KEY

First Name:______________________________ Last Name:______________________________

L05 – Worksheet – Word Problems

Part 1 – Linear Conversions

Q1: Alicia and her friends want to estimate the diameter of a Douglas fir tree. They know that a person's arm span is approximately equal to his or her height. So, they decided to join hands around the tree to determine its circumference. It takes five people - Alicia, 5' 2", Tal 5' 8", Julia 5' 6", Paul 6' 1", and Colin 6' 3"—to reach around the tree. What is the radius of the tree, to the nearest inch?

Alicia → 5'2" is 5 Feet + 2in = 60in + 2in = 62in
Tal → 5'8" is 5 Feet + 8in = 60in + 8in = 68in
Julia → 5'6" is 5 Feet + 6in = 60in + 6in = 66in
Paul → 6'1" is 6 Feet + 1in = 72in + 1in = 73in
Colin → 6'3" is 6 Feet + 3in = 72in + 3in = 75in

344in is the Circumferance.

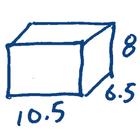
$C = 2\pi r$

$344 = 2(3.14)r \rightarrow \boxed{r \doteq 55\text{in}}$

Part 2 – Surface Area and SA Conversions

Q2: A company is deciding which box to use for their merchandise. The first box measures 8 inches by 6.25 inches by 10.5 inches. The second box measures 9 cm by 5.5 cm by 11.75 cm. If each box used material that cost $0.03 per square inch to make, how much does a company save by choosing to make fifty boxes of the smaller box in comparison to fifty boxes of the larger box?

Box #1

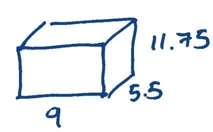


Top = (10.5)(6.5) = 68.25
Bottom = 68.25
Right = (6.5)(8) = 52
Left = 52
Front = (10.5)(8) = 84
Back = 84

408.5 in^2

$408.5\text{in}^2 \times \$0.03 = \$12.^{26}$ per box
× 50 boxes
$\$613.^{00}$

Box # 2



Top = (9)(5.5) = 49.5
Bottom = 49.5
Right = (5.5)(11.75) = 64.625
Left = 64.625
Front = (9)(11.75) = 105.75
Back = 105.75

439.75cm^2

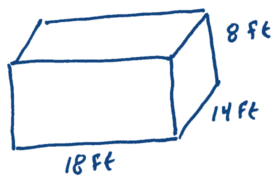
$\frac{439.75\text{cm}\cdot\text{cm}}{1} \times \frac{1\text{in}}{2.54\text{cm}} \times \frac{1\text{in}}{2.54\text{cm}} = 68.16\text{in}^2$

$68.16\text{ in}^2 \times \$0.03 = \$2.^{04}$ per box
× 50 boxes
$\$102.^{00}$

Company saves $511.00 by going with the smaller box.

KEY

Q3: You are painting the walls of a room that is 18 ft long, 14 ft wide and 8 ft high. If the paint costs \$6.50 a gallon and each gallon covers 128 ft^2 of wall, how much will it cost to paint the room?



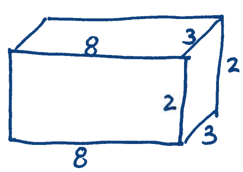
Front = (18)(8) = 144
Back = 144
Right = (8)(14) = 112
Left = 112

512 ft^2

512 ft^2 ÷ 128 ft^2 per gallon = 4 gallons of paint
× \$6.50 a gallon

\$26.00 to paint room.

Q4: Chloe wants to wrap a present in a box for Sarah. The top and bottom of the box is 8 in. by 3 in., the sides are both 3 in. by 2 in. and the front and back are 8 in. by 2 in. How much wrapping paper will Chloe need to wrap the present, measured in square feet?



