IM 10 Ch 11 Day 6 Minilesson

Today I will teach you to apply the SA and Volume formulas to solve problems

A can of tomato soup has a height of 6.3 inches and a radius of 4.24 inches.

1. Find the amount of aluminum needed to make the can.

$SA = 2\pi rh + 2\pi r^2 = 2\pi(4.24)(6.3) + 2\pi(4.24)^2$
$= 167.84 + 112.96$
$= 280.79\ in^2$

2. Find the amount of paper needed to make the label.

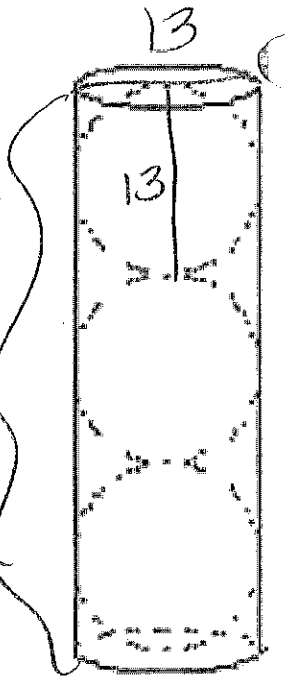
$LA = 2\pi rh = 2\pi(4.24)(6.3) = 167.84\ in^2$

3. Find the amount of soup that can fit into the can.

$V = \pi r^2 h = \pi(4.24)^2(6.3) = 355.81\ in^3$

Worktime

1. Three balls are packaged in a cylindrical container as shown . The balls just touch the top, bottom, and sides of the cylinder. The diameter of each ball is 13 cm.



A. What percent of the container is occupied by the tennis balls? Show all work and be organized.

V of Cyl $= \pi r^2 h = \pi(6.5)^2(39) = 1647.75\pi\ cm^3$

V of 1 ball $= 4/3\pi r^3 = 4/3\pi(6.5)^3 = \frac{2197}{6}\pi cm^3$

V of 3 balls $= \frac{2197}{6}\pi \cdot 3 = 1098.5\pi\ cm^3$

% of the can occupied $= \frac{1098.5\pi}{1647.75\pi} = .66 \approx 66\%$ or 2/3 of the can

B. Does it take more felt to make the tennis balls, or more plastic to make the container? Use mathematics to justify your answer. Be organized.

SA of 1 ball $= 4\pi r^2 = 4\pi(6.5)^2 = 169\pi cm^2$

SA of 3 balls $= 169\pi \cdot 3 = 507\pi cm^2$

SA of can $= 2\pi rh + 2\pi r^2 = 2\pi(6.5)(39) + 2\pi(6.5)^2 = 507\pi + 84.5\pi$
$= 591\pi\ cm^2$

It takes more plastic to make the can than it takes felt to make the balls b/c the can is the SA of the cans.

2. A box of cereal measures 8 in. wide, 11 in. high, and 2 in. deep. If all surfaces are made of cardboard and the total amount of overlapping cardboard in the box is 7 in^2, how much cardboard is used to make the cereal box?

SA $= Ph + 2B = (8+8+2+2)(11) + 2(8 \cdot 2) = 20(11) + 2(16)$
$= 252\ in^2$
$+ 7$ overlapping
$259\ in^2$

3. . The lateral area of a cone is 155.25p m^2. The slant height is 13.5 m. What is the radius?

$LA = \pi rl$

$155.25 = \pi r(13.5)$

$\frac{155.25}{13.5\pi} = r$

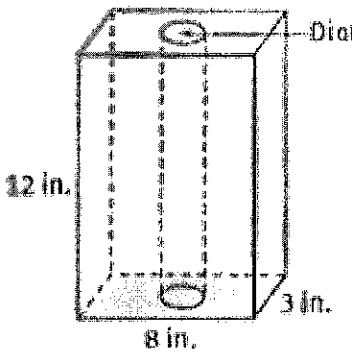
$3.66\ m = r$

a. The volume of a square pyramid is 243 in³. Determine the edge of the base if the height of the pyramid is 27 in.

