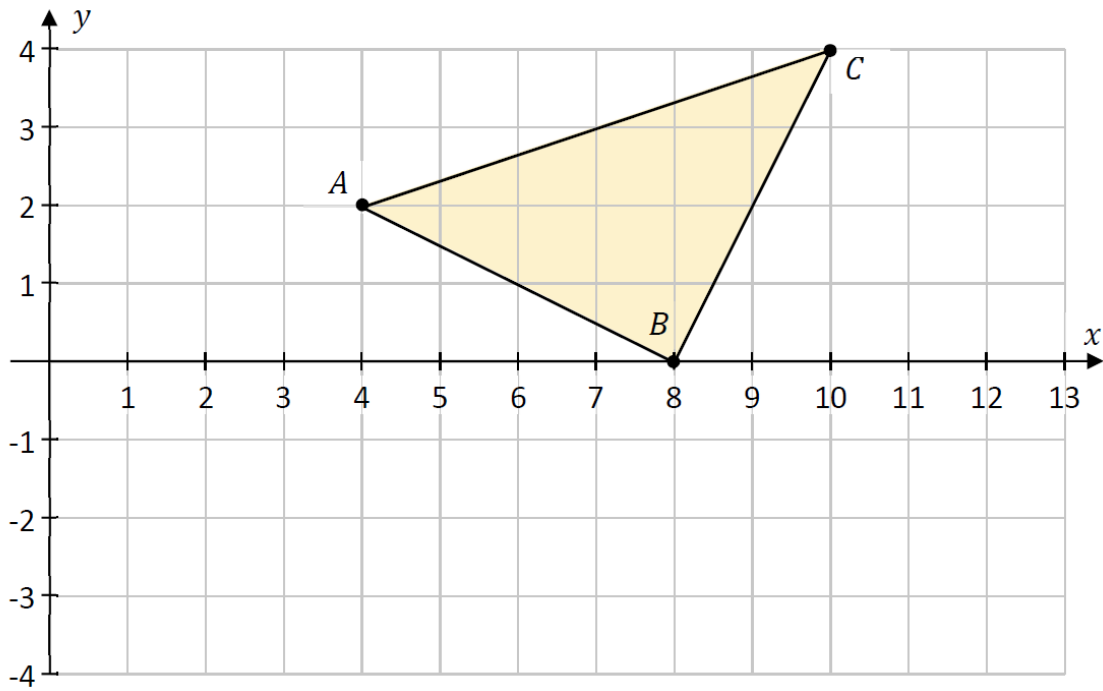


Area, Perimeter and Volume

Junior Cert Higher Level

2020 JCHL Sample Paper – Question 4 (c)

Show that the **area** of the triangle ABC is 10 square units.



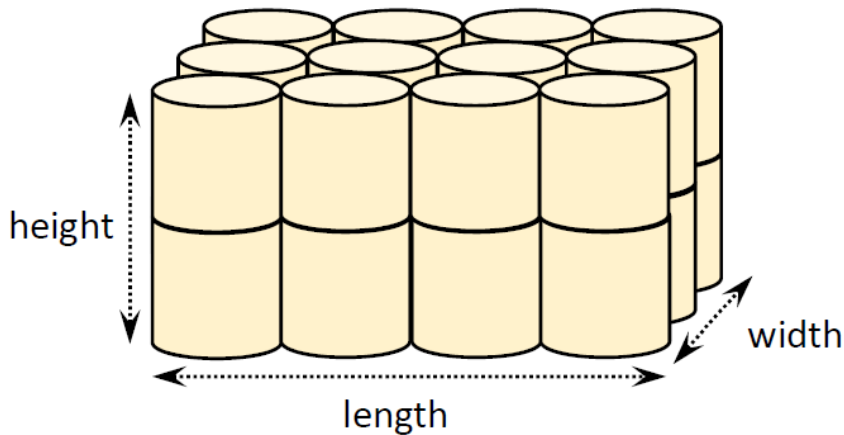
2020 JCHL Sample Paper – Question 9

- (a) A can in the shape of a cylinder has a radius of 3.6 cm and a height of 10 cm.

Work out the **volume** of the can. Give your answer in cm^3 , correct to two decimal places.

24 of these cans are to be packed into a closed rectangular box.

- (b) The cans will be arranged inside the box as follows:



- (i) Write down the height, the length, and the width of the smallest rectangular box that will be needed for these 24 cans. One is already done for you.

height = length = width =

- (ii) Work out the **volume** of this box.
(iii) Work out the **percentage** of the volume of this box that is taken up by the 24 cans.

Give your answer correct to one decimal place.

There are a number of different ways of arranging the 24 cans so that they can be packed into a rectangular box. The dimensions of the box may be different for different arrangements.

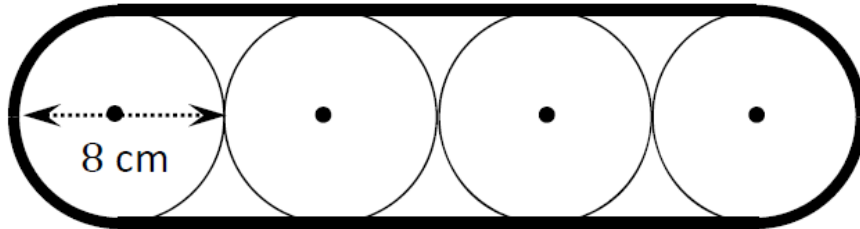
- (c) Find the dimensions of the rectangular box required for a **different** arrangement of the 24 cans. Show your working out.

height = length = width =

2019 JCHL Paper 2 – Question 10

- (a) Work out the circumference of a circle with a **diameter** of 8 cm.
Give your answer correct to one decimal place.

The rubber track for a toy digger goes around four circular wheels of diameter 8 cm, as shown.



- (b) Calculate the length of the rubber track that goes around the four wheels.
Give your answer correct to one decimal place.

