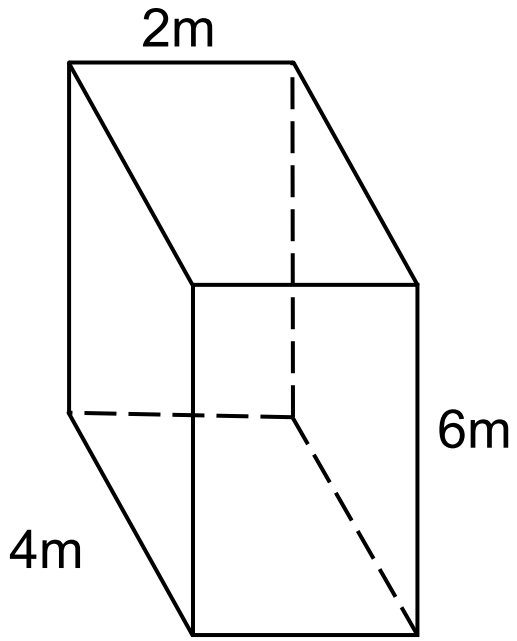
$60cm^2$

Total surface area $= 24 + 100 + 60$

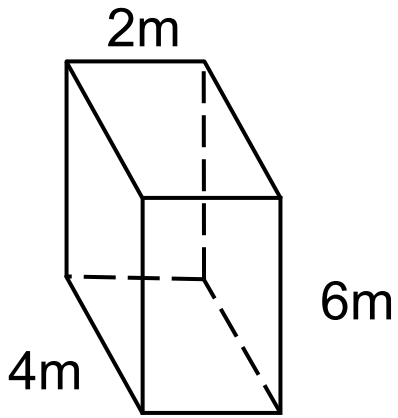
$= \underline{184\ cm^2}$

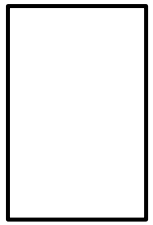
You try.....

Find the total surface area of this cuboid:

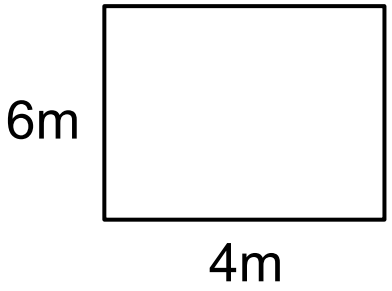


Solution

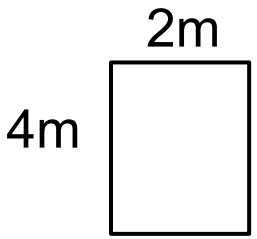




Front and back = $12m^2 \times 2 = 24m^2$



Sides = $24m^2 \times 2 = 48m^2$



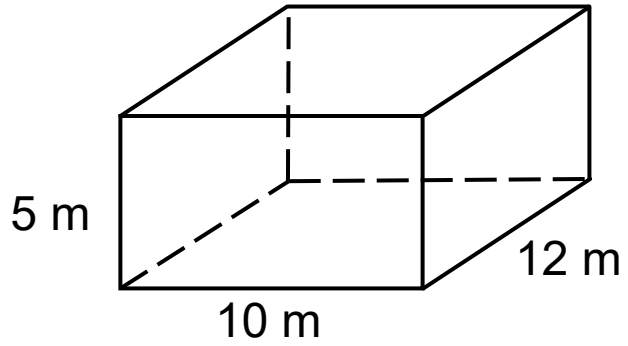
Sides = $8m^2 \times 2 = 16m^2$

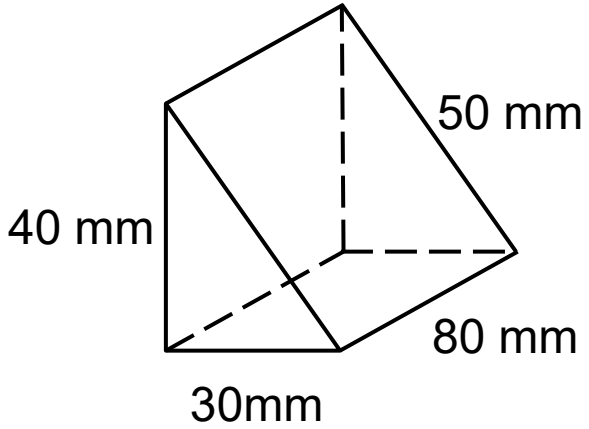
Total surface area = 24 + 48 + 16

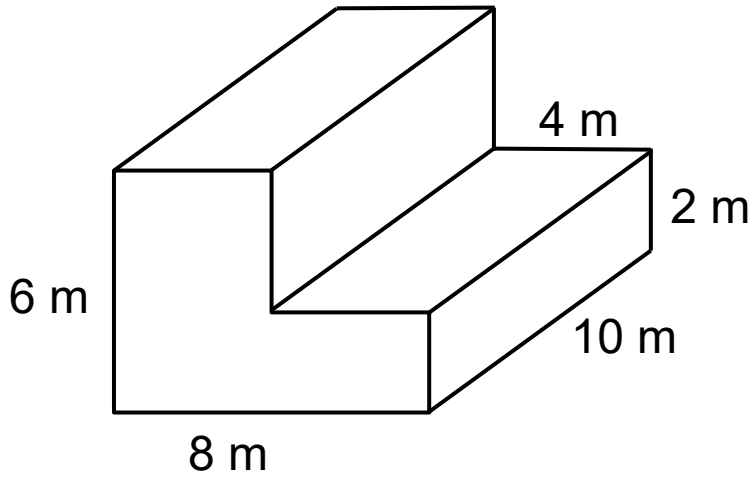
= **$88m^2$**

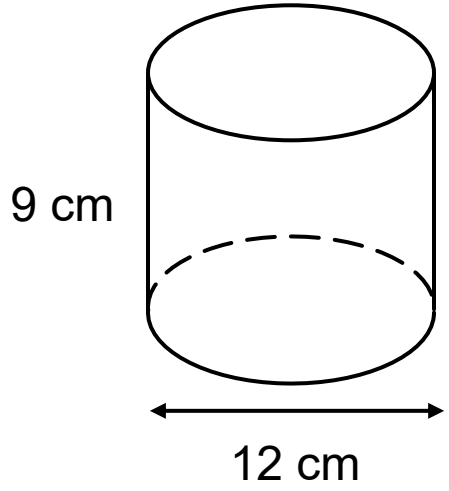
Exercise

Find the total surface area of these solids.



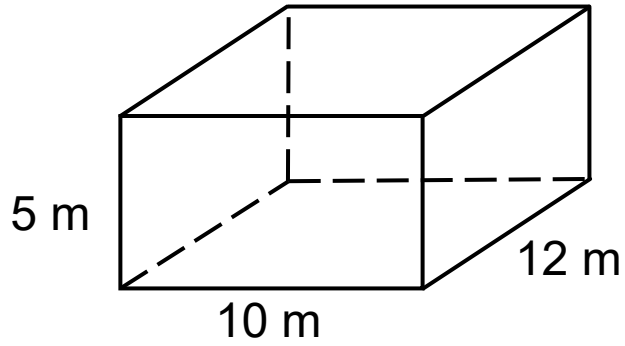




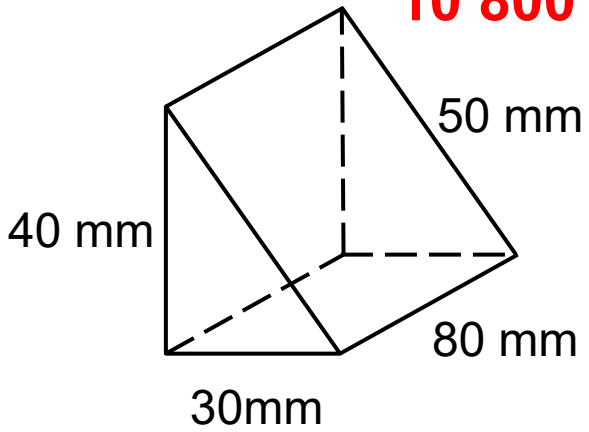


Solutions

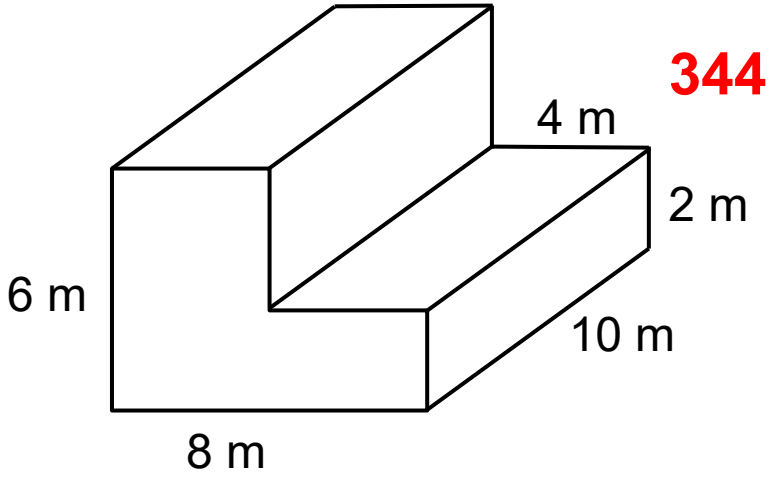
Find the total surface area of these solids.