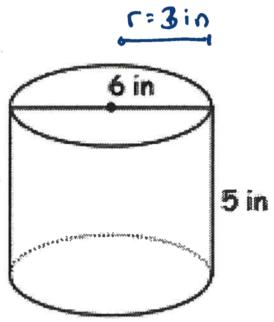
Top = (8)(3) = 24
Bottom = 24
Front = (8)(2) = 16
Back = 16
Right = (3)(2) = 6
Left = 6

92 in^2

$$\frac{92\,\text{in}\cdot\text{in}}{1} \times \frac{1\text{ ft}}{12\text{ in}} \times \frac{1\text{ ft}}{12\text{ in}} = \boxed{0.63\overline{8}\text{ ft}^2}$$

KEY

Q5: Mary wants to make several cans like the one below. She is going to cut them from a sheet of metal that has an area of 2.00 m^2. Assuming no waste, how many can she make?



Top $= \pi r^2 = (3.14)(3)^2 = 28.26$
Bottom $= 28.26$
Side $= 2\pi r h = 2(3.14)(3)(5) = 94.2$

$150.72\ in^2$

Plan: $in^2 \rightarrow cm^2 \rightarrow m^2$

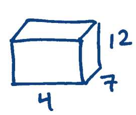
$$\frac{150.72\ in \cdot in}{1} \times \frac{2.54cm}{1in} \times \frac{2.54cm}{1in} \times \frac{1m}{100cm} \times \frac{1m}{100cm} = \frac{972.385152}{10,000} = 0.0972m^2$$

$2m^2 \div 0.0972m^2$ per cylinder $= 20.567...$

So she can make 20 cylinders.

Q6: Trey and Matt each have a rectangular prism. The base of Trey's prism is 4 cm by 7 cm and has a height of 12 cm. The base of Matt's prism is 6 in by 10 in and has a height of 3 in. How much material, in square feet, is required to make both prisms?

Trey:



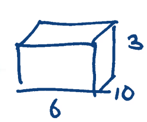
Top: $(4)(7) = 28$
Bottom $= 28$
Right: $(12)(7) = 84$
Left $= 84$
Front: $(4)(12) = 48$
Back $= 48$

$320cm^2$

Plan: $cm^2 \rightarrow in^2 \rightarrow ft^2$

$$\frac{320cm \cdot cm}{1} \times \frac{1in}{2.54cm} \times \frac{1in}{2.54cm} \times \frac{1ft}{12in} \times \frac{1ft}{12in} = 0.344ft^2$$

Matt:



Top: $(6)(10) = 60$
Bottom $= 60$
Right: $(10)(3) = 30$
Left $= 30$
Front: $(6)(3) = 18$
Back $= 18$

$216in^2$

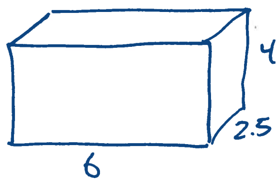
Plan: $in^2 \rightarrow ft^2$

$$\frac{216in \cdot in}{1} \times \frac{1ft}{12in} \times \frac{1ft}{12in} = 1.5ft^2$$

Both prisms require $1.844\ ft^2$ of material.

KEY

Q7: A library has an aquarium in the shape of a rectangular prism. The base is 6 ft by 2.5 ft. The height is 4 ft. How many square meters of glass were used to build the aquarium?



Glass on sides only.

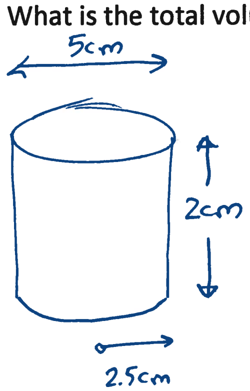
Front = $(6)(4) = 24$
Back $= 24$
Right = $(2.5)(4) = 10$
Left $= 10$

68 ft^2

$$\frac{68\ \cancel{ft} \cdot \cancel{ft}}{1} \times \frac{30.48\,c\cancel{m}}{1\ \cancel{ft}} \times \frac{30.48\,c\cancel{m}}{1\ \cancel{ft}} \times \frac{1\,m}{100\,c\cancel{m}} \times \frac{1\,m}{100\,c\cancel{m}} = \boxed{6.32\,m^2}$$

