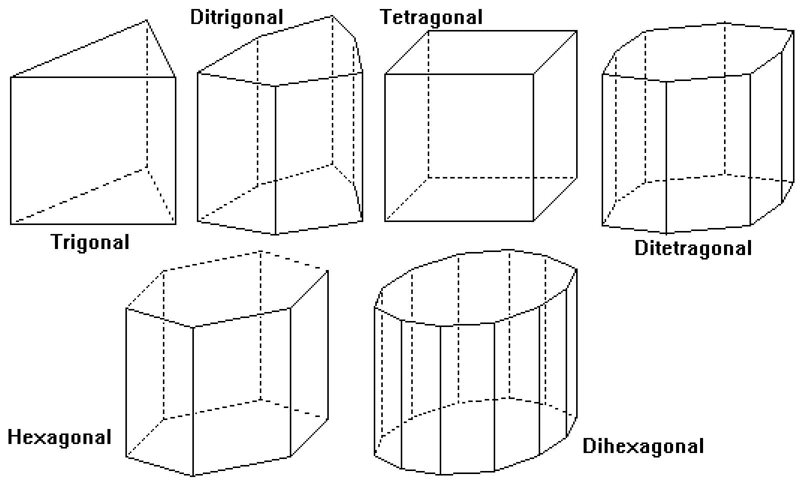
Warden Ave PS

Measurement Unit 2 – Surface Area, Volume and 3-D Shapes



Mr. D. Leavitt
Math

LEARNING GOALS

By the end of this unit, you should be able to:

- Identify and use the correct formula for calculating the surface area (SA) of various prisms (cubes, rectangular prisms, etc…).
- Identify and use the correct formula for calculating the volume (V) of various prisms (cubes, rectangular prisms, etc…).
- Solve problems involving irregularly shaped prisms to discover their surface area and volume.
- Find solutions to word problems involving surface area and volume.

AREA AND PERIMETER

So, let's get started. You previously learned about how to calculate the area any shape occupies. If you don't remember, here's a chart of what we learned earlier this year:

Shape	Formula
Rectangle (area)	L x W
Parallelogram (area)	B x H
Triangle (area)	$\frac{(B \times H)}{2}$
Trapezoid (area)	$\frac{(a + b) \times h}{2}$

Don't forget, that you'll also need to know how to calculate the perimeter of an object. Perimeter is the total of all the sides of a polygon. The simple formula for a 4-sided polygon is $P= S_1+ S_2+ S_3+ S_4$

As a way to get started, complete the following pages on the area of various shapes.

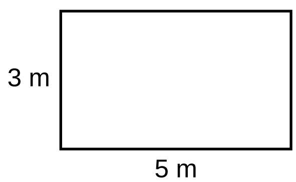
Worksheet Works.com

Calculating Area & Perimeter

Name: ____________________ **Date:** ____________________

Calculate the area and perimeter of each shape.

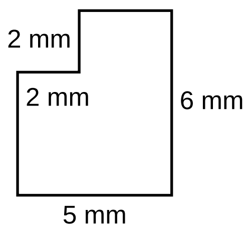
(1)



Perimeter: __________

Area: __________

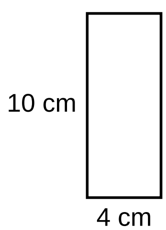
(2)



Perimeter: __________

Area: __________

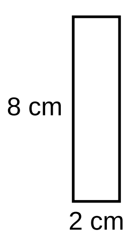
(3)



Perimeter: __________

Area: __________

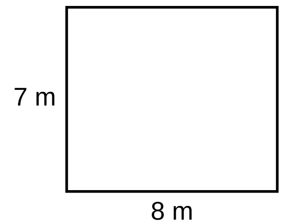
(4)



Perimeter: __________

Area: __________

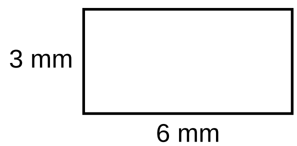
(5)



Perimeter: __________

Area: __________

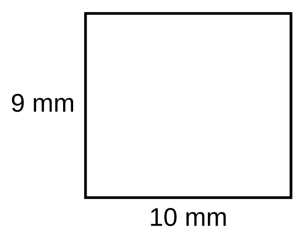
(6)



