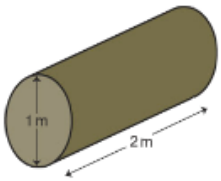
3D GEOMETRY

EXERCISES SHEET

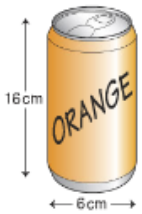
Lycée International Manosque 3e

Exercise 1

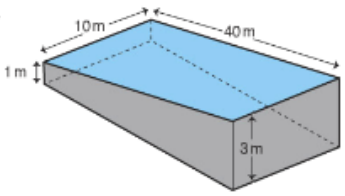
5 Find the volume and surface area of this fuel tank.



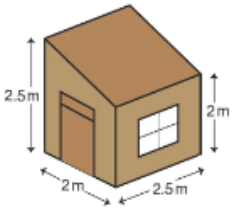
6 Find the volume and surface area of this can of drink.



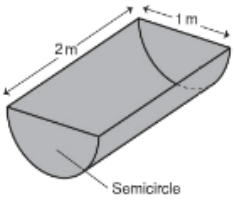
7 A swimming pool has the dimensions shown.
Find the volume in m^3.



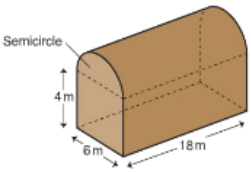
8 A penthouse shed has the dimensions shown.
Find the volume in m^3.



9 A water trough has the dimensions shown.
Find the volume in m^3.



10 A barn has the dimensions shown.
Find the volume in m^3.

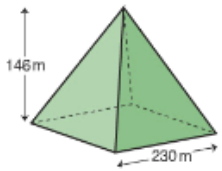


11 A carton contains 1 litre of orange juice.
The carton is 10 cm wide and 6 cm deep.
How tall is it?

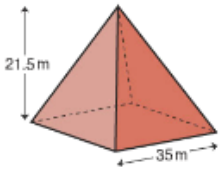
12 A half-litre jar of olive oil is a cylinder 8 cm in diameter.
How tall is it?

Exercise 2:

1 The Great Pyramid of Giza is a square-based pyramid with dimensions as shown.
Find the volume in m^3.

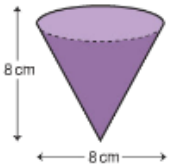


2 The glass pyramid at the Louvre is a square-based pyramid with dimensions as shown.
Find the volume in m^3.

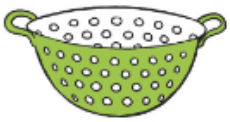


3 A traffic cone has the dimensions shown.
Find the volume in cm^3 and the curved surface area in cm^2.

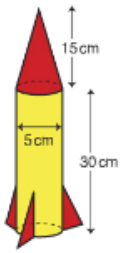
4 A funnel is an inverted cone with the dimensions shown.
Find the volume in cm^3 and the curved surface area in cm^2.



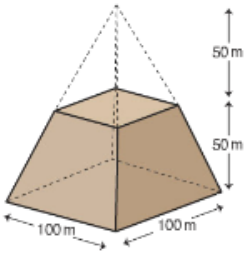
5 A food colander is a hemisphere with diameter 20 cm.
Find the volume and internal surface area, ignoring the holes.



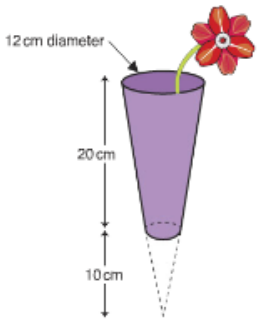
6 A toy rocket is a cone on a cylinder.
Find the volume and surface area.
Ignore the fins, but include the base.



7 A monument is South America is in the shape of a truncated pyramid.
Find the volume of the monument.



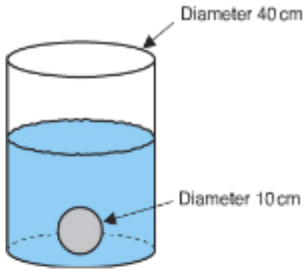
8 A vase is a truncated cone.
Find the volume of the vase.



Exercise 3

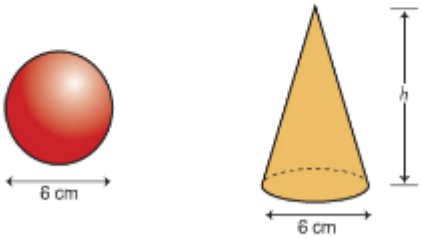
1. The volume of the Sun is $1.41 \times 10^{18} km^3$.
Find the surface area of the Sun assuming it is a sphere.

