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Date _____
Geometry

Modeling Volume

1. Cylindrical bricks are needed to fill a hole in a homeowner's backyard. Each brick is to have a diameter of 4 cm and a height of 2 cm. The weight of the concrete that the brick is going to be made from is 2.1 ounces per cubic centimeter. If the concrete costs \$.14 per ounce, how much would it cost to purchase four bricks? Round your answer to the nearest cent.

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

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

$$V = 25.1 \text{ cm}^3$$

$$25.1 \text{ cm}^3 \cdot \frac{2.1 \text{ oz}}{1 \text{ cm}^3} \cdot \frac{.14 \text{ \$}}{1 \text{ oz}} \cdot 4$$

\$29.56

2. A town in upstate New York keeps sand in a silo that is in the shape of a cone. They use this sand to help de-ice the roads after a snowstorm. The silo has a diameter of 18.6 meters and a height of 30 meters. The weight of the sand is 1.2 ounces per cubic meter. If the sand costs \$.12 per ounce, how much will it cost the town to fill 80% of the silo?

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

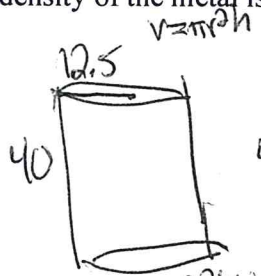
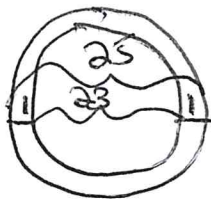
$$V = \frac{1}{3} \pi (9.3)^2 (30)$$

$$V = 2717 \dots \text{m}^3$$

$$2717 \text{ m}^3 \cdot \frac{1.2 \text{ oz}}{1 \text{ m}^3} \cdot \frac{.12 \text{ \$}}{1 \text{ oz}} \cdot .8$$

\$313.02

3. A cylindrical casing is to be put around a garbage can in a busy street in Manhattan. The diameter is 25 inches. The height of the case will be 40 inches and the casing will be 1 inch thick. The density of the metal is .841 grams per cubic inch. What will be the mass of the casing?



$$V = \pi (12.5)^2 (40)$$

$$V = 19634$$



$$V = \pi (11.5)^2 (40)$$

$$V = 16619$$

$$\begin{array}{r} 19634 \\ - 16619 \\ \hline 3015 \text{ in}^3 \end{array}$$

$$3015 \text{ in}^3 \cdot \frac{.841 \text{ g}}{1 \text{ in}^3} = 2536.9 \text{ g}$$

4. A pyramid with a square base is made of solid glass. The pyramid has a base with a side length of 5.7 cm and a height of 7 cm. The density of the glass is 2.4 grams per cubic centimeter. If the cost of the glass is \$1.25 per gram, what is the cost in producing 12 glass pyramids?

$$V = \frac{1}{3}lwh$$

$$V = \frac{1}{3}(5.7)(5.7)(7)$$

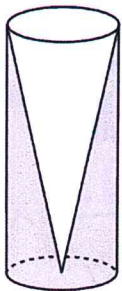
$$V = 75.81 \text{ cm}^3$$

$$75.81 \text{ cm}^3 \cdot \frac{2.4 \text{ g}}{1 \text{ cm}^3} \cdot \frac{\$1.25}{1 \text{ g}} \times 12$$

$$\$2729.16$$

5. Walter wants to make 100 candles in the shape of a cone for his new candle business. The mold shown below will be used to make the candles. Each mold will have a height of 8 inches and a diameter of 3 inches.

Walter goes to a hobby store to buy the wax for his candles. The wax costs \$0.10 per ounce. If the weight of the wax is 0.52 ounce per cubic inch, how much will it cost Walter to buy the wax for 100 candles?



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

$$V = \frac{1}{3}\pi(1.5)^2(8)$$

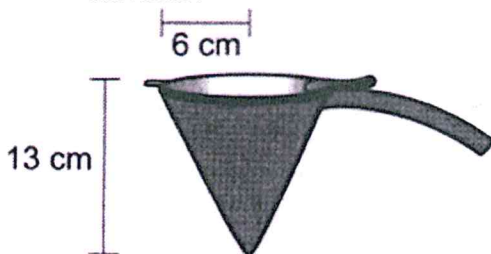
$$V = 18 \dots \text{ in}^3$$

$$18 \dots \text{ in}^3 \cdot \frac{0.52 \text{ oz}}{1 \text{ in}^3} \cdot \frac{\$0.10}{1 \text{ oz}} \times 100$$

$$\$98.02$$

6. The funnel shown below can be used to decorate cookies with melted chocolate. The funnel can be modeled by a cone whose radius is 6 cm and height is 13 cm.

The baker uses 2 cubic centimeters of chocolate to decorate each cookie. When the funnel is completely filled, what is the maximum number of cookies that can be decorated with the melted chocolate?