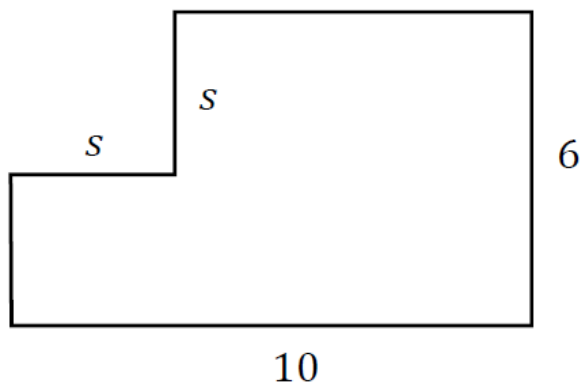
Every time the wheels turn fully, the digger travels a distance equal to one wheel's circumference.

- (c) Work out how many times each wheel will turn **fully** when the digger travels a distance equal to the length of its rubber track.

2019 JCHL Paper 2 – Question 11

In the diagram below, two of the sides have a length of s , where $0 < s < 6$ and $s \in \mathbb{R}$.

All angles are 90° or 270° .

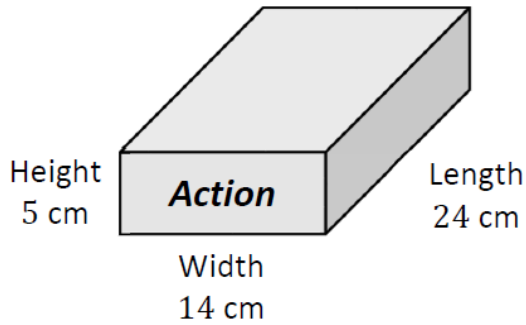


- (a) Find a formula (in algebra) for the **area** of this shape, in terms of s .
- (b) Show that (or explain why) the **perimeter** of this shape is always 32, no matter what the value of s .

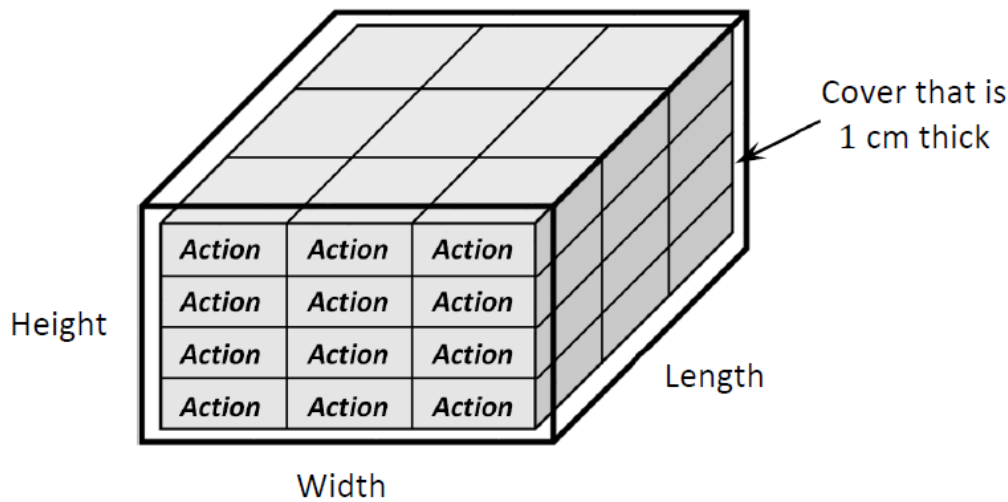
JCHL Paper 2 – Question 2

A new *Action* camera is sold in a box that is 5 cm high, 14 cm wide, and 24 cm long.

(a) Work out the **volume** of this box, in cm^3 .



36 of these boxes are packed together and a cover that is **1 cm thick** is put all around the outside of the 36 boxes, as shown below.



(b) Work out the outside dimensions of this **cover**, in cm.

The cover that is put around the 36 boxes is made of plastic.

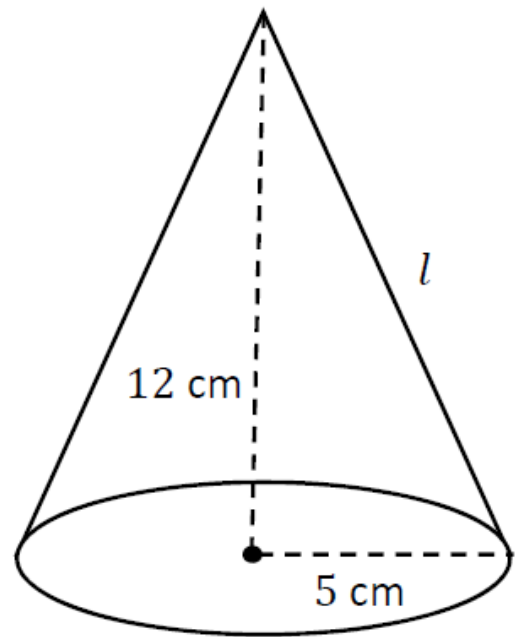
(c) Work out the **volume** of plastic in the cover.

2018 JCHL Paper 2 – Question 3

A solid cone has a radius of 5 cm and a vertical height of 12 cm, as shown.

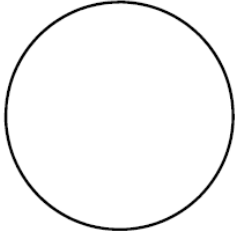
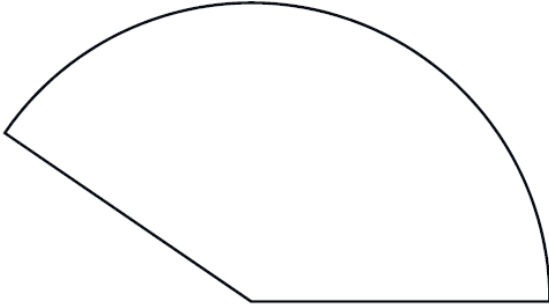
(a) Use the theorem of Pythagoras to work out the value of l , the slant height of the cone.

(b) Work out the **total surface area** of the cone.
Give your answer in cm^2 , correct to one decimal place.