2. A stone ball is dropped into a barrel of water and sinks to the bottom. The ball is completely covered by water. By how much does the water rise in the barrel?



3. A cuboid of chocolate measures 12 cm by 8 cm by 6 cm. It is melted down and cast into chocolates that are spheres with diameter 2 cm. How many spheres can be made?

4. The sphere and the cone shown have the same volume.
Calculate the height of the cone.

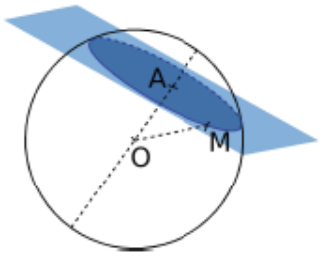


5. A spherical drop of oil with diameter 3 mm falls onto a water surface and produces a circular oil film of radius 10 cm.
Calculate the thickness of the oil film.

Exercise 4

1.

Une boule de centre O, de rayon 8 cm, est coupée par un plan qui passe par le point A.
M est un point de cette section.

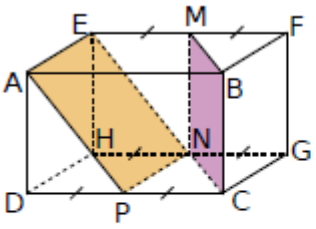


OA = 3 cm

a. Quelle est la nature de la section ?

b. Calcule l'aire exacte de la surface de cette section en cm².

2.



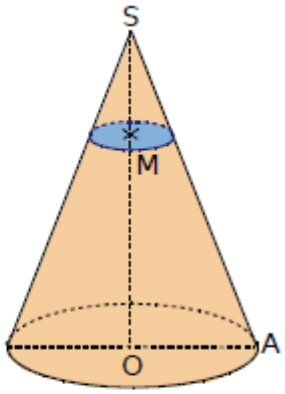
Un pavé droit ABCDEFGH est tel que AB = 6 cm ; BC = 4 cm et BF = 3 cm.
M, N et P sont les milieux respectifs de [EF], [HG] et [DC].

a. Quelle est la nature des quadrilatères AENP et BMNC ? Justifie ta réponse.

b. Compare les aires de ces deux quadrilatères.

Exercise 5 from brevet

Le cône de révolution ci-contre de sommet S a une hauteur [SO] de 9 cm et un rayon de base [OA] de 5 cm.



a. Calculer le volume V_1 de ce cône au cm³ près par défaut.

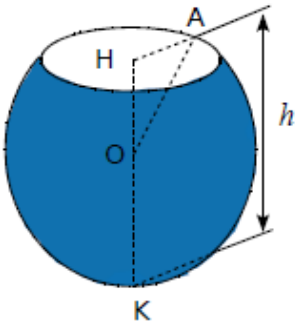
b. Soit M le point du segment [SO] tel que SM = 3 cm. On coupe le cône par un plan parallèle à la base passant par M. Calculer le rayon de cette section.

c. Calculer le volume V_2 du petit cône de sommet S ainsi obtenu au cm³ près par défaut.

Exercise 6

Une calotte sphérique est un solide obtenu en sectionnant une sphère par un plan.

Un doseur de lessive, représenté ci-contre, a la forme d'une calotte sphérique de centre O et de rayon OA = 4,5 cm. L'ouverture de ce récipient est délimitée par le cercle de centre H et de rayon HA = 2,7 cm. La hauteur totale de ce doseur est HK.



a. Dessiner en vraie grandeur le triangle AHO.

b. Calculer OH en justifiant puis en déduire que la hauteur totale [HK] du doseur mesure exactement 8,1 cm.

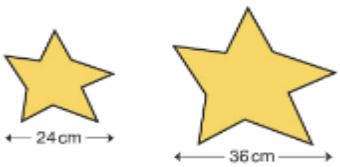
c. Le volume V d'une calotte sphérique de rayon R et de hauteur h est donné par la formule :

$$V = \frac{1}{3}\pi h^2 (3R - h).$$

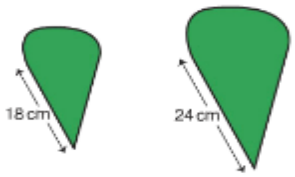
Calculer, en fonction de π, le volume exact du doseur en cm³. En déduire la capacité totale arrondie au millilitre du doseur.

Exercise 7

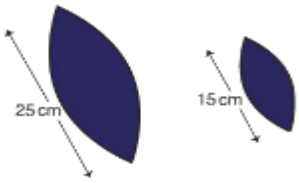
1 The two stars are similar in shape.
The area of the smaller star is 300 cm².
Find the area of the larger star.