Part 3 – Volume and VOL Conversions

Q8: A cosmetics company makes small cylindrical bars of soap with a diameter of 5 cm and a height of 2 cm. What is the total volume of soap, to the nearest cubic inch?



$$\begin{aligned} VOL &= (\text{Area of Base}) \times \text{Height} \\ &= (\pi r^2) \times \text{Height} \\ &= (3.14)(2.5)^2 \times (2) \\ &= 19.625 \times 2 \\ &= 39.25 \text{ cm}^3 \end{aligned}$$

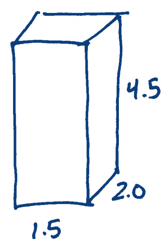
$$\frac{39.25\,cm \cdot cm \cdot cm}{1} \times \frac{1 in}{2.54 cm} \times \frac{1 in}{2.54 cm} \times \frac{1 in}{2.54 cm} = 2.395 \text{ in}^3$$

$$\doteq \boxed{2 \text{ in}^3}$$

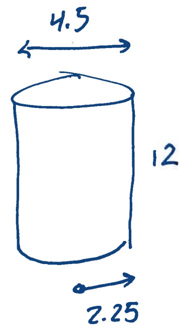
KEY

Q9: A bottled water manufacturer wants to build a fancy water bottle. One option is to build a rectangular prism that measures 1.5 in by 2.0 in by 4.5 in. The second option is to build a perfect cylinder with a diameter of 4.5 cm by 12 cm. Which container holds more water?

Option #1



Option #2



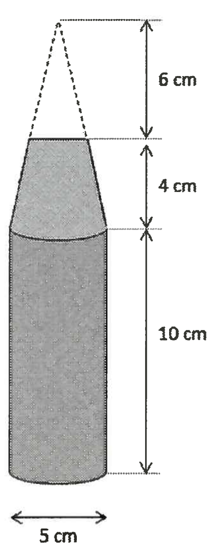
VOL = (Area of Base) × Height
= (1.5)(2.0) × (4.5)
= 13.5 in^3

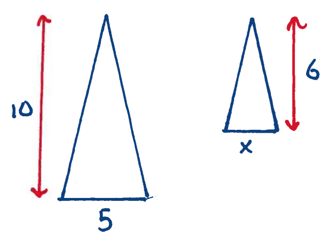
VOL = (Area of Base) × Height
= $(\pi r^2) \times h$
= $(3.14)(2.25)^2 \times (12)$
vs. $\boxed{= 190.755 \text{ cm}^3}$

$\frac{13.5 \text{ in}^3}{1} \times \frac{2.54 \text{cm}}{1 \text{in}} \times \frac{2.54 \text{cm}}{1 \text{in}} \times \frac{2.54 \text{cm}}{1 \text{in}}$ $\boxed{= 221.2 \text{cm}^3}$

The rectangular prism has more volume.

Q10: A baby bottle cab be approximated using a cylinder and part of a cone, as depicted below. What is the total volume of the bottle, to the nearest cubic centimeter?





Similar Figures (Gr 9 Concept)

$\frac{5}{10} = \frac{x}{6}$ $x = 3\text{cm}$
or $r = 1.5\text{cm}$

VOL of Cylinder = $(\pi r^2) \times h$
= $(3.14)(2.5)^2 \times 10$
= 196.25 cm^3

VOL of Large Cone = $\frac{(\pi r^2) \times h}{3}$
= $\frac{(3.14)(\quad \times 10}{3}$
= $65.41\overline{6} \text{ cm}^3$

VOL of Small Cone = $\frac{(\pi r^2) \times h}{3}$
= $\frac{(3.14)(1.5)^2 \times 6}{3}$
= 14.13 cm^3

Total VOL = Cylinder + Large Cone − Small Cone
= $(196.25) + (65.41\overline{6}) - (14.13)$
= $247.53\overline{6} \text{ cm}^3$
$\boxed{= 248 \text{ cm}^3}$