The **net** of this cone is made up of two parts, a circle and a sector.
These are shown in the table below.

(c) Complete the table by filling in each of the four missing measurements.
Give each value in cm, correct to one decimal place where necessary.

Circle		Sector of Circle	
			
Radius of the circle =		Radius of the sector =	
Circumference =		Length of the arc =	

2018 JCHL Paper 2 – Question 13

When she is on holidays, Barbara sees the building shown on the right. She wants to estimate the surface area of one of the spheres of the building.

She estimates that the **radius** of this sphere is 9

- (a) Using Barbara's estimate for the radius, out her estimate of the **surface area** of sphere.

Give your answer in m^2 , in terms of π .



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m.
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The **actual radius** of this sphere is between 8 m and 10 m, inclusive.

- (b) Work out the **maximum** value of the **percentage error** in Barbara's estimate of the surface area of this sphere (i.e. the error as a percentage of the actual surface area).

Give your answer correct to the nearest percent.

2018 JCHL Paper 2 – Question 14

A pizzeria has the following poster:



A 9 inch pizza is in the shape of a circle with a **diameter** of 9 inches.

Each Big Pizza is in the shape of a bigger circle, and is divided into **6 slices of equal area**.

Use the information in the poster to work out the **radius** of a Big Pizza.

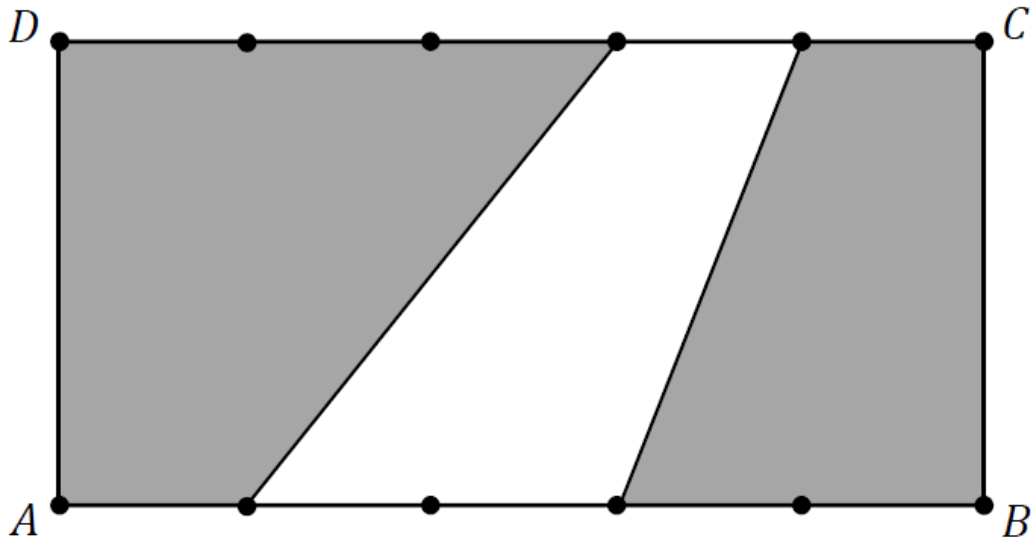
Give your answer in inches in the form $\frac{3^p}{2}$, where $p \in \mathbb{Q}$.

2017 JCHL Paper 2 – Question 2 (b)

The diagram below shows the rectangle $ABCD$.

$[AB]$ and $[CD]$ are each divided into five equal parts.

Some of the endpoints of these parts are joined by line segments, as shown.



Find the **percentage** of the area of $ABCD$ that is **shaded**. Show all of your working out.

2017 JCHL Paper 2 – Question 3

Keri has some ball bearings. Each one is in the shape of a sphere with a radius of 6 mm.

(a) Find the **volume** of one ball bearing. Give your answer in mm^3 in terms of π .

Keri is going to melt down some of her ball bearings.

She will use this material to make a sphere of radius 25 mm.

(b) Find the least number of ball bearings Keri must melt down so that she has enough material to make a sphere of radius 25 mm.

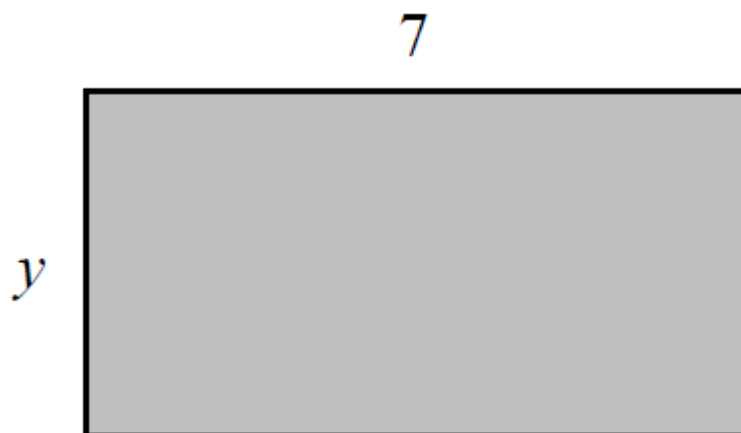
Keri has 350 ball bearings in total.

(c) Find the radius of the biggest sphere Keri could make, if she melted down all 350 ball bearings. Give your answer correct to the nearest millimetre.

2016 JCHL Paper 2 – Question 10

In this question, all lengths are in cm and all areas are in cm^2 .

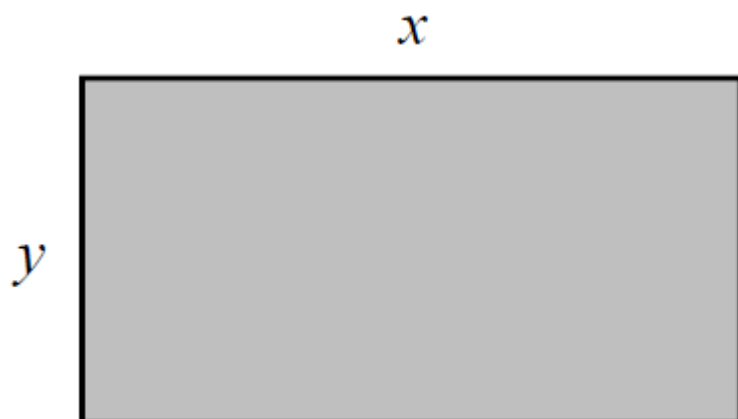
The diagram shows a rectangle with sides of length 7 and y .



