OER
TOPIC: Packaging cylindrical objects into a rectangular box

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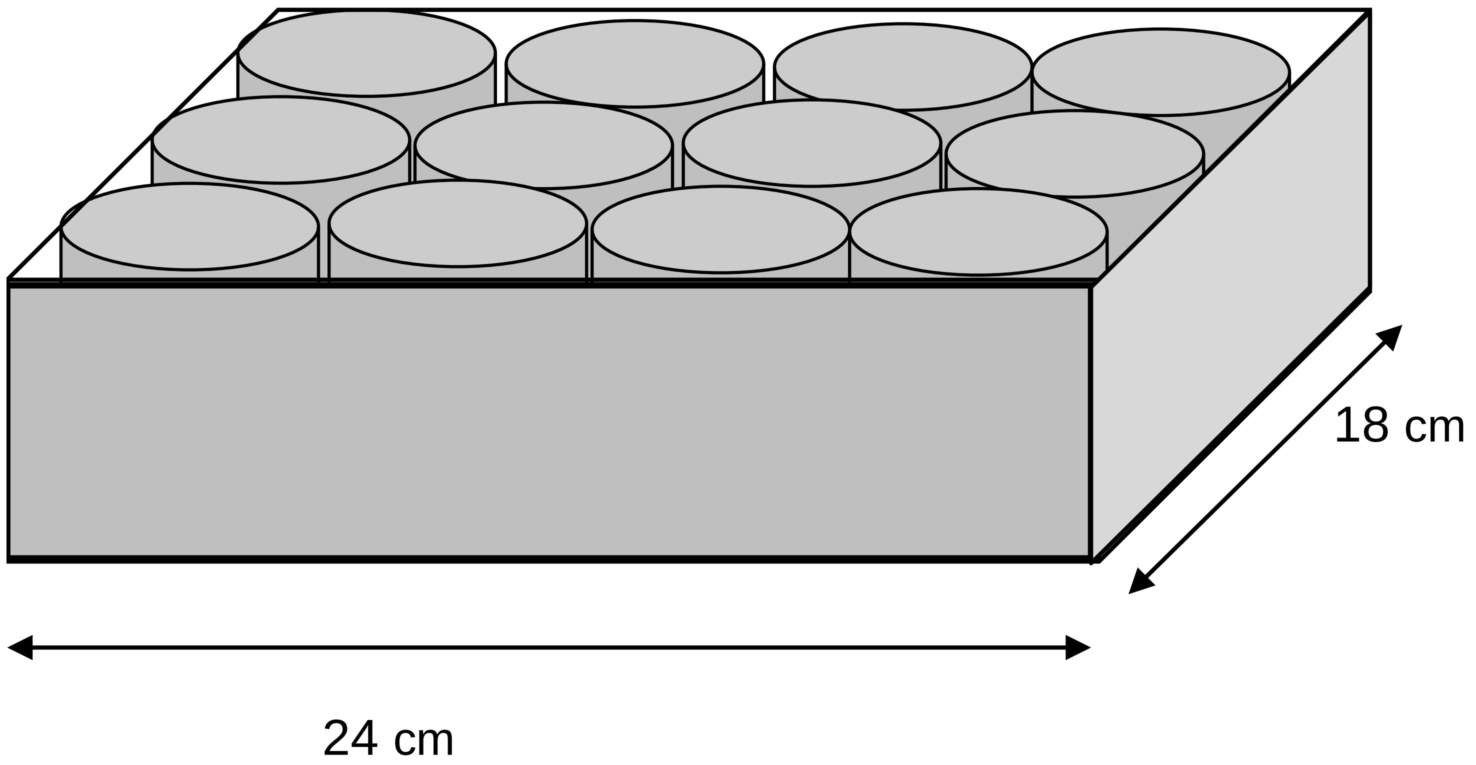
Purpose

- The purpose of this presentation is to demonstrate how calculations that involve the packaging of cylindrical objects into rectangular boxes should be dealt with.

3.3 Cans of soup are often packed in boxes, as shown below.



3.4.1 Calculate the radius of each can in the box. (2)

3.4.2 Calculate the area of the base of the box that is wasted between all of the cans. (4)

3.4.2 Calculate the volume of the box that is not taken up by the cans if the height of both box and cans is 120 mm. (3)

1.1 To answer this question, start with the 24 cm side of the box. We count the number of cans that we can see along this side, which is four. We then ask ourselves, if four cans give us the length of 24 cm, what about one can? This will be 24 cm divided by 4, which will give 6 cm, which is the diameter of one can. To find the radius of one can, we therefore divide the diameter by 2, which gives us 3 cm. The answer would still be the same if we chose the narrower side of the box, which is 18 cm (ie. 18÷3=6 cm=D; r=D/2=6/2=3 cm).

1.2 To calculate the area of the base that is wasted, we need to find the area of box and then subtract the area of cans:

Area of box = L x B =24 cm x18 cm

= $432\ cm^2$

Area of cans= $\pi r^2 \times 12\ cans$

$= 3.142 \times (3\ cm)^2 \times 12$

$= 339{,}336\ cm^2$

Wasted area = Area of box – Area of Cans

$= 432\ cm^2 - 339{,}336\ cm^2$

$= 92{,}664\ cm^2$

1.3 To calculate the volume of the box that is not taken, note that we have already calculated wasted area and we know that:

Volume of box= Area X Height.