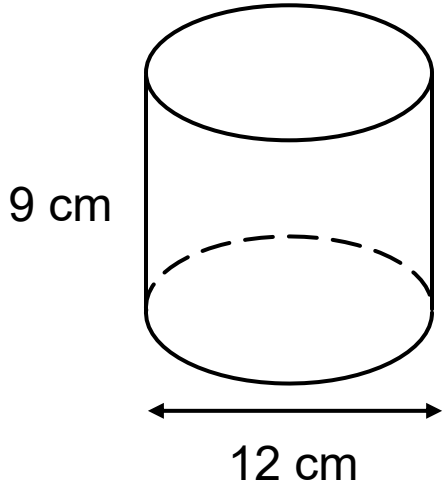
460m²



10 800 mm²



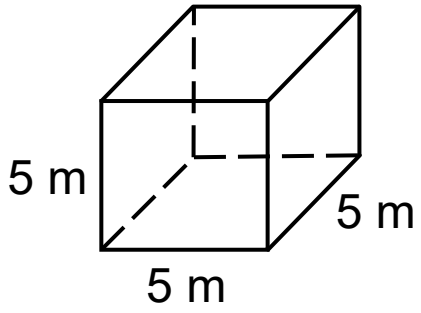
344 m²

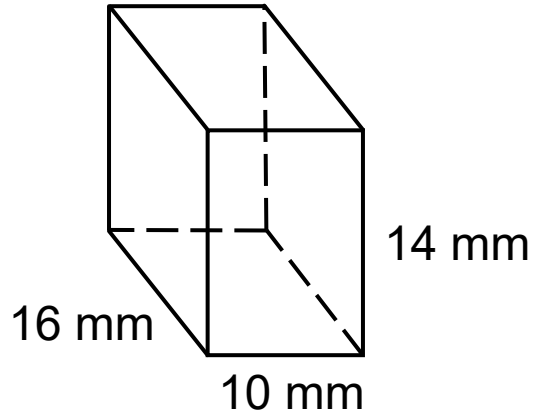


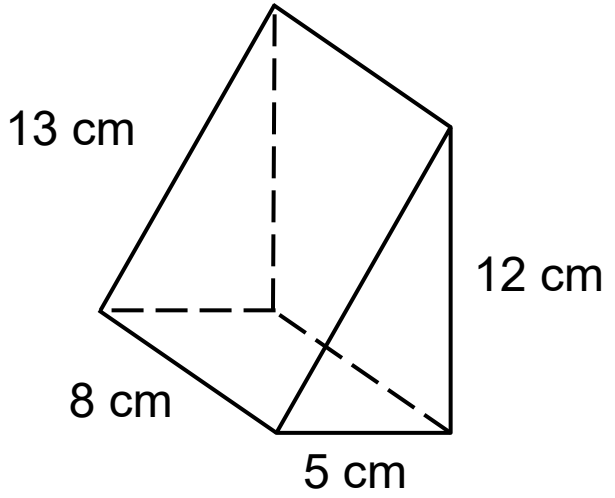
565.487 cm²
(3 decimal places)

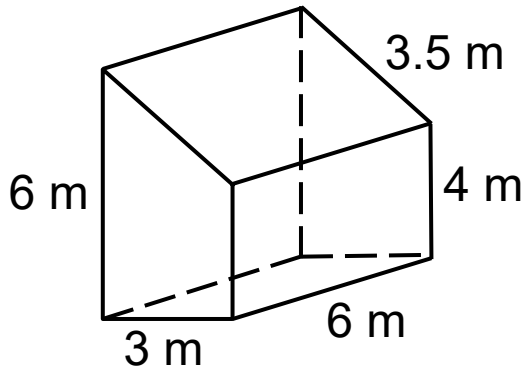
Further Exercise

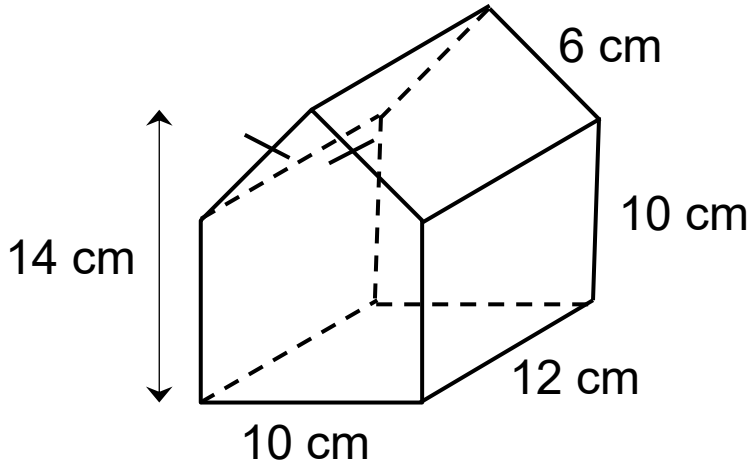
Find the total surface area of each of these solids.

