11.6 Surface Area and Volume of Spheres

Learning Target: The students will learn
- the formula for the surface area of a sphere
- the formula for the volume of a sphere
- using both

A. Spheres

If a sphere and a plane intersect, the cross section will be a circle. If the plane passes through the center of the sphere, the cross section is called a GREAT CIRCLE.

B. Surface Area

The surface area of a sphere is four times the product of \( \pi \) and the square of the radius of the sphere.

\[
S.A. = 4\pi r^2
\]

1. Find the surface area of this sphere. Leave your answer in terms of \( \pi \).

\[
4\pi(4^2) = 64\pi \text{ m}^2
\]

2. Geography Earth's equator is about 24,902 mi long. Approximate the surface area of Earth by finding the surface area of a sphere with circumference 24,902 mi.

\[
C = 2\pi r
\]

\[
24902 = \frac{8r}{\pi}
\]

\[
197387.8
\]

\( r \approx 3965.28 \text{ mi} \)

C. Volume

The volume of a sphere is four third the product of \( \pi \) and the cube of the radius of the sphere.

\[
V = \frac{4}{3}\pi r^3
\]

1. Find the volume of the sphere. Leave your answer in terms of \( \pi \).

\[
V = \frac{4}{3}\pi(6)^3 = 288\pi \text{ m}^3
\]

2. The volume of a sphere is 5000 m³. What is the surface area of the sphere?

\[
V = \frac{4}{3}\pi r^3
\]

\[
3750 = \frac{4}{3}\pi r^3
\]

\[
\frac{3750}{\pi^3} = \frac{4}{3}\pi
\]

\[
4\pi(10.61)^3
\]

\[
\approx 1414.62 \text{ m}^2
\]
3. Find the volume in terms of pi of a sphere with a surface area of $49\pi \ m^2$.

\[
\frac{49\pi}{4} = \frac{4\pi r^2}{4} \quad \Rightarrow \quad \frac{4}{3} \pi (3.5)^3
\]

\[
\sqrt{12.25} = \sqrt{r^2} \quad \Rightarrow \quad r = 3.5
\]

\[
V = \frac{4}{3} \pi (42.875) \quad \Rightarrow \quad 57.16\ \pi
\]

\[
\approx 57.16\ \pi
\]

Homework
Pg. 641 #14, 15, 18, 19, 22-24, 33, 34, 38, 40-42