

ESSENTIAL QUESTION: How do you find the surface area and volume of a sphere?

QUESTIONS:

Vocabulary:

sphere

In space, set of points a given distance from a pt.

hemisphere

Half a sphere

great circle

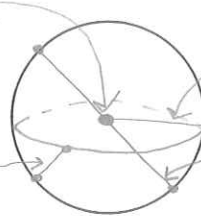
-Largest cross section of a sphere
-cuts through center

center of a sphere

radius of a sphere

chord of a sphere

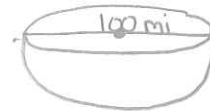
diameter of a sphere



A1. Sketch a...

a. sphere with radius 5 ft.

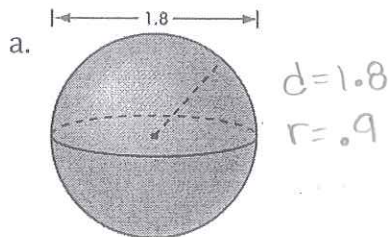
b. hemisphere with diameter 100 miles



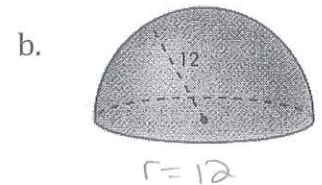
Theorem 12.11: Surface Area of a Sphere

The surface area (SA) is $SA = 4\pi r^2$, where r is the sphere's radius.

A2. Find the surface area of the solid. Measurements are in yards.



$$SA = 4\pi(0.9)^2 \approx 10.18 \text{ yd}^2$$



$$SA = \frac{1}{2}(4\pi(12)^2) \approx 904.78 \text{ yd}^2$$

SUMMARY:

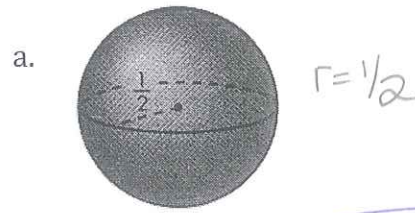
$$SA = 4\pi \cdot r^2 \text{ and } V = \frac{4}{3} \pi \cdot r^3 \text{ where } r = \text{length of radius}$$

QUESTIONS:

Theorem 12.12: Volume of a Sphere

The volume (V) is $V = \frac{4}{3}\pi r^3$, where r is the sphere's radius.

A3. Find the volume of the solid. Measurements are in meters.



$$V = \frac{4}{3}(\pi)(1/2)^3 \approx .52 \text{ m}^3$$



$$V = \frac{1}{2} \left(\frac{4}{3} \pi \right) (.75)^3$$

$$V \approx .88 \text{ m}^3$$

A4. The surface area of a sphere is $64\pi \text{ m}^2$. Find the sphere's radius.

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

$$\frac{64\pi}{4\pi} = \frac{4\pi r^2}{4\pi}$$

$$16 = r^2$$

$$r = \sqrt{16}$$

$$r = 4 \text{ m}$$

A5. The volume of a sphere is 905 ft^3 . Find its diameter.

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

$$\frac{3}{4} \left(\frac{905}{\pi} \right) = \left(\frac{4}{3} \frac{\pi r^3}{\pi} \right) \frac{3}{4}$$

$$216.05 \approx r^3$$

$$r = \sqrt[3]{216.05} = (216.05)^{1/3} \approx 6$$

$$d = 12$$

A6. Find the volume of a hemisphere if its great circle area is 10000 in^2 .

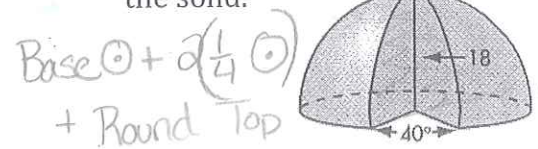
$$A = \pi r^2$$

$$\frac{10,000}{\pi} = \frac{\pi r^2}{\pi}$$

$$r = \sqrt{10,000/\pi} \approx 56.42$$

$$V = \frac{4}{3} \pi (56.42)^3 \approx 752,252.78 \text{ in}^3$$

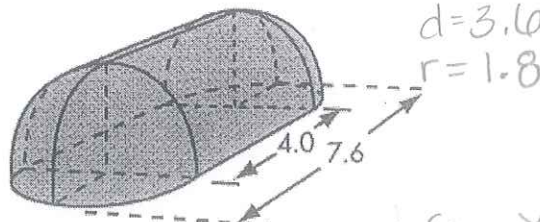
A7. Find the surface area of the solid.



$$= \frac{320}{300} \pi (18)^2 + 2 \left(\frac{1}{4} \right) \pi (18)^2$$

$$+ \left(\frac{320}{300} \right) \left(\frac{1}{2} \right) (4\pi 18^2) \approx 3223.2 \text{ units}^2$$

A8. A Kickapoo wigwam is a semicylinder with a half-hemisphere on each end. The diameters are 3.6 m and the total length is 7.6 m . Find the volume of the wigwam and the surface area of its roof.



$$V = \text{hemisphere} + \text{middle}$$

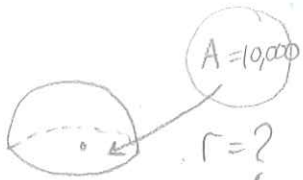
$$= \frac{1}{2} \left(\frac{4}{3} \pi (1.8)^3 \right) + \frac{1}{2} \pi (1.8)^2 \cdot 4$$

$$V \approx 12.21 + 20.36$$

$$V \approx 32.57 \text{ m}^3$$

$$SA = \frac{1}{2} (4\pi 1.8^2) + \frac{1}{2} (3.6\pi)(4) \approx$$

$$= 20.36 + 22.62 \approx 42.98 \text{ m}^2$$



Volume of prism or cylinder = (Area of base)(height) = $A \cdot (b) \cdot h$