~~Unit 9, Page 23~~

Solid Geometry Word Problems

NOTES

Carefully read and solve the problems below.

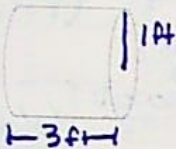1. Robert is using a cylindrical barrel filled with water to flatten the sod in his yard. The circular ends of the barrel have a radius of 1 foot. The barrel is 3 feet tall. How much water will the barrel hold?

Find the volume formula for a CYLINDER on your reference sheet and record below.

Formula: $V = \pi r^2 h$　　　$\pi = 3.14$

$r = 1 \quad h = 3$

$\pi (1)^2 (3)$
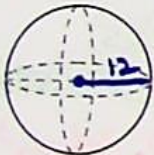
$\pi (1)(3)$

$3\pi = 3(3.14)$

$\boxed{9.42 \text{ ft}^3}$

2. If a basketball measures 24 centimeters in diameter, what volume of air will it hold?

Find the volume formula for a SPHERE on your reference sheet and record below.

Formula: $V = \dfrac{4\pi r^3}{3}$　　　$r = 12$　　$\pi = 3.14$

$\dfrac{4\pi (12)^3}{3}$　$\dfrac{4\pi (1728)}{3}$　$4\pi (576)$

2304π

$2304(3.14)$

7234.56 in^3

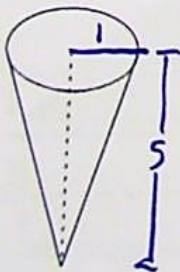3. What is the volume of a sugar cone that is 2 inches in diameter and 5 inches tall?

Find the volume formula for a CONE on your reference sheet and record below.

Formula: $V = \dfrac{\pi r^2 h}{3}$　　　$r = 1 \quad h = 5$

$\dfrac{\pi (1)^2 (5)}{3}$

$\dfrac{\pi (1)(5)}{3}$

$\dfrac{5\pi}{3} = \dfrac{5(3.14)}{3} \approx \dfrac{15.7}{3} \approx \boxed{5.23 \text{ in}^3}$

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.* $\overset{12}{\longrightarrow}$

Sphere: $V = \dfrac{4\pi r^3}{3} = \dfrac{4\pi(14)^3}{3} \quad \dfrac{4(2744)\pi}{3} \quad \dfrac{10,976\pi}{3}$

$r = 14$

$\boxed{\text{12 balls} = 137,858.56 \text{ cm}^3}$ $\quad 3658.\overline{6}(3.14) \approx \boxed{11,488.21 \text{cm}^3}$
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \text{1 ball}$

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.*
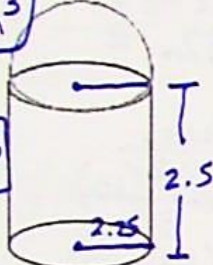
$r = 2.25$ in

$\boxed{20.35\pi \text{ in}^3}$

$20.35(3.14)$

$\boxed{\approx 63.9 \text{ in}^3}$

2.5 / 2.25

hemisphere $\dfrac{2\pi r^3}{3}$

$+$

cylinder $\pi r^2 h$

$\overset{11.4}{2\pi(2.25)^3} \quad \dfrac{22.8\pi}{3} \quad 7.6\pi$

$+$

$\pi(2.25)^2(2.5)$
$\pi(5.1)(2.5)$

7.6π
$+$
$\dfrac{12.75\pi}{20.35\pi}$

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?

$r = 3963$

$r = 1079.5$ (Spheres) $\quad$ moon | earth

$\dfrac{\text{earth}}{\text{moon}}$

$\dfrac{8.3 \times 10^{10}\pi}{1.68 \times 10^9 \pi}$

4.9×10^0

$\boxed{49 \text{ moons}}$
or about 50!

Earth: $r = 3963$
$\dfrac{4\pi(3963)^3}{3} \approx \dfrac{6.22 \times 10^{10}(4)\pi}{3} \quad \dfrac{2488 \times 10^{10}\pi}{3}$

Moon: $r = 1079.5$
$\dfrac{4\pi(1079.5)^3}{3} = \dfrac{1.26 \times 10^9 \pi}{3} = (1.68 \times 10^9 \pi)$
$\quad\quad\quad\quad\quad 4 \times .42$

$(8.3 \times 10^{10}\pi)$

4) Find the radius of a sphere with a volume of 1,767.1 m³. *Round to the nearest tenth.*

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

$3\left(\dfrac{4(3.14)r^3}{3}\right) = (1767.1)3 \quad \sqrt[3]{r^3} = \sqrt[3]{422.1}$
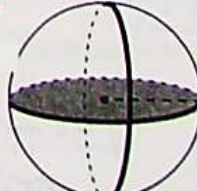
$V = 1767.1$

$\dfrac{12.56 r^3}{12.56} = \dfrac{5301.3}{12.56} \quad \boxed{r \approx 7.5\text{m}}$

5) Find the radius of a hemisphere with a volume of 2,712.3 in³. *Round to the nearest tenth.*

$V = \dfrac{2\pi r^3}{3}$

$\dfrac{2(3.14)r^3}{3} = 2712.3$

$V = 2712.3$

$3\left(\dfrac{6.28 r^3}{3}\right) = (2712.3)3 \quad \sqrt[3]{r^3} = \sqrt[3]{1295.68}$

$\dfrac{6.28 r^3}{6.28} = \dfrac{8136.9}{6.28} \quad \boxed{r \approx 10.9 \text{ in}}$