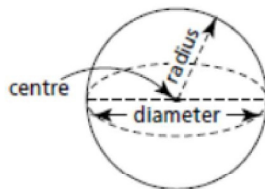


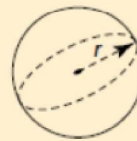
Lesson Five – Surface Area and Volume of a Sphere

Surface Area of a Sphere



Surface Area of a Sphere

The surface area, SA , of a sphere with radius r is:
 $SA = 4\pi r^2$



Example 1

The diameter of a softball is approximately 4 in. Determine the surface area of a softball to the nearest square inch.

$$\begin{aligned}
 SA &= 4\pi r^2 \\
 &= 4\pi (2)^2 \\
 &= 16\pi \text{ in}^2 \quad \leftarrow \text{exact value}
 \end{aligned}$$

\therefore radius = 2 in

$$\therefore \text{surface}^{\text{area}} \text{ is } 50 \text{ in}^2 \quad \leftarrow \text{approx. value (to the nearest square inch)}$$

Example 2

The surface area of a soccer ball is approximately 250 square inches.

~~What is~~ the diameter of a soccer ball
Determine

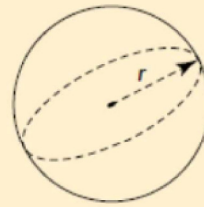
$$\begin{aligned}
 SA &= 4\pi r^2 \\
 250 &= 4\pi r^2 \\
 \frac{250}{(4\pi)} &= r^2 \\
 \sqrt{\text{ans}} &= r \\
 4.46\dots &= r \\
 \text{radius is } &4.46\dots \text{ in} \\
 d &= 2r \\
 &= 8.921 \text{ in}
 \end{aligned}$$

Volume of a Sphere**Volume of a Sphere**

The volume, V , of a sphere with radius r is:

$$V = \frac{4}{3}\pi r^3$$

$$\text{or } V = \frac{4\pi r^3}{3}$$

**Example 3**

The moon approximates a sphere with diameter 2160 mi. What is the approximate volume of the moon?

$$\begin{aligned}
 V &= \frac{4\pi r^3}{3} \\
 &= \frac{4\pi (1080)^3}{3} \\
 &= 5276669286 \text{ mi}^3 \\
 &\approx 5300000000 \text{ mi}^3 \\
 &\text{or } 5.3 \times 10^9 \text{ mi}^3
 \end{aligned}$$

$d = 2160 \text{ mi}$
 $r = 1080 \text{ mi}$

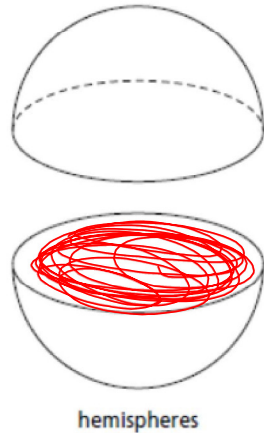
SA and Volume of Spheres.notebook

MAAPC20S

Measurement

Lesson 5

When a sphere is cut in half, two *hemispheres* are formed.



$$\begin{aligned} SA &= 2\pi r^2 + \pi r^2 \quad \text{base} \\ &= 3\pi r^2 \\ LSA &= 2\pi r^2 \end{aligned}$$

Example 4

A hemisphere has radius 5.0 cm.

Determine
a) ~~What is~~ the surface area of the hemisphere

Determine
b) ~~What is~~ the volume of the hemisphere

$$\begin{aligned} \text{a) } SA &= \frac{1}{2} \text{ sphere} + \text{area of a circle} \\ &= \frac{1}{2} (4\pi r^2) + \pi r^2 \quad \leftarrow \text{could plug } r=5 \text{ in here} \\ &= 3\pi r^2 \\ &= 3\pi (5)^2 \rightarrow 75\pi \text{ cm}^2 \text{ (exact value)} \\ &= 235.619 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{b) } V &= \frac{4\pi r^3}{3} \div 2 & \text{or} & \quad V = \frac{2}{3}\pi r^3 & \text{or} & \quad V = \frac{2\pi r^3}{3} \\ V &= \frac{4\pi (5)^3}{3} \div 2 & & \quad V = \frac{2}{3}\pi (5)^3 & & \quad = \frac{2\pi (5)^3}{3} \\ V &= 261.799 \text{ cm}^3 & & & & \end{aligned}$$

Assignment: Pg 51; 3 (a,c), 5 a, 8, 10, 12, 17 a