$V = \frac{1}{3}Bh$ $243 = \frac{1}{3}(B)(27)$ $729 = B \cdot 27$ $27 = B$

area of base $= s^2$ $27 = s^2$ $s = 5.196$ in

b. A right cylinder with diameter 2 inches has been carved out of the prism shown below.



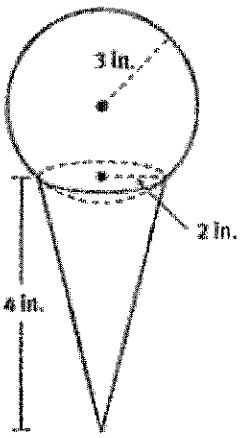
V of prism $= 8 \cdot 3 \cdot 12 = 288$ in³

V of cylinder $= \pi r^2 h = \pi(1)^2(12) = 12\pi$ in³

V of leftover $= 288 - 12\pi \approx 250.80$ in³

Determine the remaining volume of the prism. Justify your answer by showing your work.

c. A spherical scoop of ice cream has been placed on top of a cone as shown below.



V of ice cream $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(3)^3 = 36\pi$

V of cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(2)^2(4) = 5.33\pi$

If the ice cream melts completely, will it overflow the cone? Justify your answer.

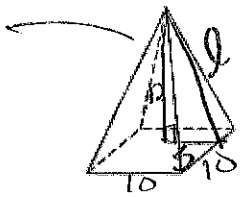
Yes the volume of the ice cream is greater than the volume of the cone.

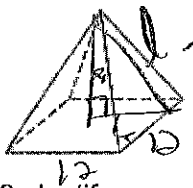
IM 10 Ch 11 Day 6 Homework

2. Pyramid tents were popular for a time during the 19th century. Although their popularity declined during the 20th century, they have recently begun to regain popularity again. The design is ideal for shaping canvas, and it only requires one pole and some stakes to secure it. Joe wants to make a right square pyramid tent and is considering two different sizes. He will either make one with a base that is 10 feet by 10 feet and has a height of 12 feet, or he will make one with a base that is 12 feet by 12 feet and has a height of 8 feet.

   a. Sketch the two pyramid designs Joe is considering and label them with the given measurements.

$l^2 = 5^2 + 12^2$
$l = 13$





$l^2 = 8^2 + 6^2$
$l = 10$

B. Which tent will have the most interior space? Justify your answer.

$V_1 = \frac{1}{3}(B)h = \frac{1}{3}(100)(12) = 400\ ft^3$

$V_2 = \frac{1}{3}(B)h = \frac{1}{3}(144)8 = 384\ ft^3$

The 1st tent has a larger volume.

C. Which tent will take the most material to construct? Justify your answer.

$SA_1 = B + \frac{1}{2}Pl = 100 + \frac{1}{2}(40)(13) = 360\ ft^2$

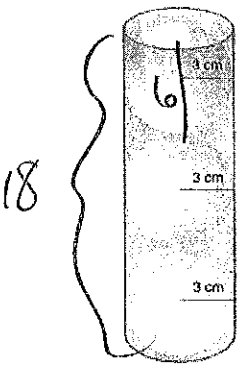
$SA_2 = B + \frac{1}{2}Pl = 144 + \frac{1}{2}(48)(10) = 384\ ft^2$

The 2nd tent has a larger SA.

D. Which tent should Joe make? Justify your answer.

I would make the 1st tent b/c it has more space but takes less material so it should cost less.

3. A can holds three tennis balls shown, each has a radius of 3 cm. What is the volume of empty space in the can?



$V\ of\ can = \pi r^2 h = \pi(3)^2(18) = 162\pi\ cm^3$

$V\ of\ 1\ ball = \frac{4}{3}(3)^3\pi = 36\pi\ cm^3$

$V\ of\ 3\ balls = 36\pi \times 3 = 108\pi\ cm^3$

$empty\ space = 162\pi - 108\pi = 54\pi\ cm^3$

4. The Pyramid of Khafre has a volume of 2,226,450 cubic meters. Its base is a square with a side length of 215 meters. What is the height of the Pyramid of Khafre?