The value of the area of the rectangle is equal to the length of its perimeter.

(a) Use this information to find the value of y .

The diagram shows a rectangle with sides of length x and y , where $x > 2$.



The value of the area of the rectangle is equal to the length of its perimeter.

(b) Use this information to write y in terms of x .

2016 JCHL Paper 2 – Question 11

Fiona finds the volumes of five different cylinders.

Each of them has a height of K centimetres.

- (a) Complete the table below to show the volume of each of the five cylinders.
Give each answer in terms of π and K .

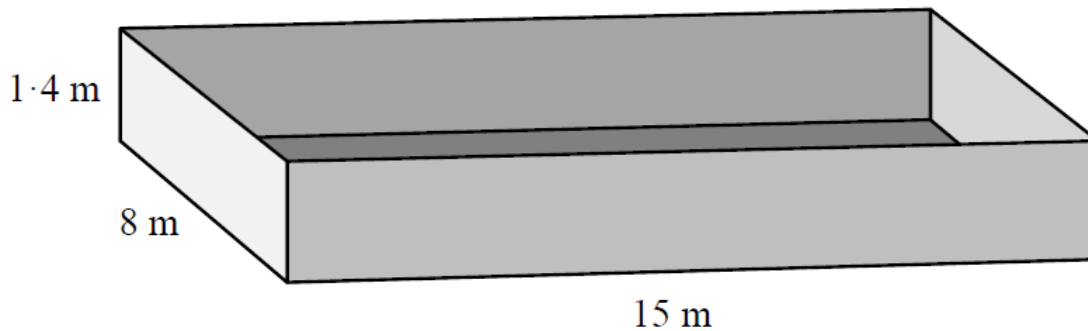
Radius of cylinder (cm)	Height of cylinder (cm)	Volume of cylinder (cm^3)
1	K	
2	K	
3	K	$9\pi K$
4	K	
5	K	

- (b) Is the sequence of volumes in the table linear, quadratic, exponential, or none of these?
Justify your answer fully.

2015 JCHL Paper 2 – Question 4

A swimming pool is 15 m long, 8 m wide, and 1.4 m deep, as shown in the diagram.

Harry says: “The area of the bottom of the swimming pool is $8 \times 15 = 120 \text{ cm}^2$ ”



(a) Explain what is **wrong** with Harry’s answer.

Harry will use $20 \text{ cm} \times 20 \text{ cm}$ tiles to cover the **inside** of the pool.

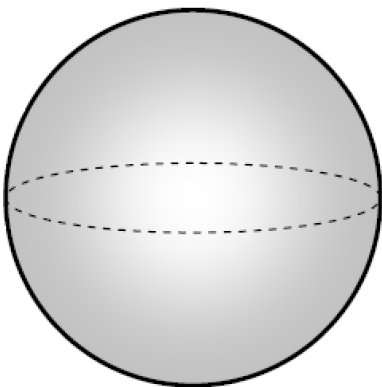
(b) Find the **minimum** number of tiles that Harry will need.

The surface of the water in the swimming pool is 10 cm below the top of the pool.

(c) Find the volume of water in the swimming pool.

2015 JCHL Paper 2 – Question 14

A small sphere has a radius of 1.5 cm.



(a) Find the **volume** of the small sphere. Give your answer in cm^3 , in terms of π .

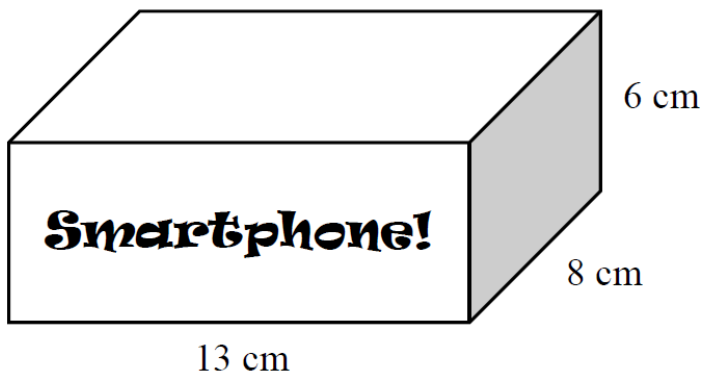
The volume of a large sphere is three times the volume of the small sphere.

(b) Find the **radius** of the large sphere.

Give your answer in cm, in the form $\frac{a\sqrt[3]{a}}{b}$ where $a, b \in \mathbb{N}$.

