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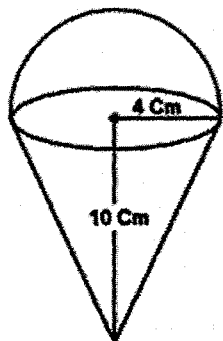
Date: 3/19/18

C GEOMETRY

TROICI

LESSON #4: COMPOSITE VOLUME

Now: Find the volume of the ice cream cone to the nearest hundredth:



$$V_{\text{cone}} = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \pi (4)^2 (10)$$

$$= 167.5516$$

$$V_{\frac{1}{2} \text{ sphere}} = \frac{\frac{4}{3} \pi r^3}{2}$$

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

$$+ = 134.0412 =$$

$$\boxed{301.59 \text{ cm}^3}$$

1. A fish tank in the shape of a rectangular prism has dimensions of 14 inches, 16 inches, and 10 inches. The tank contains 1680 cubic inches of water. What percent of the fish tank is empty?

$$V = Bh$$

$$V = l \cdot w \cdot h$$

$$V = 14 \cdot 16 \cdot 10$$

$$V = 2240 \text{ in}^3$$

$$2240 - 1680 = \frac{560 \text{ in}^3}{2240 \text{ in}^3} = .25 \times 100 = \boxed{25\%}$$

2. The diameter of a basketball is approximately 9.5 inches and the diameter of a tennis ball is approximately 2.5 inches. The volume of the basketball is about how many times greater than the volume of the tennis ball?

$$V_{\text{ball}} = \frac{4}{3} \pi r^3$$

$$V = \frac{4}{3} \pi (4.75)^3$$

$$V = 448.9205$$

$$V_{\text{tennis}} = \frac{4}{3} \pi (1.25)^3$$

$$V = 8.1812$$

$$\frac{8.1812x}{8.1812} = \frac{448.9205}{8.1812}$$

$$x = 54.8722$$

$$\boxed{x = 55 \text{ times}}$$

3. When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in³. After being fully inflated, its volume is approximately 294 in³. To the nearest tenth of an inch, how much does the radius increase when the volleyball is fully inflated?

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

$$\frac{180}{\frac{4}{3} \pi} = \frac{4}{3} \pi r^3$$

$$\frac{4}{3} \frac{3}{4} \frac{1}{\pi} = \frac{4}{3} \frac{3}{4} \frac{1}{\pi} r^3$$

$$\frac{294}{\frac{4}{3} \pi} = \frac{4}{3} \pi r^3$$

$$\frac{4}{3} \frac{3}{4} \frac{1}{\pi} = \frac{4}{3} \frac{3}{4} \frac{1}{\pi} r^3$$

$$4.1249 - 3.5026 = .6223$$

$$\boxed{.6 \text{ increase}}$$

$$\frac{180}{\pi} = \pi r^3$$

$$\sqrt[3]{42.9718} = r^3$$

$$r = 3.5026$$

$$\frac{294}{\pi} = \pi r^3$$

$$\sqrt[3]{70.1873} = r^3$$

$$r = 4.1249$$

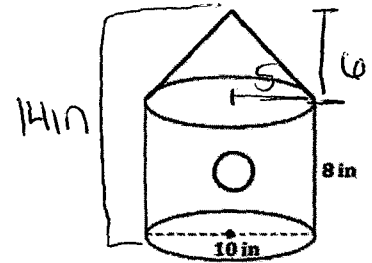
4. The 14-inch tall bird house below is made up of a cone placed on top of a cylinder. Find the amount of birdseed that will fill the birdhouse to the nearest whole number.

$$V_{\text{cylinder}} + V_{\text{cone}}$$

$$\pi r^2 h + \frac{1}{3} \pi r^2 h$$

$$\pi (5)^2 (8) + \frac{1}{3} \pi (5)^2 (6)$$

$$\boxed{178.5 \text{ in}^3}$$



5. A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the nearest cubic meter, the total volume inside the storage tank.

