Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) solve problems involving surface area and volume
    of 3-dimensional figures.

6.4.1: Surface Area and Volume

Date: _Dec. 10/18_

Ex. 1 A swimming pool is 30 m wide, 50 m long and 7 m deep.

a) Determine the volume of this pool.

$$V = \ell w h$$
$$= 50(30)(7)$$
$$= 10\ 500\ m^3$$

b) If it costs \$1.09/m2 for the liner, how much will it cost to line this pool?

$$S.A. = \ell w + 2\ell h + 2wh$$
$$= 50(30) + 2(50)(7) + 2(30)(7)$$
$$= 2620\ m^2$$

$$Cost = \frac{\$1.09}{m^2} \times 2620\ m^2$$

$$= \$2855.80$$

∴ it will cost \$2855.80 to line this pool.

c) Another company will line the pool for \$0.87/yd2. Is this a better deal?

$$S.A. = 2620\ m^2 \times \frac{1.2\ yd^2}{m^2}$$
$$= 3144\ yd^2$$

$$Cost = \frac{\$0.87}{yd^2} \times 3144\ yd^2$$

$$= 2735.28$$

∴ yes; it is a better deal.

Ex. 2   The Cleavers want to paint this shed, shown below.

a)   What is the total surface of the outside of the shed, including the roof?

$S.A._{total} = 2\ sides + 2\ f/b + 2\ roof + 2\ tri_{roof}$

$= 2(15)(4) + 2(12)(4) + 2(15)(8.485)$

$= 120 + 96 + 254.55 + 72 \quad + 2\left(\frac{1}{2}(12)(6)\right)$

$\doteq 542.55\ ft^2$
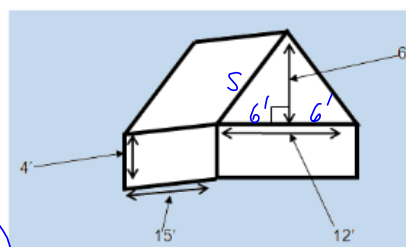
$S^2 = 6^2 + 6^2$
$= 72$
$S = \sqrt{72}$
$\doteq 8.4852$
$\doteq 8.485$

b)   If the dimensions of a doorway are 6' by 2.5', what is the surface area of the outside of the shed, excluding the door?

$A_{door} = 6(2.5)$
$= 15$

$\therefore SA_{shed-Door} = 542.55 - 15$
$\doteq 527.55$

c)   If each gallon of paint covers 350 square feet, how many gallons of paint will be needed to give the outside of the shed (excluding the doorway) two coats of paint, and the floor inside with one coat of paint?

Total Paint Needed $= 2(SA_{S-D}) + SA_{Floor}$

$= 2(527.55) + 15(12)$

$= 1055.10 + 180$

$\doteq 1235.10\ ft^2$

gallons of paint

$= \dfrac{1235.10}{350}$

$\doteq 3.538$

$\therefore 4\ gallons\ of\ paint$

Ex. 3   "Pioneer Logs" is a brand of children's toy which is sold in a large cylindrical container.
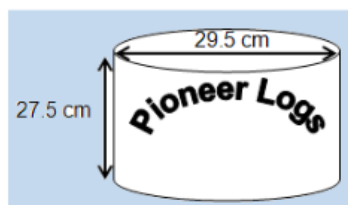
- The diameter of the container is 29.5 cm $\longrightarrow \therefore r = \frac{29.5}{2}$
- The height of the container is 27.5 cm
- The top (lid) is made of plastic $= 14.75$
- The base is made of metal
- The lateral (side) surface is made of cardboard

a)   What is the surface area of the lid?

$$SA = \pi r^2$$
$$= \pi (14.75)^2$$
$$\doteq 683.4932$$
$$\doteq 683.493 \, cm^2$$

b)   What is the surface area of the lateral side?

$$SA_{lateral} = 2\pi r h$$
$$= 2\pi (14.75)(27.5)$$
$$\doteq 2548.6170$$
$$\doteq 2548.617 \, cm^2$$

c)   Calculate the amount of wrapping paper needed to wrap this toy.

$$Paper \; Needed = 2(683.493) + 2548.617$$
$$\doteq 3915.603 \, cm^2$$

Discuss "d" briefly, then begin the homework.

d)   If the "Pioneer Logs" are packaged in a box that can hold 12 containers, determine the dimensions of
   a box with a minimum amount of surface area and is still appropriate for shipping.
   Explain why you decided to use that particular shipping box.

6.4.2: Surface Area and Volume   Date: _____

Round **final** answers to 3 decimal places, when appropriate.