Perimeter: __________

Area: __________

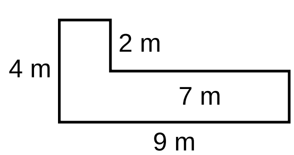
(7)



Perimeter: __________

Area: __________

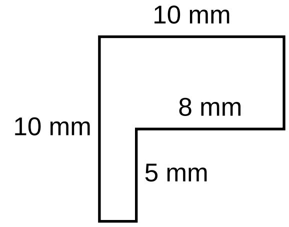
(8)



Perimeter: __________

Area: __________

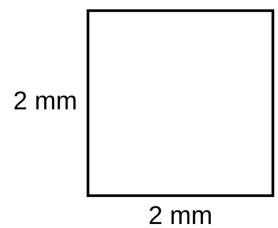
(9)



Perimeter: __________

Area: __________

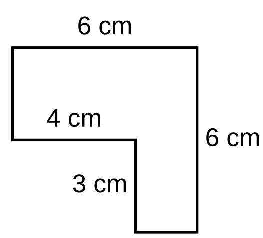
(10)



Perimeter: __________

Area: __________

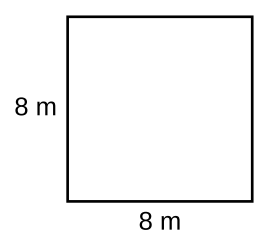
(11)



Perimeter: __________

Area: __________

(12)



Perimeter: __________

Area: __________

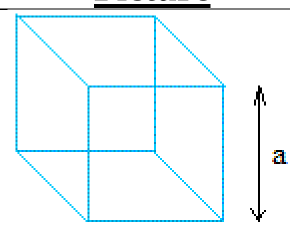
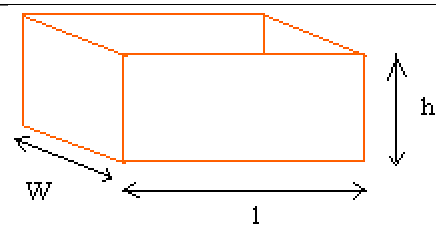
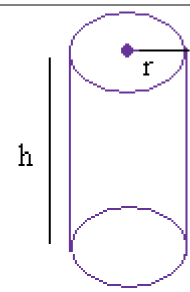
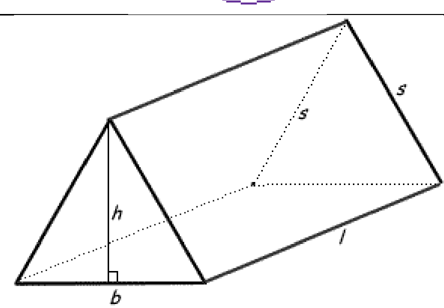
Surface Area

So now that we've learned all about the area and perimeter of 2-D (two dimensional) objects and polygons, we can explore the concept of surface area.

Surface Area is the total area of the surface of a three-dimensional object. Put another way, you add the area of all the sides of a 3-D object together to get the total surface area.

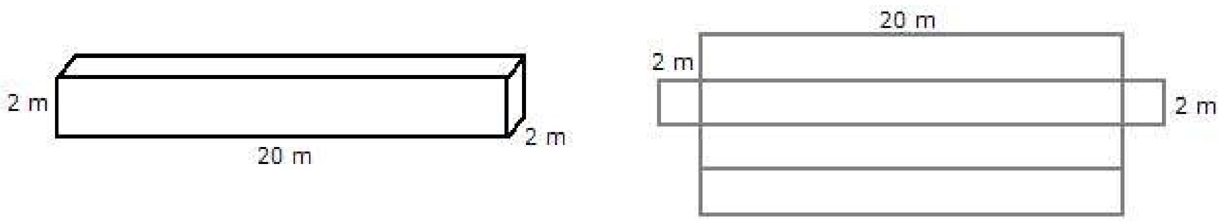
A 3-D object is any figure or form that has **Length**, **Width** and **Height**.