2014 JCHL Paper 2 – Question 2

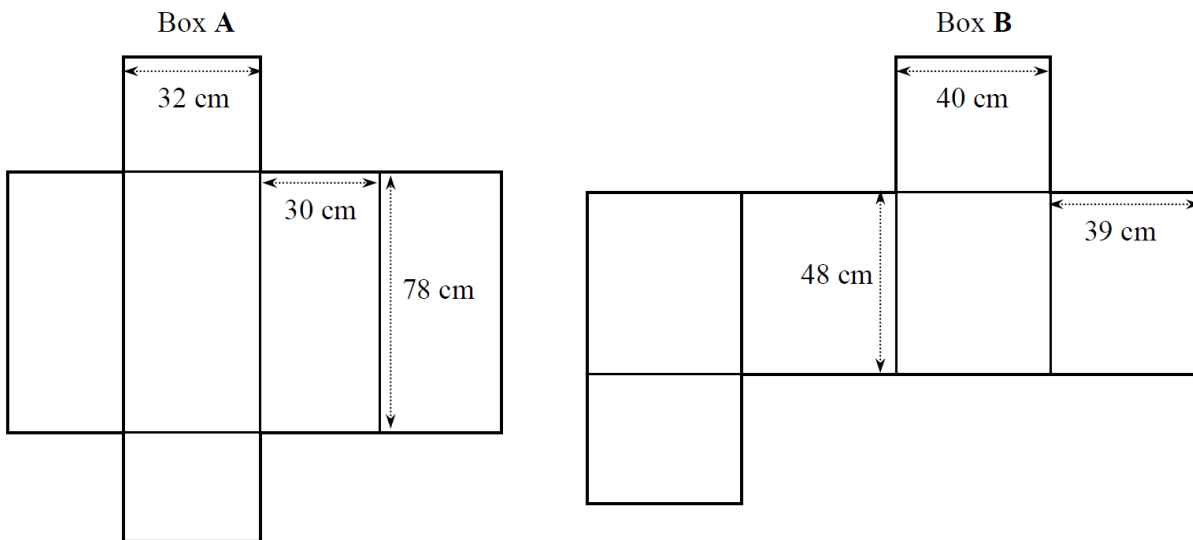
The box for an individual mobile phone is 13 cm long, 8 cm wide, and 6 cm high, as shown.



- (i) Find the volume of an individual mobile phone box.

These individual mobile phone boxes will be shipped in a large rectangular box.

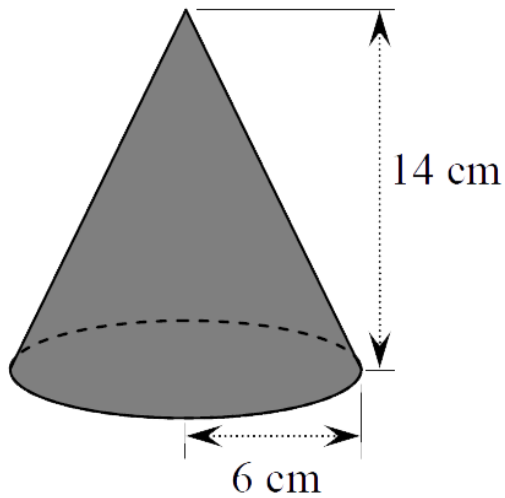
Below are diagrams of the nets of two large boxes that could be used, Box A and Box B.



- (ii) Show that Box A and Box B have the same volume.
- (iii) What is the largest number of individual mobile phone boxes that will fit in each large box?
- (iv) Find the surface area of each large box.
- (v) The large boxes are made from cardboard. The cardboard costs €0.67 per m^2 . The cardboard just covers the net of a box. Find the cost of the box that uses the least amount of cardboard.
- (vi) An average of 140 large boxes is produced each month. Find the saving, per annum, if you choose to make the box that uses the least amount of cardboard.

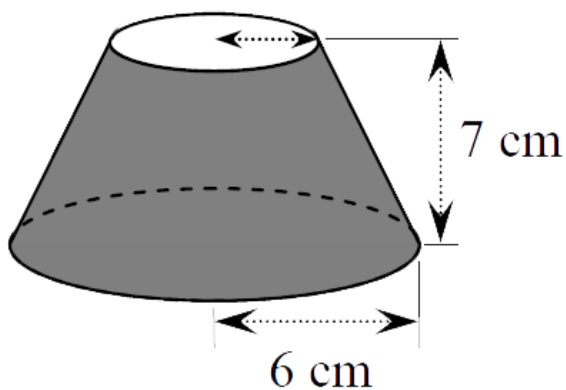
2014 JCHL Paper 2 – Question 10

A solid cone has a radius of 6 cm and a height of 14 cm, as shown.



- (i) Find the volume of the cone. Give your answer in terms of π .

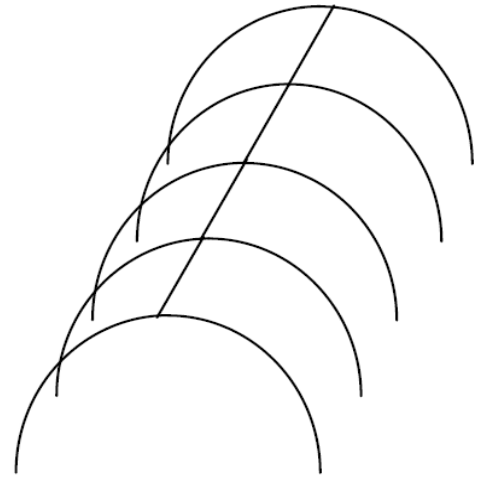
The shape shown below is a *frustum*. This is made by taking the cone above, cutting it horizontally at a height of 7 cm, and removing the upper portion. The radius of the circular top of the frustum is 3 cm, as shown in the diagram.



- (ii) Find the ratio of the volume of the frustum to the volume of the original cone.

2014 JCHL Sample Paper 2 – Question 1

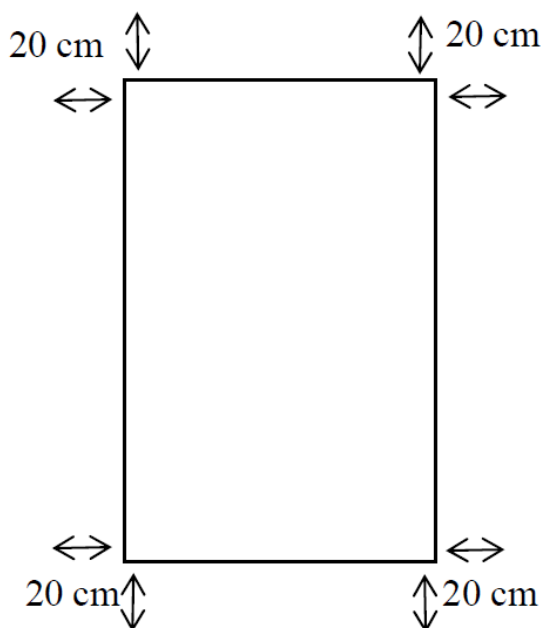
Deirdre constructs a “polytunnel” on a level part of her back garden. Five vertical, semicircular metal hoops, each of radius 2 m, are attached to brackets at ground level and covered with a polythene sheet. The hoops are 2 m apart.