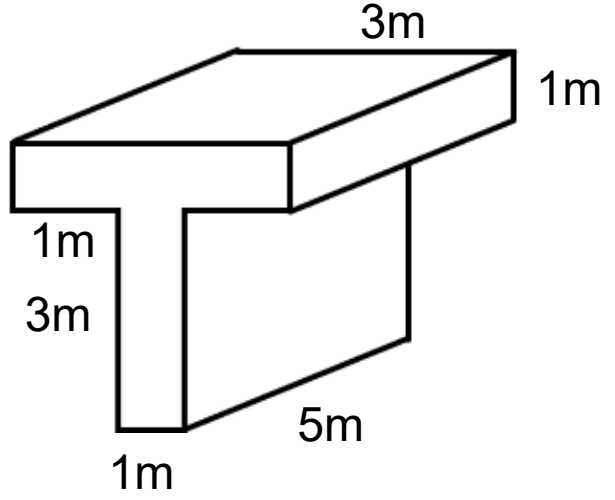






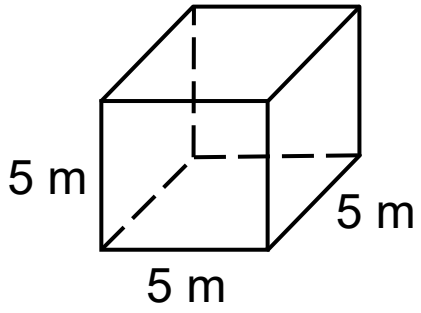




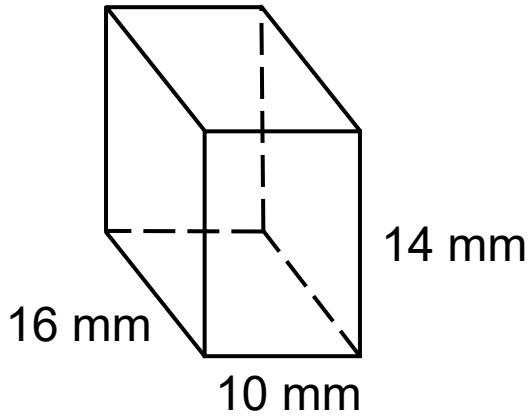


Solutions

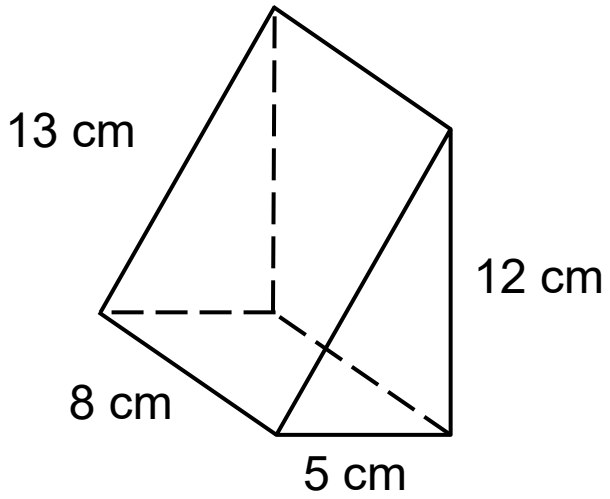
Find the total surface area of each of these solids.