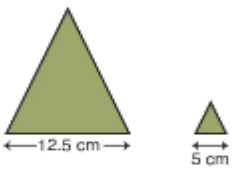
2 The two shapes shown are similar.
The area of the smaller shape is 216 cm².
Find the area of the larger shape.



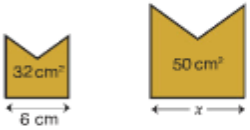
3 The two shapes shown are similar.
The area of the larger shape is 125 cm².
Find the area of the smaller shape.



4 The two triangles are similar.
The area of the larger triangle is 75 cm².
Find the area of the smaller triangle.

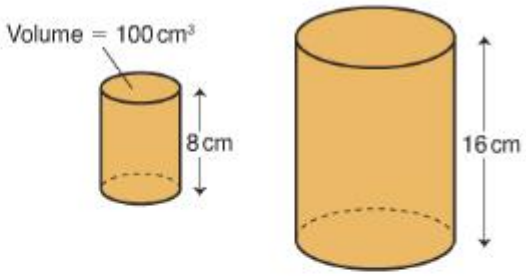


5 The two shapes are similar.
Find x.

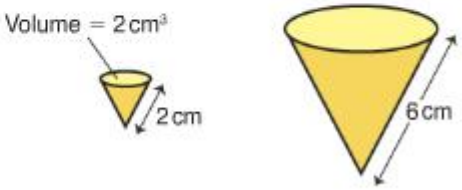


Exercise 8

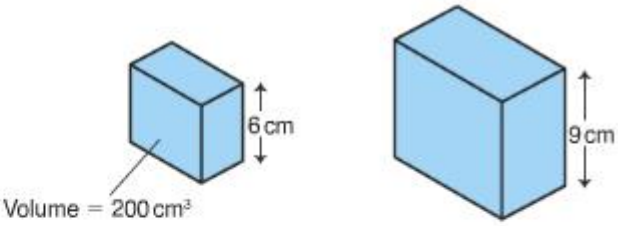
1 The cylinders shown are similar.
Find the volume of the larger cylinder.



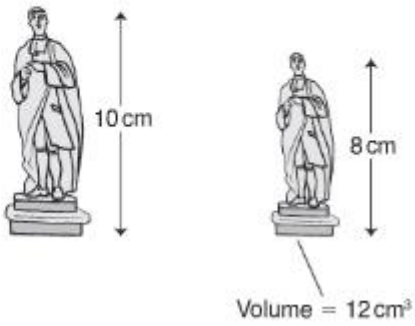
2 The cones shown are similar.
Find the volume of the larger cone.



3 The solids shown are similar.
Find the volume of the larger solid.



4 The statues shown are similar.
Find the volume of the larger statue.



Exercise 9 from brevet

25 *Extrait du Brevet*

On considère qu'une boule de pétanque a pour volume 196 cm³ et que son rayon est le double de celui du cochonnet.

Source Wikipédia. Domaine public.

a. Quel est le rapport de réduction du rayon ? (Donne une écriture fractionnaire ou décimale.)

b. En déduire le volume du cochonnet.

Exercise 10

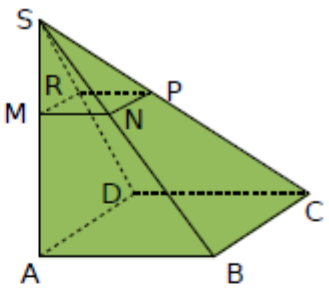
a. Sur une carte, la distance entre Paris et Bordeaux est 23,3 cm et dans la réalité, 582,5 km. Quelle est l'échelle de cette carte ?

b. La surface de la France est 675 417 km². Quelle est la superficie de la France sur cette carte ? Donne la valeur approchée au cm² près par défaut.

Exercise 11 from brevet

38 *Extrait du Brevet*

Sur la figure ci-contre, SABCD est une pyramide à base carrée de hauteur [SA] telle que AB = 9 cm et SA = 12 cm. Le triangle SAB est rectangle en A.



Soit M un point de [SA] tel que SM = x cm, où x est compris entre 0 et 12. On appelle MNPR la section de la pyramide SABCD par le plan parallèle à la base passant par M.

a. Montrer que MN = 0,75 x.

b. Soit $\mathcal{A}(x)$ l'aire du carré MNPR en fonction de x. Montrer que $\mathcal{A}(x) = 0{,}562\,5\,x^2$.

c. Recopier et compléter le tableau ci-dessous.

x en cm	0	2	4	6	8	10	12
$\mathcal{A}(x)$ en cm²							

d. Placer dans un repère les points d'abscisse x et d'ordonnée $\mathcal{A}(x)$ donnés par le tableau.

e. L'aire de MNPR est-elle proportionnelle à la longueur SM ? Justifier à l'aide du graphique.