MAT-222-840 Name: Solutions

Spring 2017 Date: ______

Team Problems for Chapter 11

Problem #1: Cylinder nets

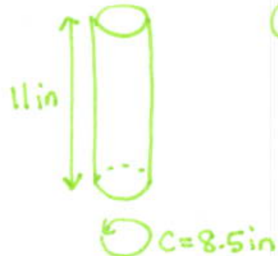
You will need an 8.5-inch-by-11-inch piece of paper and tape.

1. Roll the paper and tape it along its long edge to make a cylinder.

2. What is the lateral surface area of this cylinder?

$$LA = 8.5 \times 11 = \boxed{93.5 \text{ in}^2}$$

3. What is the surface area of this cylinder, **including** the bases? *Find the radius of the base using an algebraic method, NOT by measuring.*



$$C = 2\pi r = 8.5 \text{ in}$$

$$r = \frac{8.5}{2\pi} \text{ in}$$

$$SA = 2B + 2\pi r h$$

$$= 2\pi\left(\frac{8.5}{2\pi}\right)^2 + 93.5$$

$$= 11.5 + 93.5$$

$$= \boxed{105 \text{ in}^2}$$

Problem #2: Cone nets

You will need a piece of paper, a compass, a ruler, scissors, and tape.

1. Use the compass to make a circle with a 3-inch radius on your paper. Measure a 120° central angle in your circle, and cut this part of the circle out. Cut out the remaining part of the circle and join the two cut radii with tape to make a cone.

240°

2. What is the lateral surface area of this cone?

$$LA = \left(\frac{240}{360}\right)\pi(3)^2 = 6\pi \approx \boxed{18.85 \text{ in}^2}$$

3. What is the surface area of the cone, **including** the base? *You may estimate the radius of the base by measuring with a ruler.*

Radius of base is approx. 2 inches.

$$SA = LA + B = 18.85 + \pi(2)^2 = \boxed{31.42 \text{ in}^2}$$

Problem #3: Volume Problem Solving

1. How many plastic 2cm×2cm×2cm cubes can be neatly stacked in an 8cm×10cm×12cm box? Explain.

Volume of box = $8\times10\times12 = 960\text{cm}^3$

Volume of cube = $2\times2\times2 = 8\text{cm}^3$

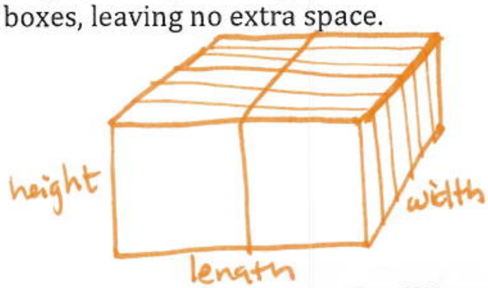
$\frac{960}{8} = \boxed{120 \text{ cubes}}$

2. How many plastic 2cm×2cm×2cm cubes can be neatly stacked in an 8cm×9cm×12cm box? Explain. Method from #1 won't work since there will be empty space in this box.

Box: 8 cm × 9 cm × 12 cm

will fit: 4 cubes × 4 cubes × 6 cubes = $4\times4\times6 = \boxed{96 \text{ cubes}}$

3. A BerryBombs cereal box is 10 inches tall, 7½ inches wide, and 2½ inches deep. Give the length, width, and height of a cardboard box that could hold exactly 12 BerryBombs cereal boxes, leaving no extra space.



Pack 2×6 boxes

length = $2\times7.5 = 15$ in
width = $6\times2.5 = 15$ in
height = $1\times10 = 10$ in

Problem #4: More Volume Problem Solving

1. A 9-inch-by-9-inch-by-12-inch jar in the shape of a rectangular prism is completely filled with gum balls of diameter ¾ inches. Estimate the number of gum balls in the jar, and explain your reasoning. ↳ radius 3/8 in

Volume of jar = $9\times9\times12 = 972 \text{ in}^3$

Vol of gumball = $\frac{4}{3}\pi\left(\frac{3}{8}\right)^3 = 0.22 \text{ in}^3$

$\frac{972}{0.22} = 4418.2$ or $\boxed{4418 \text{ gumballs}}$

2. A jar in the shape of a 9-inch-tall cylinder with a circular base of diameter 6 inches is completely filled with gum balls of diameter ¾ inches. Estimate the number of gum balls in the jar, and explain your reasoning. radius = 3in

Volume of jar = $Bh = \pi r^2 h = \pi(3)^2(9) = \boxed{254.5 \text{ in}^3}$

Vol of gumball = 0.22 in^3

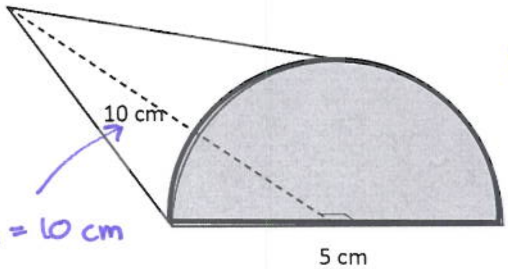
$\frac{254.5}{0.22} = 1156.7$ or $\boxed{1156 \text{ gumballs}}$

3. Do you think your estimates in 1 & 2 are overestimates or underestimates? Explain your reasoning.

Overestimate: The jar will have air pockets not filled with gumballs.

Problem #5: Even More Volume Problem Solving

Find the volume of the following solids:



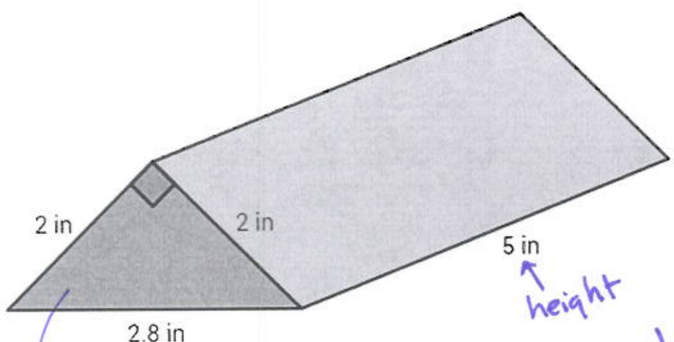
$h = 10$ cm

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

$= \frac{1}{6}\pi (2.5)^2 (10)$

$= \boxed{32.7 \text{ cm}^3}$

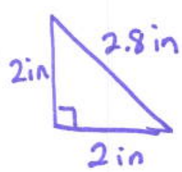
$r = \frac{5}{2} = 2.5$ cm



height

$V = Bh = 2(5) = \boxed{10 \text{ in}^3}$

B:



$A = \frac{1}{2}(2)(2) = 2 \text{ in}^2$