1. The mailbox shown is made up of a half-cylinder attached to a rectangular prism. The rectangular prism has no top where it is attached to the half-cylinder. The half-cylinder has a radius of 5 cm. The rectangular prism has a length of 25 cm, a width of 10 cm and a height of 7.5 cm.

   a) Determine the amount of aluminum needed to build the mailbox.
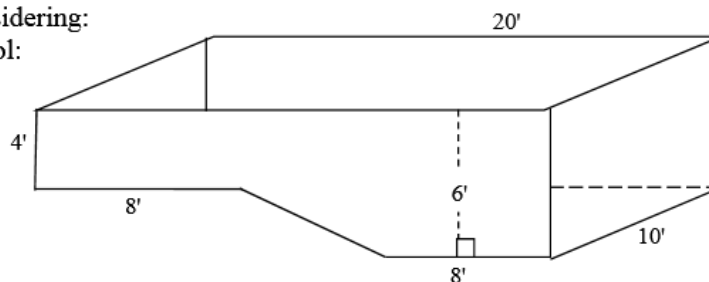   b) Determine how much space is available in the mailbox to hold the mail.
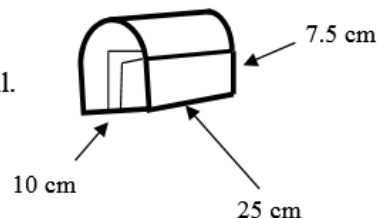
2. Mr. Hill wants to put a pool in his backyard. He's been investigating different types of pools.
   a) The first pool is shown below:
   Calculate the volume of this pool:
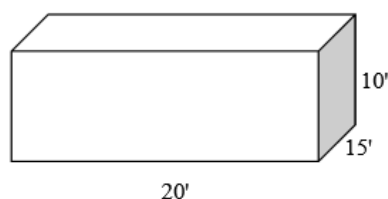
   b) Here is the other pool he is considering:
   Calculate the volume of this pool:

   c) How long will it take to drain each pool at 5 ft ^{3}/min?

3. The landscaping plan of schoolyard includes 3 circular gardens. Each garden will have a concrete border of uniform width, as shown below:

   $d_i = 13'$

   $h = 1'$

   $d_2 = 14'$
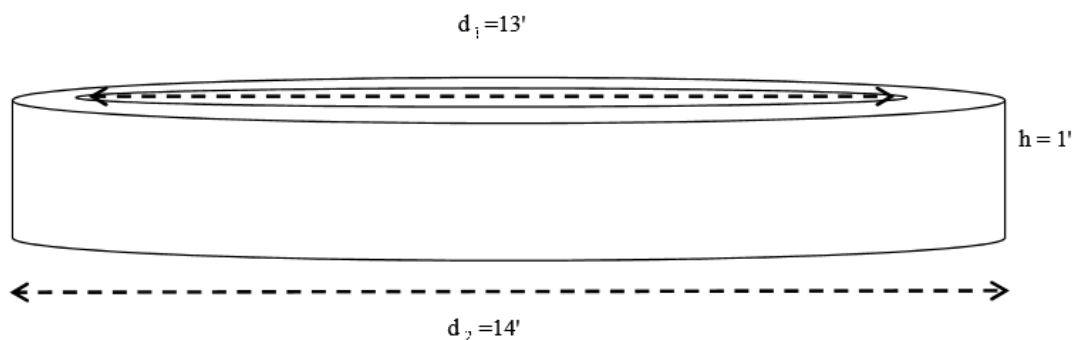
   a) Calculate the volume of concrete to be used to make 3 of these gardens.
   b) If concrete costs $ 5.70/ft^3, what is the price of pouring these gardens, including tax? (Note: PST is 8% and GST is 5%)

c) The inside of the garden is to contain a 9" layer of topsoil and a 3" layer of wood chips.

    i) Calculate the volume of both layers.
       *Hint: It will help to have the thickness changed to feet for (ii)
    ii) The cost of topsoil is $0.77/ft^3, and the cost of wood chips is $0.90/ft^3.
       Calculate the combined cost of topsoil and wood chips for the 3 gardens, including tax.
    iii) What is the total cost of the 3 gardens?

Answers to 6.4.2

1a) 1246.239 cm²   b) 2856.748 cm³
2a) 3000 ft³   b) 1000 ft³   c) Drain_A=10 hrs. Drain_B=3 hrs. 20 min
3a) 21.206 ft³ (but 3 gardens rounds to 64 ft³)   b) $412.22 (w/ tax)
3ci) $\text{Vol}_{Topsoil}$=299 ft³   Cost=$260.16 (w/ tax)
3cii) $\text{Vol}_{Woodchips}$=100 ft³ Cost=$101.70 (w/ tax)   ∴ Total Cost=$774.08