(i) Find the area of ground covered by the tunnel.

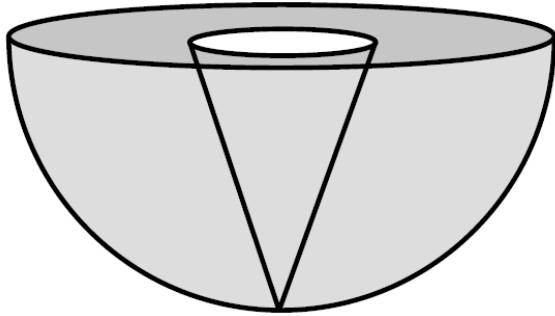
The hoops are also held in place by a straight piece of metal attached at the top of each hoop.

- (ii) Find the total length of metal needed to construct the tunnel.
- (iii) The polythene is buried in the ground to a depth of 25 cm all around the tunnel (including both ends). Find the dimensions and area of the smallest rectangular sheet of polythene that can be used.
- (iv) Find the volume of air in the tunnel.
- (v) To finish, Deirdre constructs a rectangular raised bed of height 25 cm inside the tunnel. There is a space of 20 cm between the bed and each side of the tunnel. The bed is then filled with topsoil. Soil costs €80 per tonne and 1 m^3 of soil weighs 0.75 tonnes. Find the cost of filling the bed with soil.



2013 JCHL Paper 2 – Question 14

A solid metal hemisphere has a radius of 12 cm.



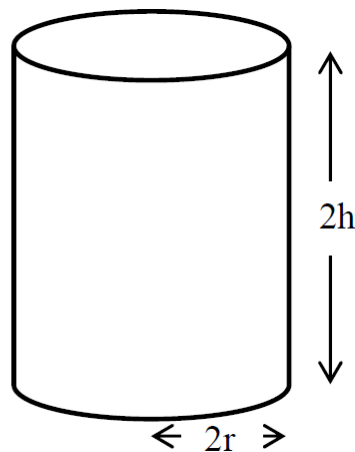
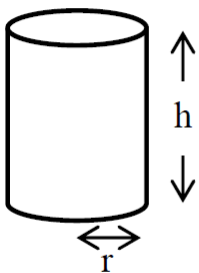
- (a) Calculate the volume of the hemisphere. Give your answer in terms of π .

A solid cone of radius 4 cm and height 12 cm is cut from the hemisphere.

- (b) Calculate the volume of the cone. Give your answer in terms of π .
- (c) The remaining metal in the hemisphere is melted down and recast into cones of the same dimensions as the cone above. How many cones can be formed from the remaining metal?

2013 JCHL Paper 2 – Question 15

The dimensions of two solid cylinders are shown in the diagrams below.



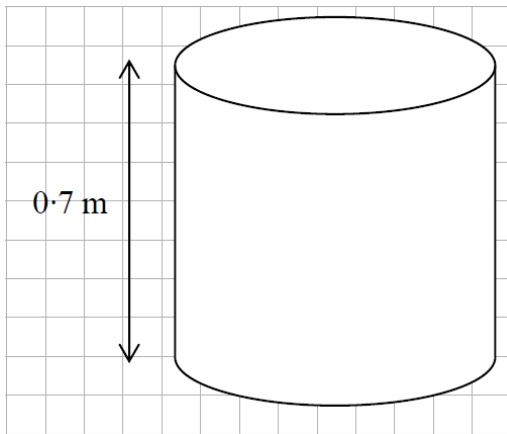
- (a) Calculate the ratio of the curved surface area of the smaller cylinder to the curved surface area of the larger cylinder.
- (b) Calculate the ratio of the volume of the smaller cylinder to the volume of the larger cylinder.

2012 JCHL Paper 2 – Question 1

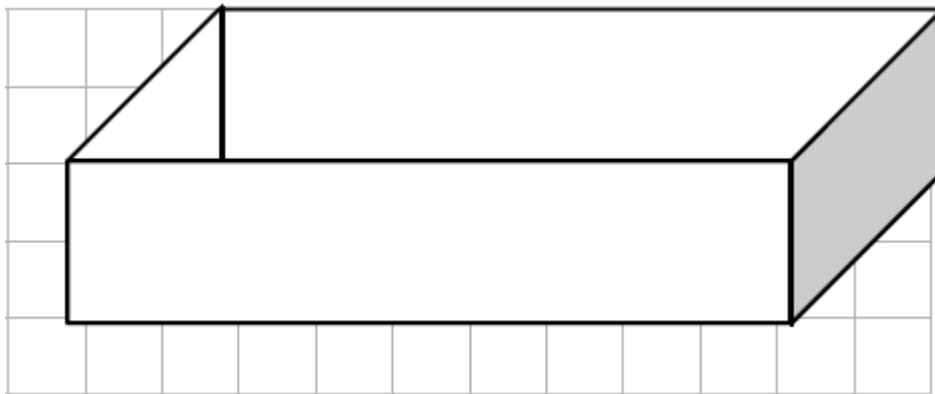
A tissue measures $300\text{ mm} \times 260\text{ mm}$. There are 100 tissues in a box.
Find the total area of tissue in the box in m^2 .

2012 JCHL Paper 2 – Question 2

(a)
A container in the shape of a cylinder has a capacity of 50 litres. The height of the cylinder is 0.7 m. Find the length of the diameter of the cylinder.
Give your answer correct to the nearest whole number.



(b)
A rectangular tank has a length of 0.6 m, a width of 0.35 m and its height measures 15 cm.