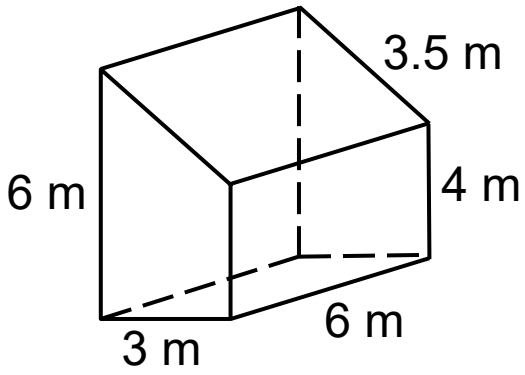
150 m²



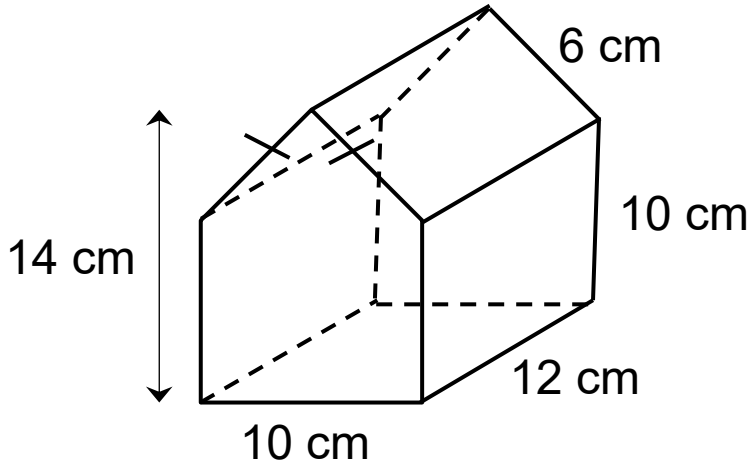
1 048 mm²



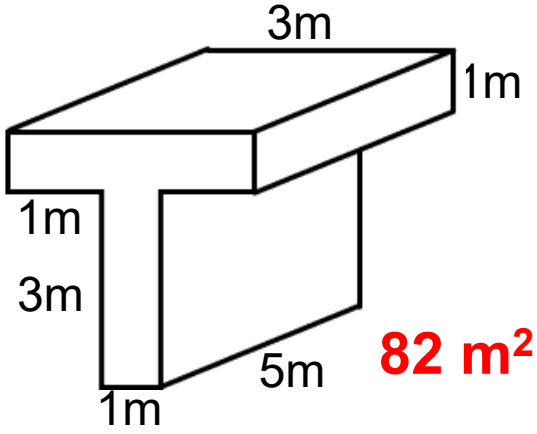
300 m²



129 m²



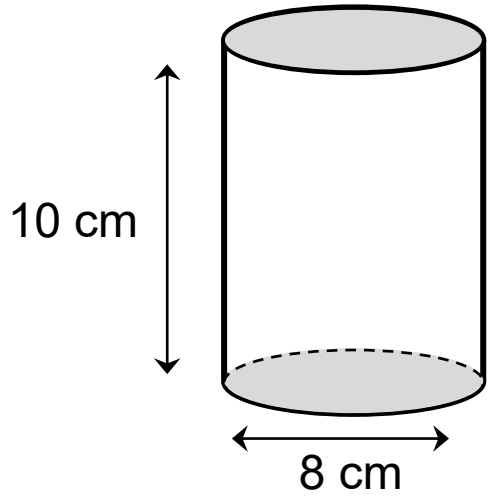
744 cm²



82 m²

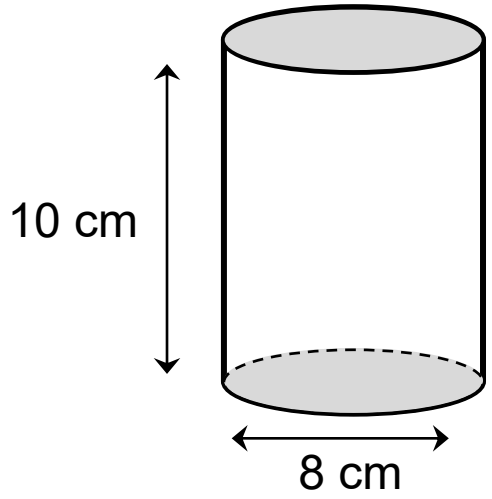
Cylinders

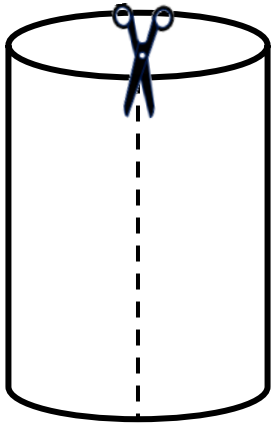
Find the total surface area of this cylinder.

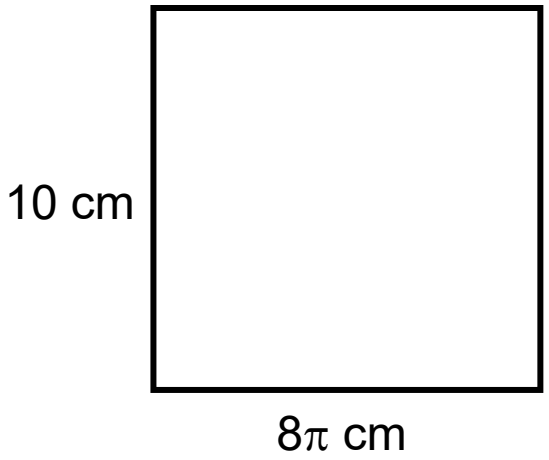


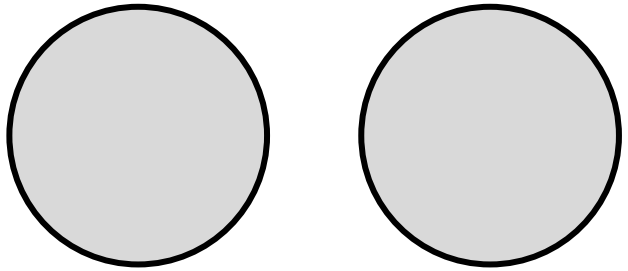
Solution

Find the total surface area of this cylinder.