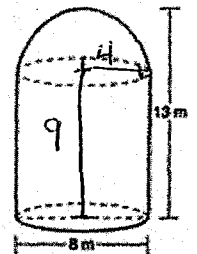
$$V_{\text{cylinder}} + V_{\text{hemisphere}}$$

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

$$\pi (4)^2 (9) + \frac{1}{2} \left(\frac{4}{3} \pi (4)^3 \right)$$

$$586.4306$$

$$\boxed{586 \text{ m}^3}$$



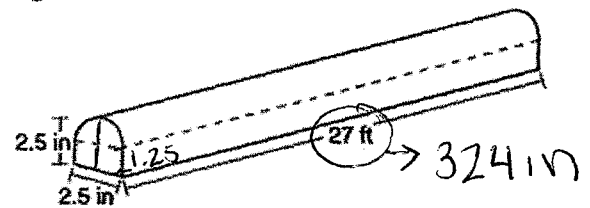
6. A fabricator is hired to make a 27-foot-long solid metal railing for the stairs at the local library. The railing is modeled by the diagram below. The railing is 2.5 inches high and 2.5 inches wide and is comprised of a rectangular prism and a half-cylinder. How much metal, to the nearest cubic inch, will the railing contain?

$$V_{\text{rect. prism}} + V_{\frac{1}{2} \text{ cylinder}}$$

$$(2.5)(1.25)(324) + \frac{1}{2} \pi (1.25)^2 (324)$$

$$1807.71564$$

$$\boxed{1808 \text{ in}^3}$$



7. Tennis balls are sold in cylindrical cans with the balls stacked one on top of the other. A tennis ball has a diameter of 6.7 cm. To the nearest cubic centimeter, what is the minimum volume of the can that holds a stack of 4 tennis balls?

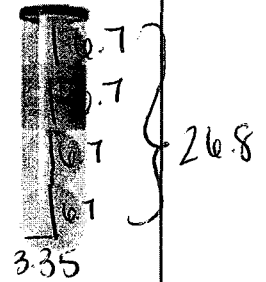
V_{cylinder}

$$V = \pi r^2 h$$

$$V = \pi (3.35)^2 (26.8)$$

$$V = 944.8748$$

$$\boxed{V = 945 \text{ cm}^3}$$



8. As shown in the diagram below, a cylindrical tennis ball container with a diameter of 7.0 cm and a height of 20.8 cm can hold three spherical tennis balls, each with a diameter of 6.8 cm. A company is trying to design a better container and wants to first determine how much "empty space" there is in the current container when filled with tennis balls. To the nearest tenth of a cubic centimeter, what is the volume of the space in the container that is not filled by tennis balls?

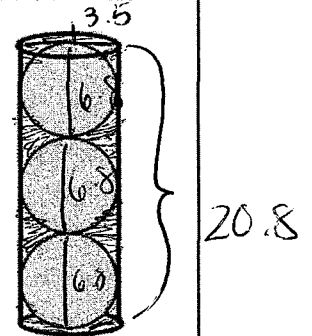
$V_{\text{cylinder}} - V_{\text{3 spheres}}$

$$\pi r^2 h - 3 \left(\frac{4}{3} \pi r^3 \right)$$

$$\pi (3.5)^2 (20.8) - 3 \left(\frac{4}{3} \pi (3.4)^3 \right)$$

$$306.5691$$

$$\boxed{306.6 \text{ cm}^3}$$



9. The diagram at the right shows a right circular cylinder and a right circular cone with congruent bases and equal heights. If the cone section is removed from the cylinder, find the volume of the remaining section of the cylinder, in terms of π .

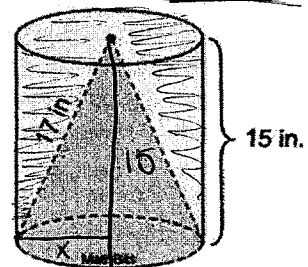
$V_{\text{cylinder}} - V_{\text{cone}}$

$$\pi r^2 h - \frac{1}{3} \pi r^2 h$$

$$\pi (8)^2 (15) - \frac{1}{3} \pi (8)^2 (15)$$

$$960\pi - 320\pi$$

$$\boxed{640\pi \text{ in}^3}$$



$$15^2 + x^2 = 17^2$$

$$\boxed{x = 8}$$

convert to ft first!

- 10) A thermal insulating sleeve is used to cover the lateral surface of a hot water heater to help improve efficiency. The hot water tank is a cylinder with a 13 inch radius and a 75 inch height. The sleeve is 3 inches thick. The insulating material that makes up the sleeve is a fiberglass composite. How many cubic inches of fiberglass composite are needed to create each sleeve, to the nearest tenth of a cubic foot?

Big cylinder - small cylinder
 $\pi(1.3)^2(6.25) - \pi(1.08)^2(6.25)$

11.86278

11.9 ft³

