1. An artist has 20 triangular prisms like the one shown. He decides to use them to build a giant triangular prism with a triangular base of length 5.6 m and height 6.8 m.

a) Does he have enough small prisms?

b) What is the volume of the new prism to the nearest hundredth of a metre?

2. Two cylinders have the same volume. The first cylinder has a diameter of 10 cm and a height of 30 cm. The second cylinder has a diameter of 8 cm. What is the height of the second cylinder, to the nearest tenth of a centimetre?

3. A concrete culvert that is 10 m long has an outside diameter of 1 m and an inside diameter of 0.8 m. Determine the volume of concrete required to make the culvert, to the nearest tenth of a cubic centimetre.
4. A pipe has an outside diameter of 10 cm, an inside diameter of 8 cm, and a height of 40 cm. What is the capacity of the pipe, to the nearest tenth of a cubic centimetre?

$$V = \pi r^2 h$$
$$= \pi \times 4^2 \times 40$$
$$= 2010.65 \text{ cm}^3$$

Capacity is litres or mL as well.

So approx 2 Litres.

5. A clay planter has the shape of a right triangular prism as shown. Inside the planter is a cylindrical hole. Calculate the volume of clay needed to make the planter, to the nearest tenth of a cubic centimetre.

$$\text{Vol of clay} = 0.931 \text{ m}^3$$

6. Manuel's company uses shipping crates with dimensions 3 m x 3 m x 7 m. He has to ship 25,000 boxes with dimensions 10 cm x 10 cm x 20 cm. Calculate whether one crate will be enough.

$$10 \times 10 \times 20 = 2000 \text{ cm}^3$$

$$\div 100^3$$

$$0.002 \text{ m}^3$$

$$\times 25,000 \text{ boxes}$$

$$50 \text{ m}^3$$

Yes, one crate should work!
7. Laura, an office manager, has purchased a carton that is 300 cm × 400 cm × 600 cm to store 9000 boxes of files. Each box has dimensions 30 cm × 26 cm × 10 cm. Calculate whether all of the files will fit in the carton.

\[\text{boxes of files} = 36 \times 26 \times 10 = 7800 \text{ cm}^3\]

8. In the cafeteria at Prairietown School, the garbage can is filled up twice every lunch hour. The garbage can is a cylinder with a radius of 25 cm and a height of 95 cm.

a) Determine the volume of garbage produced each day in the cafeteria.

\[V = \pi r^2 h = \pi \times 25^2 \times 95 = 186532.1 \text{ cm}^3\]

b) Determine the volume of garbage produced in a 5-day week.

\[186532.1 \times 5 = 932660.5 \text{ cm}^3\]

The school's environment club wants to reduce the weekly garbage to below 470 000 cm³ by encouraging students to recycle. To reach this goal, how many times should the garbage can be filled each lunch hour?

A cylinder has a diameter of 80 cm and a length of 45 cm. Another cylinder has the same volume but is 80 cm long. What is the diameter of the longer cylinder?
10. A rectangular tub with dimensions $2 \times 1 \times 0.5$ m is filled with water using a pail of radius 0.1 m and height 0.35 m. How many pails of water will be required? Give your answer to the nearest whole pail.

$$V = \pi \times 0.1^2 \times 0.35 = 0.01099557$$

No of pails = $\frac{1}{0.01099557} = 90.94$ so 91 pails needed

11. Ted sells his homemade peanut butter for $1.60 a jar at the local Farmers’ Market. The jar is 8 cm in diameter and 10 cm high. He decides he will also sell peanut butter in jars that are 16 cm in diameter and 20 cm high. What should he charge if he uses the same price per cubic centimetre?

$$V = \pi \times 8^2 \times 20 = 4024.24 \text{ cm}^3$$

$$\text{Price/cm}^3 = \frac{1.60}{4024.24} = \$0.000398$$

$\$1.27$59

12. a) A wooden block is formed in the shape shown by cutting a right rectangular solid from a larger one. What is the volume of the solid shown?

b) Check your calculations by using a second method to solve the problem.
13. Fatima wants to fill a circular wading pool. She does not have a hose, so she uses a rectangular pail that she fills from a tap. The inside diameter of the pool is 120 cm and it is 25 cm deep. The inside dimensions of the pail are 30 cm \times 22 cm \times 24 cm deep.

a) Fatima wants to fill the pool to a depth of 18 cm. What volume of water does she have to carry?

b) Each time she goes to the tap, Fatima fills the pail to a height of 20 cm. What is the volume of water in the pail?

c) Calculate how many pails of water Fatima has to carry to fill the pool to a depth of 18 cm.

\begin{align*}
\text{Volume of a cube} & = s \times s \times s \\
\text{So, 8000 is the product of three equal numbers. What number is it?}
\end{align*}

\begin{align*}
\text{Volume of a cylinder} & = \pi \times \text{rad}^2 \times \text{height} \\
& = \pi \times 10^2 \times 10 \\
& = 3143.2 \text{ cm}^3
\end{align*}

14. A cylindrical vase fits perfectly in a cube-shaped box. If the box has a volume of 8000 cm³, what is the volume of the vase?
15. Kevin and Jasjot plan to install a culvert that is 8 m long and holds a volume of 40 m$^3$ of water. What diameter of culvert should they use?

![Diagram of a culvert]

\[\text{Volume} = \pi \times r^2 \times \text{Length}\]

\[40 \text{ m}^3 = \pi \times r^2 \times 8\]

\[\frac{40}{\pi \times 8} = r^2\]

\[r^2 = 1.59\]

\[r = \sqrt{1.59}\]

\[r = 1.26\text{ m}\]

16. The end of a car tunnel has the shape of a semi-circle on top of a rectangle. The tunnel is exactly 4 km long.

a) Calculate the volume of air in the tunnel with no cars in it.

b) The air in a car tunnel must be exchanged frequently. If the exhaust system pumps the air out at a rate of 10 m$^3$ per second, how long does it take to replace the stale air with fresh air in the entire tunnel? Give your answer in hours and minutes.

![Diagram of a car tunnel]

\[\text{Volume of cylinder} = \pi \times r^2 \times h\]

\[\text{Volume of semi-circle} = \frac{1}{2} \pi \times r^2 \times h\]

\[\text{Volume of rectangle} = \text{Base} \times \text{Height}\]

\[\text{Total Volume} = \text{Volume of cylinder} + \text{Volume of semi-circle} + \text{Volume of rectangle}\]

\[\text{Volume of cylinder} = \pi \times 2.5^2 \times 4000\]

\[= 39269.9\text{ m}^3\]

\[\text{Volume of semi-circle} = \frac{1}{2} \pi \times 2.5^2 \times 4000\]

\[= 149269.9\text{ m}^3\]

\[\text{Volume of rectangle} = 5 \times 5.5 \times 4000\]

\[= 110000\text{ m}^3\]

\[\text{Total Volume} = 110000 + 39269.9 + 149269.9\]

\[= 149269.9\text{ m}^3\]

\[10\text{ m}^3\ \text{per sec} = 10 \times 60 = 600\text{ m}^3/\text{min}\]

\[149269.9 \div 600 = 248.8\text{ min} + 0.15\]

\[248.8 \div 60\text{ min} = 4\text{ hours} + 9\text{ min}\]