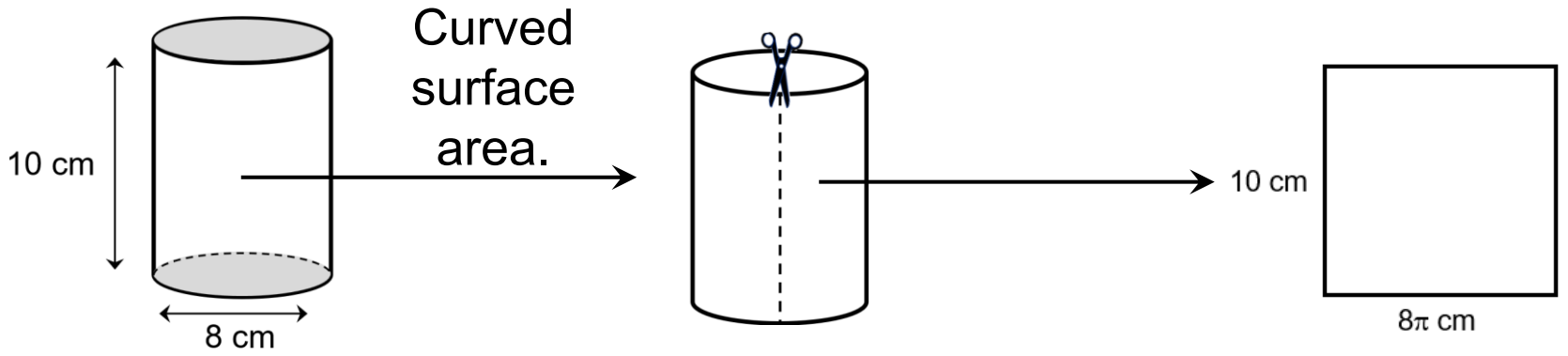






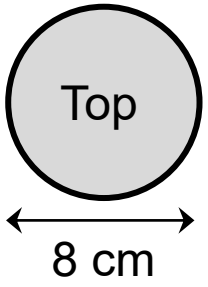


Solution



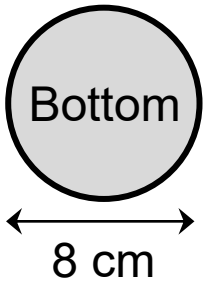
$10 \times 8\pi = 80\pi \text{ cm}^2$

+



$\pi \times 4^2 = 16\pi \text{ cm}^2$

+

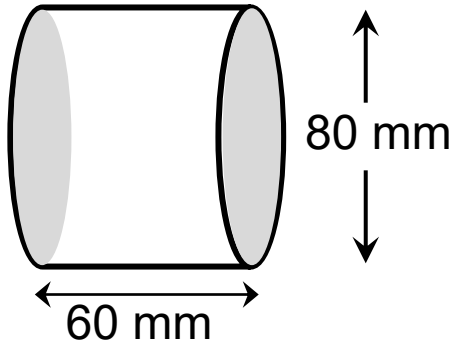


$\pi \times 4^2 = 16\pi \text{ cm}^2$

Total surface area = **$112\pi \text{ cm}^2$**

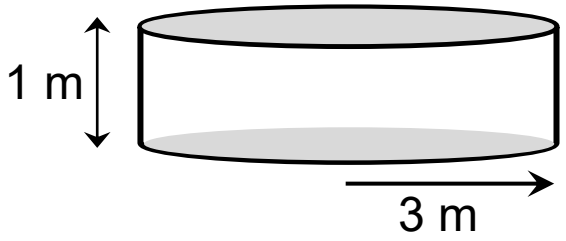
Exercise

Find the total surface area of this cylinder.



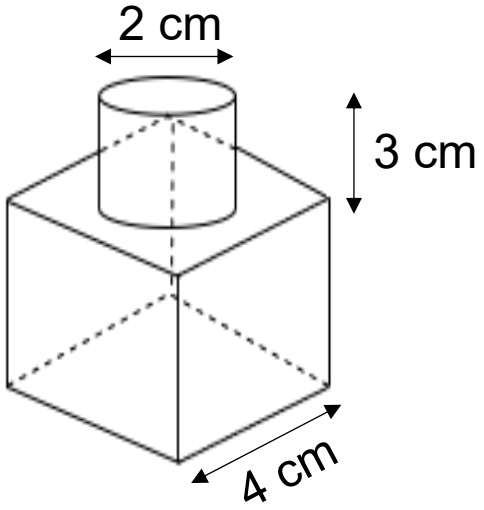
Give your answer in terms of π.

