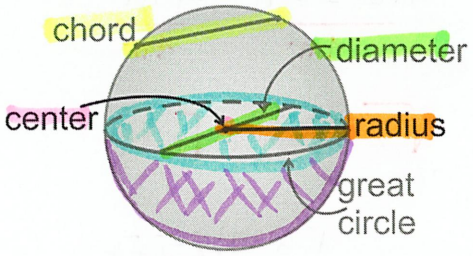
Chapter 12.6: Surface Area and Volume of Spheres

A Sphere is the set of all points in space equidistant from a given point.



Center of a Sphere: the given point from which all points on the sphere is equidistant.

Radius of a Sphere: a segment from the center to any point on the sphere

Chord of a Sphere: a segment whose endpoints are on the sphere.

Diameter of a Sphere: a chord that contains the center of the sphere.

Great Circle: the intersection of a sphere and plane that contains the center of the sphere.

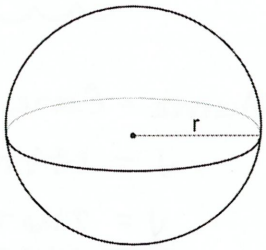
Hemisphere: one of the congruent halves of a sphere.

Surface Area of a Sphere (Theorem 12.11):

The surface area S of a sphere is

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

where r is the radius of the sphere.



Volume of a Sphere (Theorem 12.12):

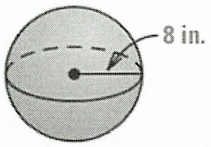
The volume V of a sphere is

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

where r is the radius of the sphere.

Example #1: Find the surface area and volume of the sphere. Round answers to the nearest hundredth.

a.)



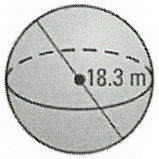
$SA = 4(\pi \cdot 8^2)$ $V = \frac{4}{3}(\pi \cdot 8^3)$

$SA = 256\pi \text{ in}^2$

$SA = 804.25 \text{ in}^2$

$V \approx 2144.66 \text{ in}^3$

b.)



$d = 18.3 \text{ m}$

$r = 9.15 \text{ m}$

$SA = 4(\pi \cdot 9.15^2)$ $V = \frac{4}{3}(\pi \cdot 9.15^3)$

$SA \approx 1052.09 \text{ m}^2$

$V \approx 3208.87 \text{ m}^3$

Example #2: The surface area of a sphere is 110.25π ft^2. Find the diameter of the sphere. Round answers to the nearest hundredth.

$\frac{110.25\pi}{4\pi} = \frac{4\pi r^2}{4\pi}$

$\sqrt{27.56} = \sqrt{r^2}$

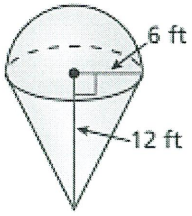
$r \approx 5.25$ ft

$d = 2(5.25)$

$d = 10.5$ ft

Example #3: Find the volume of the composite solid. Round answers to the nearest hundredth.

a.)



Cone Volume $= \frac{1}{3}(\pi \cdot 6^2)(12)$

$V = 144\pi$ ft^3

$\frac{1}{2}$ Sphere Volume $= \frac{1}{2}(4\pi \cdot 6^2)$

$V = 72\pi$ ft^3

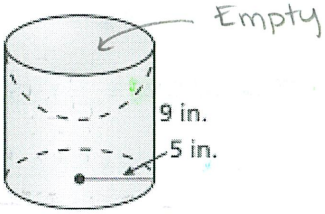
Total Volume = Cone + $\frac{1}{2}$ Sphere

$V = 144\pi + 72\pi$

$V = 216\pi$ ft^3

$V \approx 678.58$ ft^3

b.)



Cylinder Volume $= (\pi \cdot 5^2)9$

$V = 225\pi$ in^3

$\frac{1}{2}$ Sphere Volume $= \frac{1}{2}(4\pi \cdot 5^2)$

$V = 50\pi$ in^3

Total Volume = Cylinder $-$ $\frac{1}{2}$ Sphere

$V = 225\pi - 50\pi$

$V = 175\pi$ in^3

$V \approx 549.78$ in^3

c.)