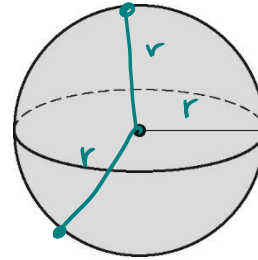Day 20 Notes

Volume of a Sphere

Key Vocabulary:

☐ A **Sphere** is the locus of points in space that are a fixed distance from the **center** of the sphere.

☐ A **radius** connects the center of the sphere to any point on the sphere.

☐ What do we call half a sphere? hemisphere

☐ A **great circle** divides a sphere into two ≅ hemispheres
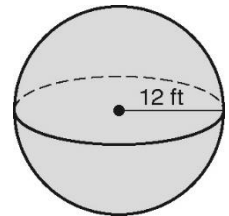
> ### Volume of a Sphere
> $$V = \frac{4\pi r^3}{3}$$

1. Find the volume of each sphere. Give your answers in terms of π.

$$V = \frac{4\pi (12)^3}{3}$$

$$V = 2{,}304\,\pi \text{ ft}^3$$

12 ft

2. Basketballs typically range in size from very small promotional items only a few inches in diameter to extra-large basketballs nearly a foot in diameter used in training exercises to increase the skill of players. The standard size of a basketball in the NBA is 9.5 to 9.85 inches (24.1 to 25.0 cm) in diameter. What is the difference in the amount of air that is required for the smallest and largest NBA basketball? Round to the nearest hundredth.

$$V_{Small} = \frac{4\pi(9.5)^3}{3}$$

$$V_{Large} = \frac{4\pi(9.85)^3}{3}$$

$$V \approx 3{,}591.36 \text{ in}^3$$

$$V \approx 4{,}003.12 \text{ in}^3$$

Difference in volume is 411.76 in³

3. How much "orange" is in the ½ orange to the right? Round to the nearest hundredth.

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

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

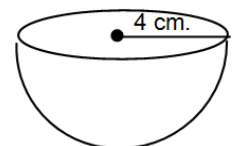blc hemisphere

$$= \frac{32\pi}{3} \div 2 = \frac{16\pi}{3}$$

$$V = \frac{16\pi}{3} \text{ cm}^3$$

or

$$V \approx 16.76 \text{ cm}^3$$

4 cm.

4. If the area of the great circle of the sphere is 256π in², find the volume of the sphere.

$$A_O = \pi r^2 \qquad V = \frac{4\pi r^3}{3}$$

$$256\pi = \pi r^2 \qquad = \frac{4\pi(16)^3}{3}$$

$$16 = r$$

$$V = \frac{16{,}384\pi}{3} \text{ in}^3$$

5. Find the diameter of a sphere with a volume of $4{,}500\pi$ in³.

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

$$3 \cdot 4500\pi = \frac{4\pi r^3}{3} \cdot 3$$

$$13{,}500\pi = 4\pi r^3$$

$$\sqrt[3]{3{,}375} = \sqrt[3]{r^3}$$

$$15 \text{ in} = r$$

What # mult. by itself
3 times, gives us 3,375?
Have to take cube root to get rid of 3ʳᵈ power

6. Margot is thirsty after a 5-km run for charity. The organizers offer the containers of water shown in the figure. Margot wants the one with the greater volume of water. Tell which container Margot should pick.

$$V_{Sphere} = \frac{4\pi r^3}{3} \qquad V_{CyL} = A_{Base} \cdot h$$
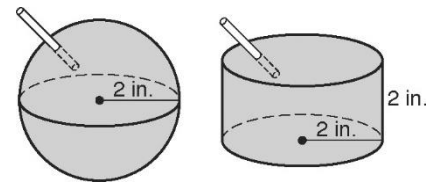
$$= \frac{4\pi(2)^3}{3} \qquad\qquad = \pi(2)^2 \cdot 2$$

$$= \frac{32\pi}{3} \qquad\qquad = 8\pi \text{ in}^3$$

$$\approx 10^2/_3\pi \text{ in}^3$$

2 in.

2 in.

2 in.

Margot should choose the spherical container.

7. A look ahead… ☺ Find the volume of the composite figure below. (Make an "ingredient" list. What do we need to find the volume of?)

$$V_{hemisphere} = \frac{2}{3}\pi(6)^3 = 144\pi$$

$$B = \pi(6)^2 = 36\pi$$

$$V_{cylinder} = 36\pi \cdot 14 = 504\pi$$

$$V_{total} = 144\pi + 504\pi = 648\pi \text{ cm}^3$$

Diameter = 12 cm

6cm

6cm

Height = 20 cm

14cm