Find the total surface area of this cylinder.



Give your answer correct to 2 decimal places.

This solid is made from a cylinder placed on top of a cube.

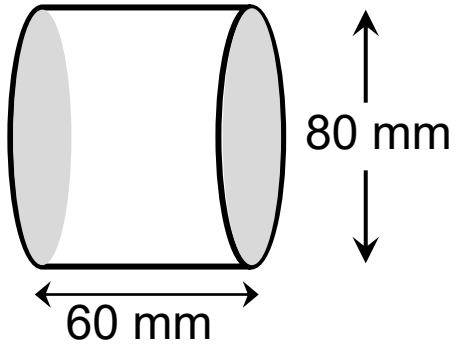


Find the surface area of the solid.

Give your answer to 3 significant figures.

Solutions

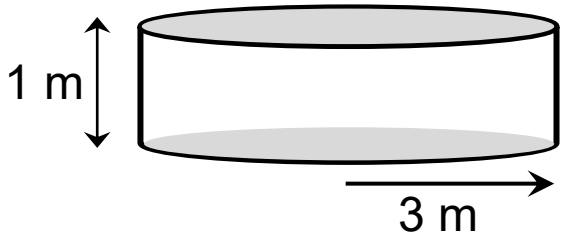
Find the total surface area of this cylinder.



Give your answer in terms of π.

$8\,000\pi$ mm^2

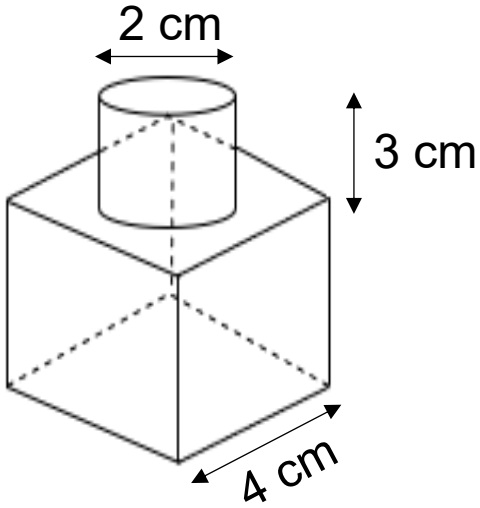
Find the total surface area of this cylinder.



Give your answer correct to 2 decimal places.

75.40 m^2

This solid is made from a cylinder placed on top of a cube.



Find the surface area of the solid.

Give your answer to 3 significant figures.

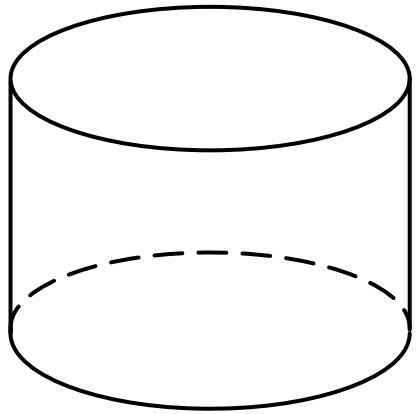
115 cm^2

Extension

The diameter of a cylinder is equal to the height of the cylinder.

The total surface area of the cylinder is 150π.

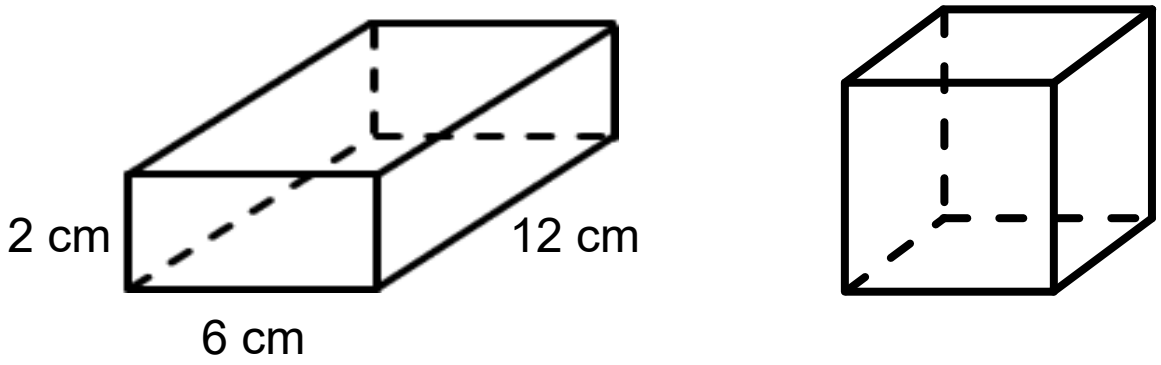
Find the diameter and height of the cylinder.