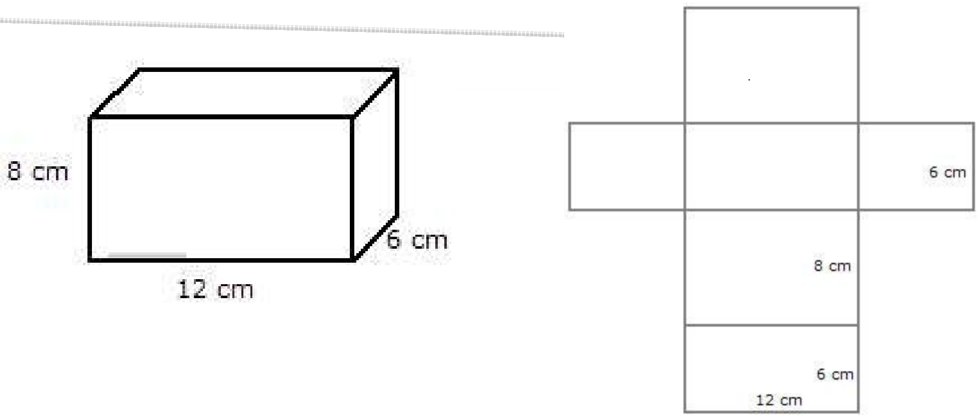
Here is a chart of some of the figures we'll be looking at for surface area:

Shape	**Picture**	**Formula**
Cube		Surface area = $6 \times a^2$
Rectangular Prism		Surface area = l X w X h
Cylinder		Surface area = $(2 \times pi \times r^2)$ + $(2 \times pi \times r \times h)$ pi = 3.14 h is the height r is the radius
Triangular Prism		Surface area = bh +2(ls) + (lb)

There are obviously more figures but they are all variations on these figures, so you can figure them out from there. On the following two pages you'll practice using the formulas on various figures. Don't forget to identify the figure and show you work starting with the formula.

Calculate the surface areas
for each of the objects below.

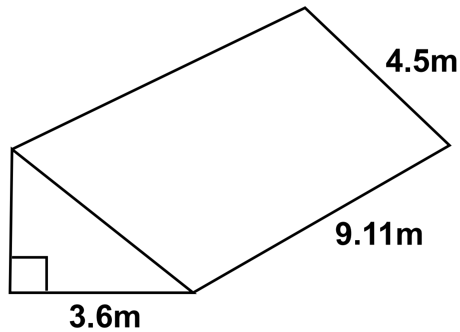




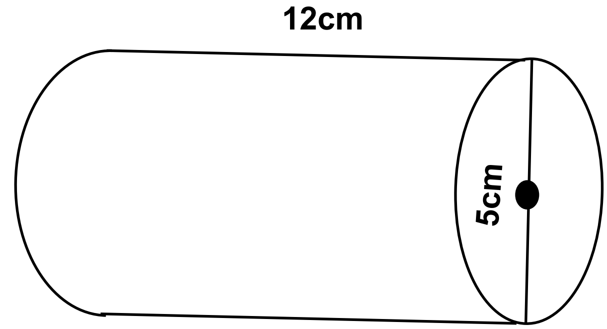
Surface Area

Name: *Class:*

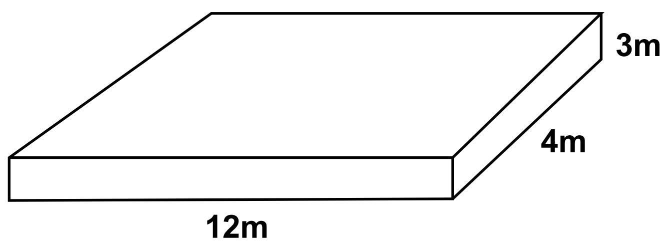
Find the sureface area of the following figures