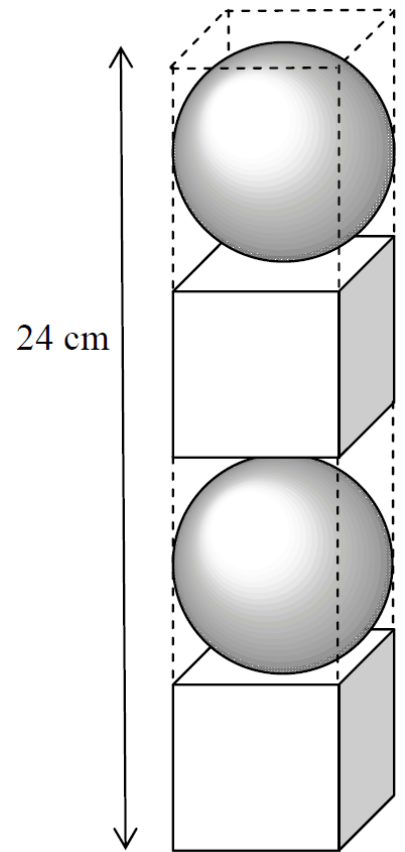
Find the capacity of the rectangular tank.

(c)
The rectangular tank is full of water. This water is then poured into the cylindrical container in (a) above. Find the depth of water in the cylinder.
Give your answer correct to one decimal place.

2012 JCHL Paper 2 – Question 3

An ornament is carved from a rectangular block of wood which has a square base and a height of 24 cm. The ornament consists of two identical spheres and two identical cubes as illustrated in the diagram. The diameter of each sphere is equal to the length of the side of each cube. The ornament has the same width as the original block.

- (a) Find the length of a side of one of the cubes.
- (b) Find the volume of the ornament.
- (c) In making the ornament, what percentage of the original block of wood is carved away?

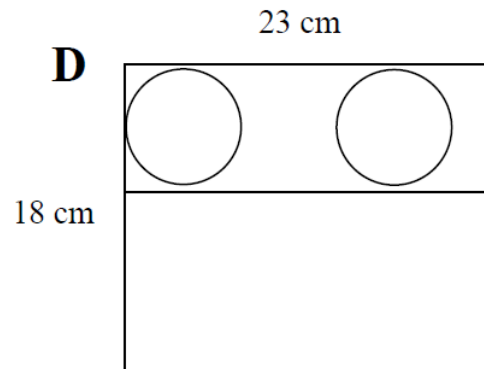
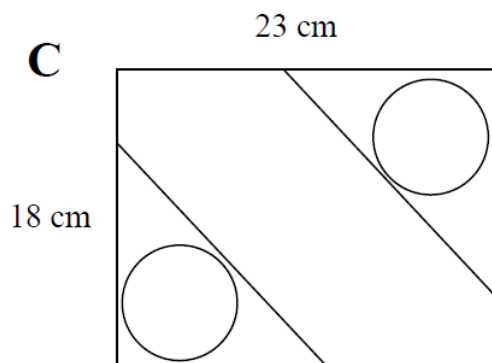
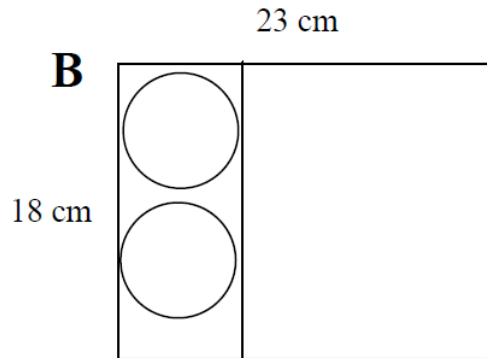
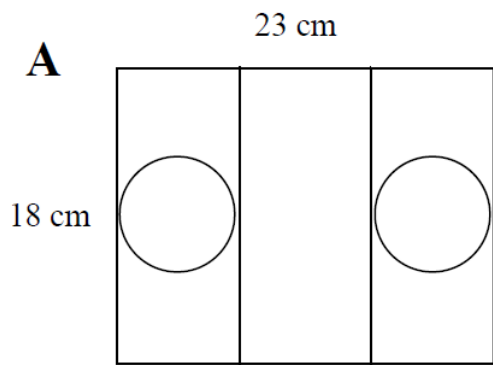


2012 JCHL Paper 2 – Question 4

A soup tin in the form of a cylinder has a diameter of 7 cm and a height of 10 cm. The cylinder is constructed from pieces of metal cut from a thin sheet measuring 23 cm by 18 cm.

- (i) Which one of the four diagrams A, B, C or D could represent the sheet of metal from which the cylinder has been cut?

Give a reason for your choice.

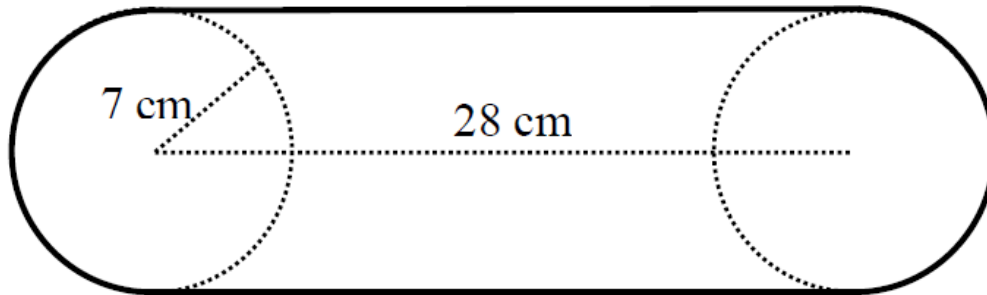


- (ii) Find the area of metal which remains after the pieces have been cut out.
- (iii) Find the capacity of the soup tin.

2011 JCHL Paper 2 – Question 1 (a)

The diagram shows two pulley wheels of equal size, connected by a drive belt. The radius of each wheel is 7 cm and the distance between the centres is 28 cm.