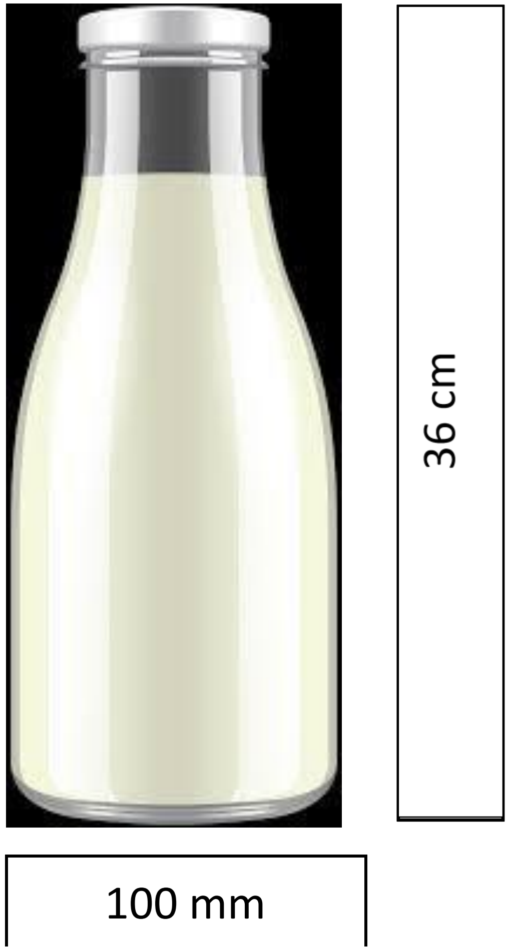
The given height is in mm while our area is in cm^2. So, we should convert mm into cm.

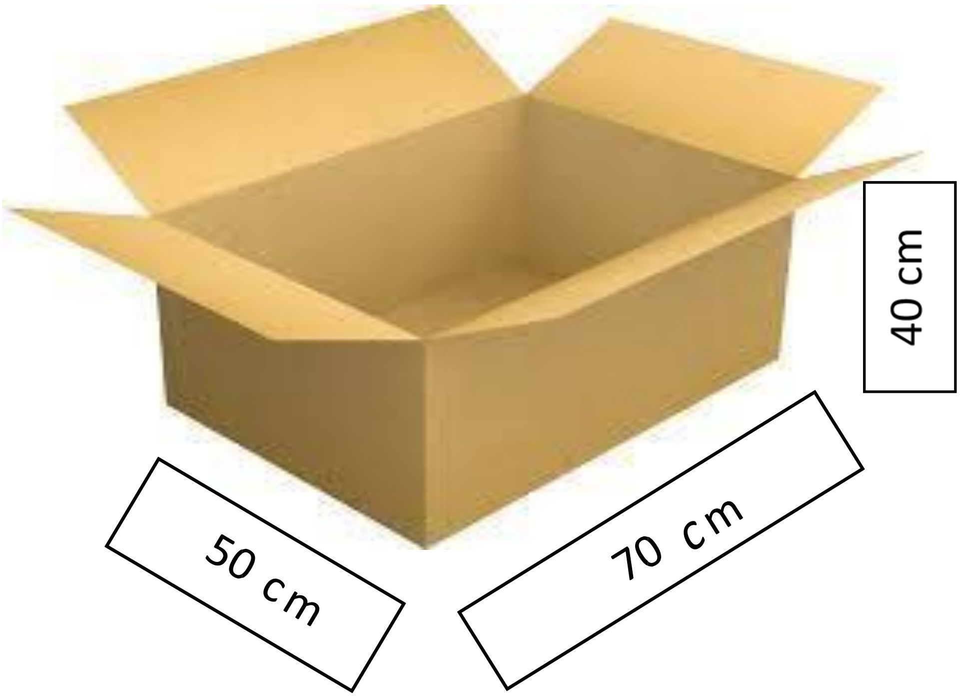
120mm= 12cm

Volume =$92{,}664\ cm^2 \times 12\ cm$

=$1111{,}968\ cm^3$

The students are supposed to carry a number of $2\ l$ bottles home from the supermarket.





1. Determine the number of $2\ l$ bottles that can be placed (packaged) in the box.

- Given:
  - Volume of a cylinder = $\pi r^2 h$;
  - $\pi = 3.142$
  - Volume of box= $l \times b \times h$

Convert 100 mm to cm

=100 mm ÷ 10=10 cm

Dividing the height of the box by the height of each bottle $=$ 40 cm ÷ 36 cm = 1,111.

This simply means that we cannot stack one bottle on top of another.

- Number of bottles that will be along the length of the box=

$$\frac{length\ of\ the\ box}{diameter\ of\ the\ bottle} = \frac{70cm}{10cm}$$

$$= 7\ bottles.$$

- Number of bottles along the breadth of the box =

$$\frac{Breadth\ of\ the\ box}{diameter\ of\ the\ bottle} = \frac{50cm}{10cm}$$

$$= 5\ bottles$$

The number of bottles that can be packaged in one box is
7 x 5 = 35 bottles.

Thank You