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

$$V = \frac{1}{3}\pi(6)^2(13)$$

$$V = 490 \dots \text{ cm}^3$$

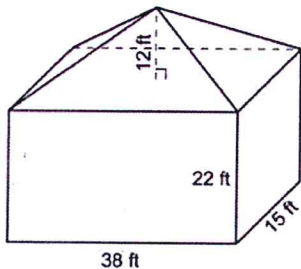
$$490 \dots \text{ cm}^3 \cdot \frac{1 \text{ cookie}}{2 \text{ cm}^3} = 245$$

7. Trees that are cut down and stripped of their branches for timber are approximately cylindrical. A timber company specializes in a certain type of tree that has a typical diameter of 0.2 meters and a typical height of about 10 meters. The density of the wood is 380 kilograms per cubic meter, and the wood can be sold by mass at a rate of \$4.75 per kilogram. What will be the cost for selling 20 trees?

$$\begin{aligned}
 V &= \pi r^2 h \\
 V &= \pi (0.1)^2 (10) \\
 V &= .31 \dots m^3
 \end{aligned}$$

$$\begin{aligned}
 &.31 \dots m^3 \cdot \frac{380 \text{ Kg}}{1 m^3} \cdot \frac{4.75 \text{ \$}}{1 \text{ Kg}} \times 20 \\
 &= 11341.15
 \end{aligned}$$

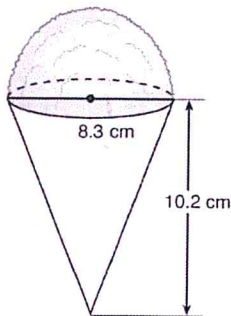
8. A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet. An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the nearest tenth of a minute, for the filter to clean the air contained in the building.



rectangular prism	pyramid	
$V = lwh$	$V = \frac{1}{3}lwh$	$14820 \text{ ft}^3 \cdot \frac{1 \text{ min}}{2400 \text{ ft}^3}$
$V = 38(15)(22)$	$V = \frac{1}{3}(38)(15)(12)$	6.2 minutes
$V = 12540$	$V = 2280$	
$12540 + 2280 = 14820 \text{ ft}^3$		

9. A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters. The desired density of the shaved ice is 0.697 g/cm³, and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.

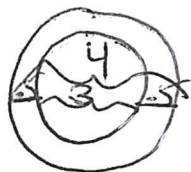
1000 g



hemisphere	Cone
$V = \frac{1}{2}(\frac{4}{3}\pi r^3)$	$V = \frac{1}{3}\pi r^2 h$
$V = \frac{1}{2}(\frac{4}{3}\pi (4.15)^3)$	$V = \frac{1}{3}\pi (4.15)^2 (10.2)$
$V = 149 \dots$	$V = 183 \dots$
$149 \dots + 183 \dots = 333 \dots \text{ cm}^3$	

$$333 \dots \text{ cm}^3 \cdot \frac{0.697 \text{ g}}{1 \text{ cm}^3} \cdot \frac{3.83 \text{ \$}}{1000 \text{ g}} \times 50 = 44.53$$

10. A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the nearest tenth of a cubic centimeter, the amount of chocolate in each hollow sphere. The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm³, determine and state, to the nearest gram, the total mass of the chocolate in the box.



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

$$V = \frac{4}{3}\pi(2)^3 \quad V = \frac{4}{3}\pi(1.5)^3$$

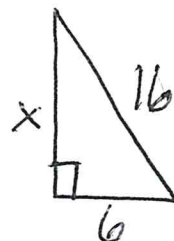
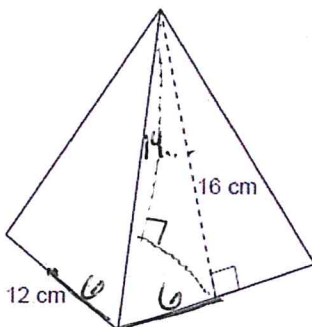
33... 19...

$$\begin{array}{r} 33... \\ -14... \\ \hline 19... \text{ cm}^3 \end{array}$$

$$19 \text{ cm}^3 \cdot \frac{1.308 \text{ g}}{1 \text{ cm}^3} \times 8 = 203 \text{ grams}$$

11. A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters. Determine and state the volume of the candle, to the nearest cubic centimeter. The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the nearest ounce.

~~14 cm~~
~~12 cm~~
~~16 cm~~
~~12 cm~~



$$a^2 + b^2 = c^2$$

$$6^2 + x^2 = 16^2$$

$$36 + x^2 = 256$$

$$\begin{array}{r} -36 \\ -36 \end{array}$$

$$\sqrt{x^2} = \sqrt{220}$$

$$x = 14... \text{ cm}$$

$$\boxed{x = 14 \text{ cm}}$$

$$V = \frac{1}{3}bh$$

$$V = \frac{1}{3}(12)(12)(14...)$$

$$V = 712 \text{ cm}^3$$

$$712 \text{ cm}^3 \cdot \frac{0.032 \text{ oz}}{1 \text{ cm}^3} = 2302$$