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

$2226450 = \frac{1}{3}(215)^2 h$

$6679350 = 215^2 h$

$144.496 \approx h$

5. Your municipality is replacing the storage tanks in the community. Which plan provides the greater total capacity?

Plan 1: Install one cylindrical tank that is 150 feet tall and has a radius of 50 feet.

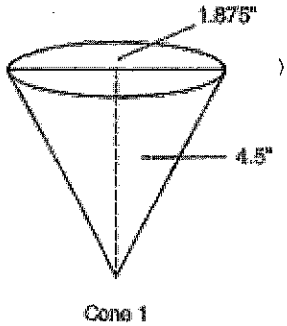
Plan 2: Install two cylindrical tanks that are 75 feet tall. One cylindrical tank has a radius of 30 feet, and one tank has a radius of 25 feet.

$V_1 = \pi r^2 h = \pi(50)^2(150) = 375000\pi$ ft^3

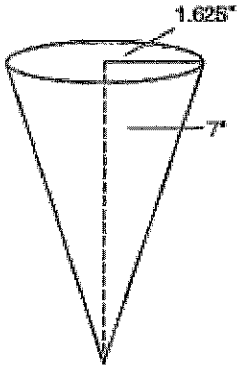
$V_2 = \pi r^2 h + \pi r^2 h = \pi(30)^2(75) + \pi(25)^2(75) = 67500\pi + 46875\pi = 114375$ ft^3

The 1st plan has a greater volume.

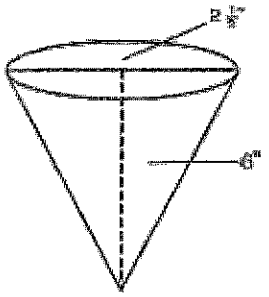
6. Joel owns a frozen yogurt and fruit smoothie shop. He just placed an order for three different sizes of cones. He needs to determine how much to charge for each cone. Which cone should he charge the most and least for?



Cone 1



Cone 2



Cone 3

$V_1 = \frac{1}{3}\pi r^2 h$

$\frac{1}{3}\pi(.9375)(4.5)$

$\approx 1.40625\pi$

$V_2 = \frac{1}{3}\pi r^2 h$

$V_2 = \frac{1}{3}\pi(1.625)(7)$

$\approx 3.7917\pi$

$V_3 = \frac{1}{3}\pi r^2 h$

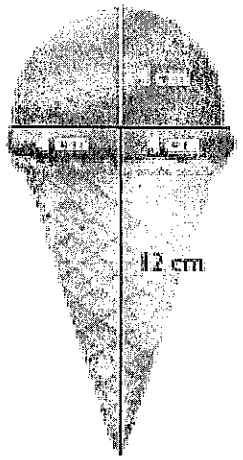
$V_3 = \frac{1}{3}\pi(1.25)(6)$

$V_3 = 2.5\pi$

The 1st cone has the least volume so it should cost the least, the 2nd cone should be the most.

IM 10 Ch 11 Day 6 Formative

A frozen sphere of yogurt is pressed into the cone shown. If the yogurt melts would it overflow the cone? Explain. Use mathematics to support your answer.



Exercise 23

$V_{icecream} = \frac{4}{3}\pi(4)^3 = 85\frac{1}{3}\pi\ cm^3$

$V_{cone} = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(4)^2(12) = 64\pi\ cm^3$

Since the ice cream has a greater volume the cone will overflow.

IM 10 Ch 11 Day 6 Formative

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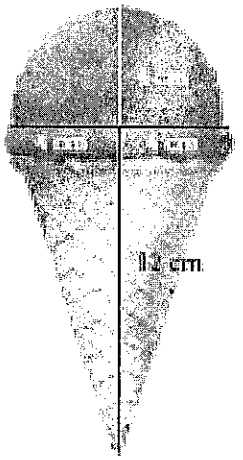

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