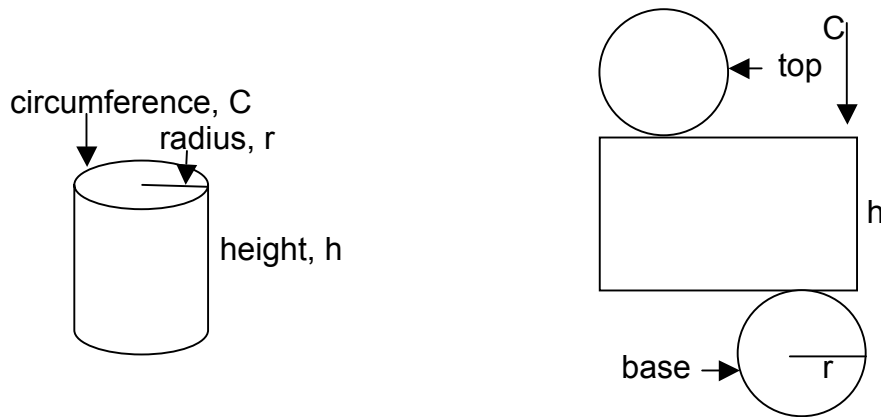


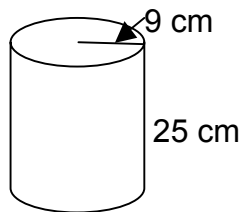
## 7.7 SURFACE AREA OF CYLINDERS AND SPHERES

A cylinder is like a prism but its bases are circles. To find the surface area of a cylinder, you need to find the area of the two circles and the area of the side between them – the lateral face. It is easy to see how to do this by drawing a net of a cylinder.



From this net, you can see that the cylinder is made up of 2 circles and the lateral face which is a rectangle. The length of the rectangle is the circumference of the circle, and the width of the rectangle is the height of the cylinder. To calculate the surface area of a cylinder, calculate these parts and add them together.

Example 1: Calculate the surface area of a cylinder that has a radius of 9 cm and a height of 25 cm, as shown below.



Solution: Find the area of the base, the circumference of the cylinder, and the area of the lateral face.

$$\text{Area of the base} = \pi r^2 = \pi \times 9^2 = 254.5 \text{ cm}^2$$

$$\text{Circumference of the cylinder} = 2\pi r = 2 \times \pi \times 9 = 56.5 \text{ cm}$$

$$\text{Area of the lateral face} = C \times h = 56.5 \times 25 = 1412.5 \text{ cm}^2$$

$$\begin{aligned} \text{Total Surface Area} &= 2 \times \text{area of the base} + \text{area of the lateral face} \\ &= 2 \times 254.5 + 1412.5 = \mathbf{1921.5 \text{ cm}^2} \end{aligned}$$

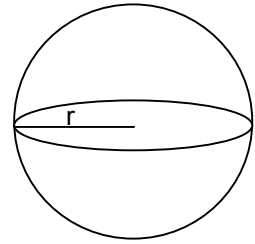
NOTE: The formula for surface area of a cylinder is:

$$\text{SA} = 2\pi rh + 2\pi r^2$$

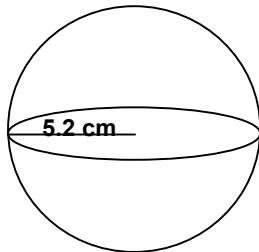
A sphere is like a ball. All points on a sphere are the same distance from the centre. It is not possible to draw the net of a sphere, and thus we simply use a formula to calculate its surface area. The surface area depends on the radius of the sphere.

The formula for surface area of a sphere is:

$$SA = 4\pi r^2$$



Example 2: Calculate the surface area of the following sphere.



Solution: Use the formula to calculate the surface area.

$$SA = 4\pi r^2 = 4 \times \pi \times 5.2^2 = 339.8 \text{ cm}^2$$

Example 3: If a ball has a surface area of  $3500 \text{ mm}^2$ , what is the radius of this ball?

Solution: Use the formula to calculate the radius, given the surface area.

$$SA = 4\pi r^2$$

$$3500 = 4\pi r^2$$

Divide each side by  $4\pi$ . The right side will cancel out.

$$\frac{3500}{4\pi} = \frac{4\pi r^2}{4\pi}$$

$$\frac{3500}{4\pi} = r^2$$

Divide the left side:  $3500 \div (4 \times \pi)$

$$278.52 = r^2$$

To find  $r$ , use the square root button.

$$\sqrt{278.52} = \sqrt{r^2}$$

$$16.7 = r$$

The radius is approximately 16.7 cm.

## **ASSIGNMENT 7.7 – SURFACE AREA OF CYLINDERS AND SPHERES**

- 1) Draw a net and use it to find the surface area of a pipe that has a radius of 15 cm and is 75 cm long.
- 2) Find the surface area of a cylindrical pop can that is 37 cm tall and has a *diameter* of 8 cm.
- 3) A sphere has a radius of 7.6 m. What is its surface area?
- 4) Find the radius of a sphere with a surface area of  $6700 \text{ m}^2$ .
- 5) A hemisphere is **half** a sphere. What is the surface area of a hemisphere with a radius of 28.4 mm?