Name: Key **Class:** _____

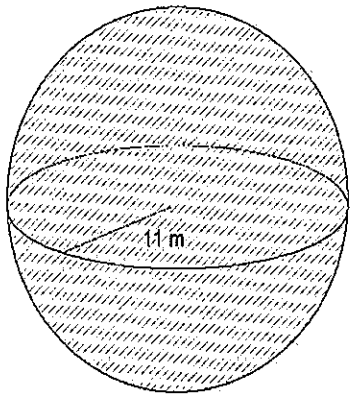
M8-U8: Notes #3 - Volume of 3-D Figures - Spheres **Date:** _____

A. Spheres – the set of all points in space that are the same distances from a center point.

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

For Examples 1 and 2, find the volume of each sphere.

Example 1:



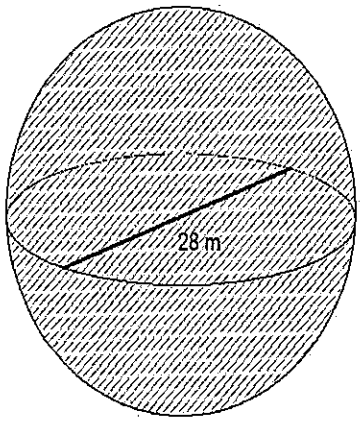
$V = \frac{4\pi(11)^3}{3}$

$= \frac{4\pi(1331)}{3}$

$= \frac{5324\pi}{3}$

Volume = $\frac{5324\pi}{3}\ m^3$

Example 2: (Hint: What's the radius?)



$d = 28$
$r = 14$

$V = \frac{4\pi(14)^3}{3}$

$= \frac{4\pi(2744)}{3}$

$=$

Volume = $\frac{10976\pi}{3}\ m^3$

Find the volume to the nearest tenth.

≈ 5575.279763

Volume ≈ $5575.3\ m^3$

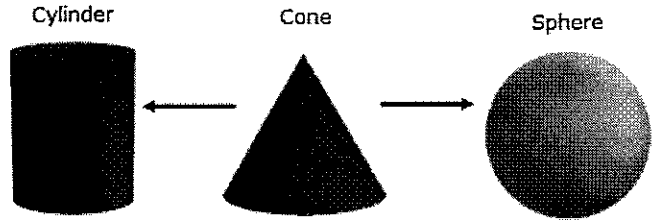
≈ 11494.04032

Volume ≈ $11{,}494.0\ m^3$

B. Comparing/Analyzing volumes.

Example 3:

a) Given the following figures, let's analyze their formulas. Restate their formulas under the pictures.



$\pi r^2 h$ $\quad \frac{\pi r^2 h}{3}$ $\quad \frac{4\pi r^3}{3}$

b) How many cones fit inside a cylinder?

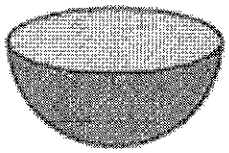
3

c) How many cones fit inside a sphere?

4

Example 4:

Hemisphere – a circle separates a sphere into two congruent halves.

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

Find the volume of the hemisphere with a diameter of 15 km. Round to the nearest tenth.

$r = 7.5$

$V = \frac{4\pi (7.5)^3}{3}$

$= \frac{1687.5\pi}{3}$

$= 562.5\pi$

cut in half for a hemisphere

$\frac{562.5\pi}{2} = 281.25\pi$

≈ 883.5729338

$\approx 883.6 \text{ km}^3$

C. Determining missing lengths.

Example 5:
The volume of a golf ball is 41.63 cm^3. What is the radius of the golf ball to the nearest tenth?

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

$41.63 = \frac{4\pi r^3}{3}$

$\frac{124.89}{(4\pi)} = \frac{4\pi r^3}{4\pi}$

$\sqrt[3]{r^3} = \sqrt[3]{19.93843042}$

$r \approx 2.150003996$

$r \approx 2.2 cm$

Example 6:
The volume of a baseball is about 13.39 cubic inches. What is the diameter of the baseball to the nearest tenth?

$13.39 = \frac{4\pi r^3}{3}$

$\frac{40.17}{(4\pi)} = \frac{4\pi r^3}{4\pi}$

$\sqrt[3]{r^3} = \sqrt[3]{3.196627032}$

$r \approx 1.473094662$

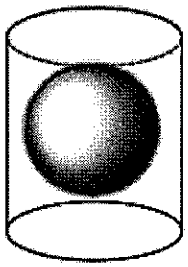
$d = 2r$

$d \approx 2.946189325$

$d \approx 2.9 in$

D. Composite Volume

Example 7:
Find the remaining volume of the cylinder if the height of the cylinder is 6m, the radius of the cylinder is 3m, and the ball has a radius of 3m.



[*not drawn to scale*]

$V_{Total} = V_{cy} - V_{sp}$

$= \pi(3)^2(6) - \frac{4\pi(3)^3}{3}$

$= 54\pi - 36\pi$

$= 18\pi\ m^3$

Additional Practice:

Find the volume of each solid. Show all work.

1. Approximately how much air would be needed to fill a dozen soccer balls with a radius of 14cm? *Round to the nearest hundredth.*

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

$= \frac{4\pi(14)^3}{3}$

$= \frac{4\pi(2744)}{3}$

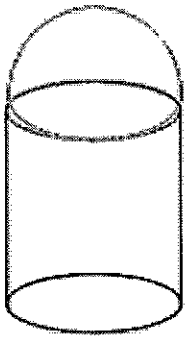
≈ 11494.04032

there are twelve of them

so 137928.4839

thus $137,928.48\ cm^3$

2. Find the volume of the following figure if the diameter is 4.5 in and the height of the cylinder is 2.5 in. *Round to the nearest tenth.*



$r = 2.25$

$V_{Total} = V_{cy} + V_{1/2\ sp}$

$= \pi(2.25)^2(2.5) + \left(\frac{4\pi(2.25)^3}{3}\right)/2$

$= 12.65625\pi + 7.59375\pi$

$= 20.25\pi\ in^3$

≈ 63.61725124

$\approx 63.6\ in^3$

$r = 3963$

3. The diameter of the earth is approximately 7,926 miles. The diameter of the moon is approximately 2,159 miles. Approximately how many moons would fit inside the earth?

$r = 1079.5$

$V = \frac{4\pi(1079.5)^3}{3}$

$= 5269343972$

$V = \frac{4\pi(3963)^3}{3}$

$= 2.60711883 \times 10^{11}$

$\frac{2.60711883 \times 10^{11}}{5269343972} \approx 49.47710462$

almost 50 moons inside earth.

4. Find the radius of a sphere with a volume of 1,767.1 m^3. *Round to the nearest tenth.*

$1767.1 = \frac{4\pi r^3}{3}$

$\frac{5301.3}{4\pi} = \frac{4\pi r^3}{4\pi}$

$\sqrt[3]{421.8640499} = \sqrt[3]{r^3}$

$7.49993511 \approx r$

$r \approx 7.5\,m$

5. Find the radius of a hemisphere with a volume of 2,712.3 in^3. *Round to the nearest tenth.*

$2712.3 = \frac{4\pi r^3}{6}$

$\frac{16273.8}{4\pi} = \frac{4\pi r^3}{4\pi}$

$\sqrt[3]{1295.027856} \approx \sqrt[3]{r^3}$

$10.8999679 \approx r$

$10.9\,in \approx r$