Exam Style Question

The diagram shows a cube and a cuboid.

The total surface area of the cube is equal to the total surface area of the cuboid.

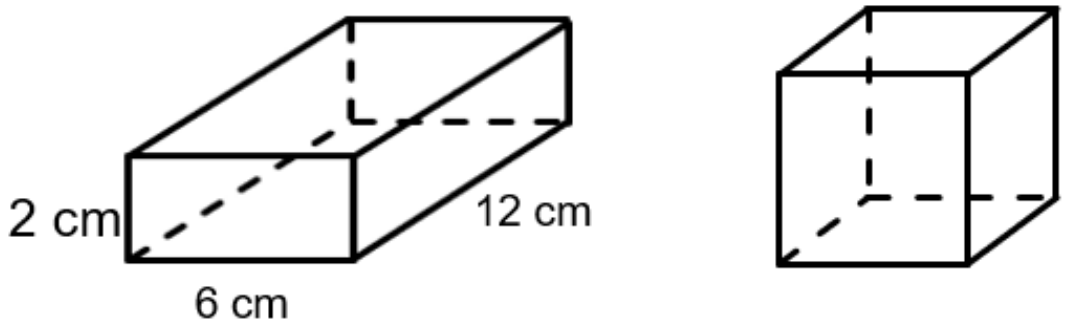


Find the height of the cube

Solution

The diagram shows a cube and a cuboid.

The total surface area of the cube is equal to the total surface area of the cuboid.



Find the height of the cube

Surface area of cuboid

= (2 x 6 x 12) + (2 x 6 x 2) + (2 x 12 x 2)

= 144 + 24 + 48

= 216 cm²

Surface area of cube = 6 x area of one face

Area of one face = 216 ÷ 6 = 36cm²

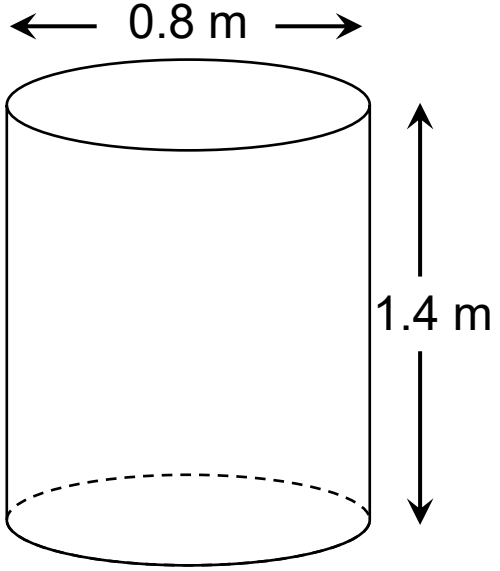
Height of cube √36 = 6cm

Exam Style Question

Jenny must cover 5 tanks completely with paint.

Each tank is a cylinder with a top and a bottom.

Each tank has a diameter of 0.8m and a height of 1.4m



Jenny has 3 tins of paint.

Each tin of paint covers $41.5m^2$.

Has Jenny got enough paint?

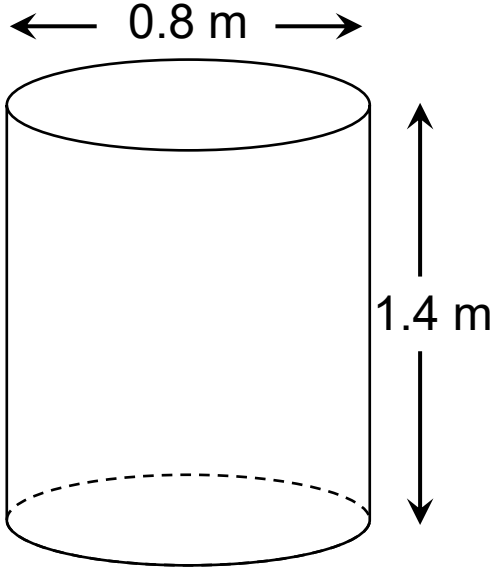
Show how you get to your answer.

Solution

Jenny must cover 5 tanks completely with paint.

Each tank is a cylinder with a top and a bottom.

Each tank has a diameter of 0.8m and a height of 1.4m



Jenny has 3 tins of paint.

Each tin of paint covers 1.5m^2.

Has Jenny got enough paint?

Show how you get to your answer.

Surface area of cylinder

$= (2 \times \pi \times 0.4^2) + (\pi \times 0.8 \times 1.4)$

$= 4.523893421\ m^2$

Three tins of paint contain enough paint to cover:

$3 \times 1.5 = 4.5m^2$

Jenny does not have enough paint.

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