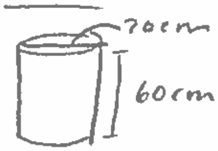
E: Prisms and Cylinders

Examples:

1. Two cylinders have the same volume. The first cylinder has a diameter of 20cm and a height of 60cm. The second cylinder has a diameter of 16cm. What is the height of the second cylinder, to the nearest tenth of a centimetre?

1st



2nd

$V = A_b \times h$

$= \pi r^2 \times h$

$= (3.14)(10)^2(60)$

$= (3.14)(100)(60)$

$= 18840 \text{ cm}^3$

$r = \frac{20}{2}$

$= 10\text{cm}$

$V_1 = V_2$

$V_2 = \pi r^2 \times h$

$r = \frac{16}{2}$

$= 8$

$18840 = (3.14)(8)^2 \times h$

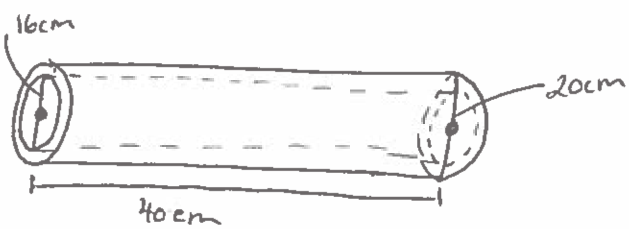
$18840 = (3.14)(64) \times h$

$18840 = 200.96h$

$\frac{18840}{200.96} = \frac{\cancel{200.96}h}{\cancel{200.96}}$

$\boxed{93.8 \text{ cm} = h}$

2. A pipe has an outside diameter of 20cm, an inside diameter of 16cm, and a height of 80cm. What is the capacity of the pipe, to the nearest tenth?



$V = A_b \times h$

$= \pi r^2 \times h$

$= (3.14)(8)^2(40)$

$= (3.14)(64)(40)$

$= 8038.4\text{cm}^3$

- Use the inner dimensions because that is where the liquid will "fill" up.

$r = \frac{16}{2}$

$= 8$

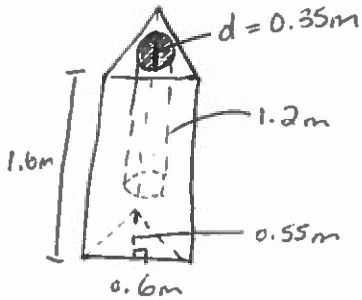
Capacity usually is measured in Litres (L) so remember:

$1L = 1000\text{cm}^3$

$\frac{8038.4\text{cm}^3}{1000}$

$\boxed{= 8.0L}$

3. A cardboard container has the shape of a right triangular prism. Inside the container is a cylindrical hole. Find the volume of cardboard needed to make the containers, to the nearest tenth.



$r = \frac{0.35}{2}$

$= 0.175$

$V = V_{outside} - V_{inside}$

$= V_T - V_c$

$= A_b \times h - A_b \times h$

$= \frac{bh_T}{2} \times h_p - \pi r^2 \times h$

$= \frac{(0.6)(0.55)}{2} \times 1.6 - (3.14)(0.175)^2(1.2)$

$= (0.165)(1.6) - (3.14)(0.030625)(1.2)$

$= 0.264 - 0.115395$

$\boxed{= 0.1\ m^3}$

Assignment Pg. 273 # 3-7

→ The answer to 6 in the text is wrong. It should be $2009.6\text{cm}^3 = 2.0\text{L}$ not 2.0cm^3

E: Prisms and Cylinders Continued

Examples:

1. A company uses shipping crates with dimensions 3.5m x 3.5m x 7.5m. They need to ship 30 000 boxes with dimensions 10.5cm x 10.5cm x 20.5cm. Will they all fit in one crate?

$V_{crate} = A_b \times h$
$= lwh$
$= (3.5)(3.5)(7.5)$
$= 91.875 m^3$

10.5cm x 10.5cm x 20.5cm

$\Downarrow$

0.105m x 0.105m x 0.205m

$V_{Box} = A_b \times h$
$= lwh$
$= (.105)(.105)(.205)$
$= 0.002260125 m^3$

$(0.002260125)(30\,000) = \boxed{67.80375 m^3}$

They will fit in one crate.

2. A rectangular tub with dimensions ~~2.5~~ 2.5m x 1.5m x 1m is filled with water using a pail of radius 0.15m and height 0.4m. How many pails of water will be required to fill the tub?

$V_{Tub} = A_b \times h$
$= lwh$
$= (2.5)(1.5)(1)$
$= 3.75 m^3$

$V_{Pail} = A_b \times h$
$= \pi r^2 \times h$
$= (3.14)(0.15)^2(0.4)$
$= (3.14)(0.0225)(0.4)$
$= 0.02826 m^3$

$\frac{V_{Tub}}{V_{pail}} = \frac{3.75}{0.02826}$

$= 132.696$ $\therefore$ 133 pail

Assignment Pg. 273 #8-17