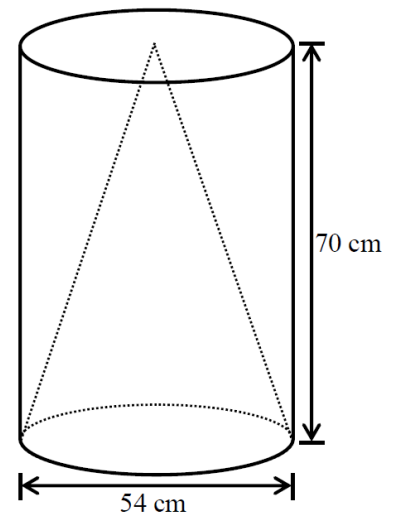
Calculate the length of the belt. Give your answer correct to the nearest whole number.



2011 JCHL Paper 2 – Question 1 (b)

The diagram shows a solid cylinder of diameter 54 cm and of height 70 cm. A cone, of the same diameter and height as the cylinder, is cut from inside the cylinder.

- (i) Calculate the volume of the cylinder. Give your answer in terms of π .
- (ii) Calculate the volume of the cone. Give your answer in terms of π .
- (iii) What fraction of the cylinder remains after the cone is removed?



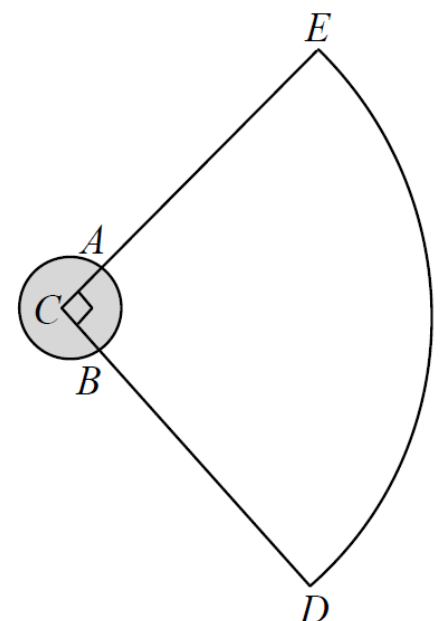
2011 JCHL Paper 2 – Question 1 (c)

The diagram, not to scale, represents a shot-put zone in an athletics stadium. The area of CDE is a quarter of the area of a disc of centre C and of radius 100 m.

- (i) Calculate the area of CDE , correct to two decimal places.

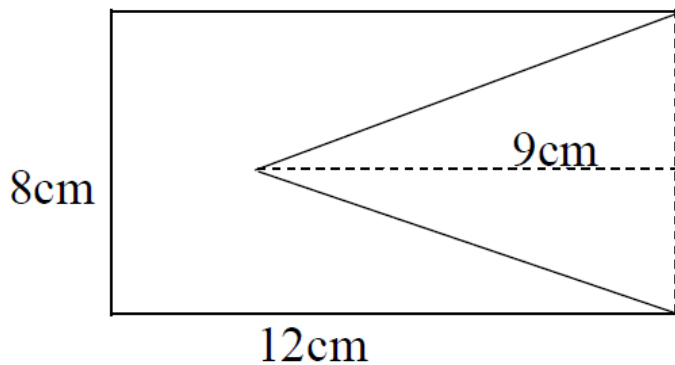
The shot-put zone consists of a throwing zone and a landing zone. The throwing zone (shaded) is a disc of centre C and of radius 1 m.

- (ii) Calculate the area of the throwing zone, correct to two decimal places.



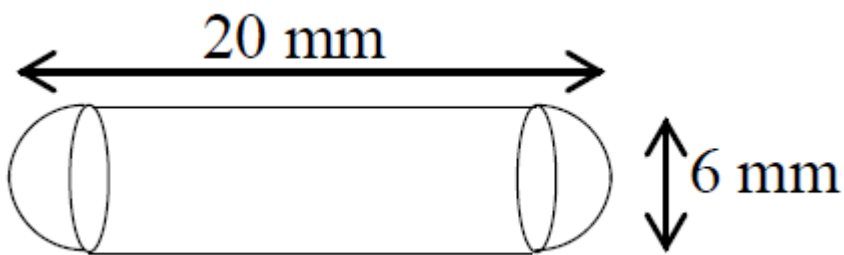
2011 JCHL Sample Paper 2 – Question 1 (a)

The diagram shows a rectangular piece of cardboard with a triangular section cut out. Calculate the area of the cardboard.



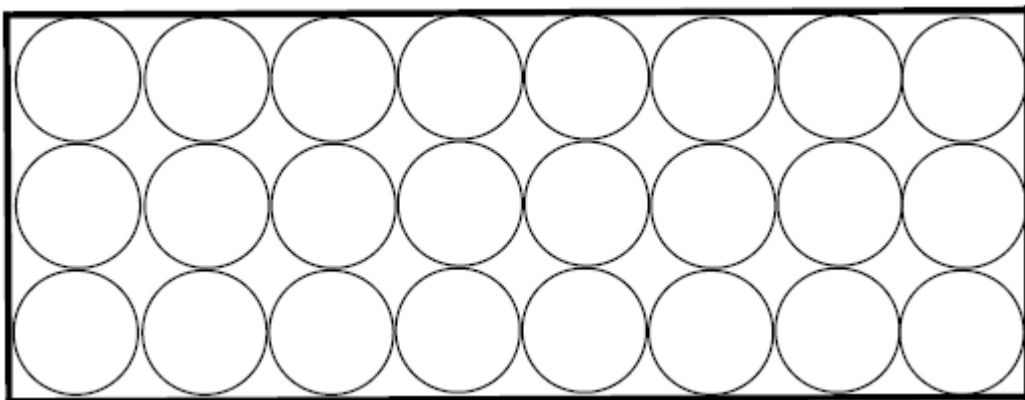
2011 JCHL Sample Paper 2 – Question 1 (c)

A vitamin capsule is in the shape of a cylinder with hemispherical ends. The length of the capsule is 20 mm and the diameter is 6 mm.



- (i) Calculate the volume of the capsule, giving your answer correct to the nearest mm^3 .

A course of these vitamins consists of 24 capsules. The capsules are stacked in three rows of eight in a box, as shown in the diagram.



- (ii) How much of the internal volume of the box is not occupied by the capsules.