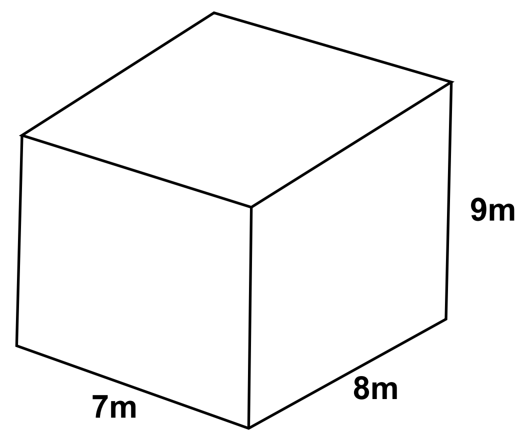
1. ______________________



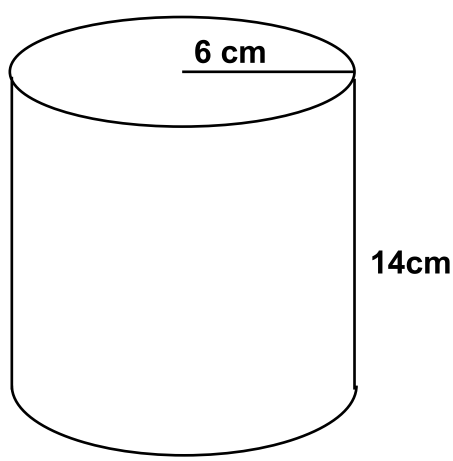
2. ______________________



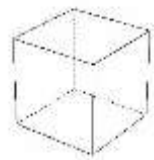
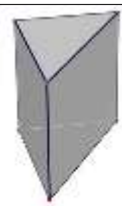
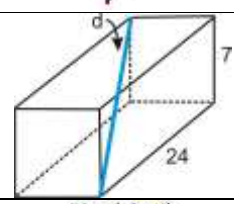
3. ______________________



4. ______________________



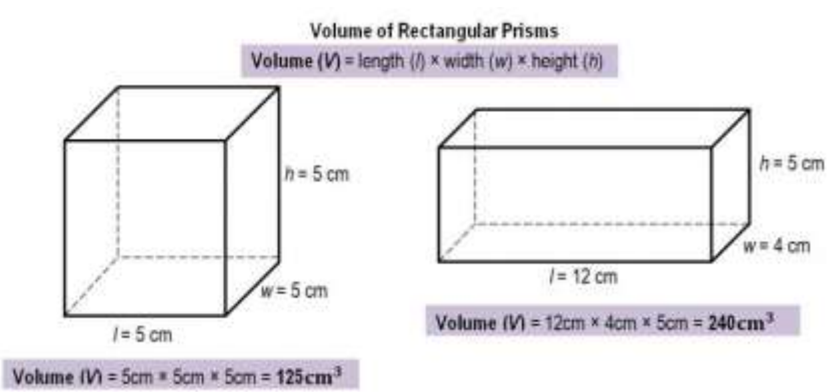
5. ______________________

SHAPE	PICTURE	VOLUME FORMULA	NOTES
Cube		S^3	S = length of any side (or edge)
Cylinder		*pi* r^2 h OR *pi* X r^2 X h	r = radius of circular face, h = height, *pi*=3.14
Prism (non rectangular)		Bh OR B x h	B = area of the base, h = height
Rectangular Prism		lwh OR l X w X h	l = length, w = width, h = height
Pyramid		Bh/3	B = area of the base, h = height of pyramid

<u>Volume</u>

If Surface Area is like the wrapping around the box, then volume is how much you can put in that box. Volume measures the area contained inside a 3-D object.

The definition for Volume is the amount of 3-dimensional space an object occupies. It is also referred to as its ***Capacity***. Let's look at these examples:



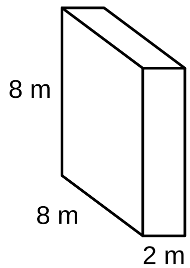
Note that the formula is written at the top and that the answers are written in cm^3, or cubic centimeters.

Calculating Volume

Name: ______________________ **Date:** ______________________

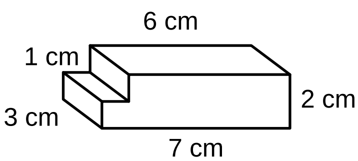
Calculate the volume of each solid.

(1)



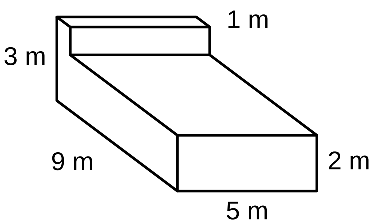
Volume: 128 m^3

(2)



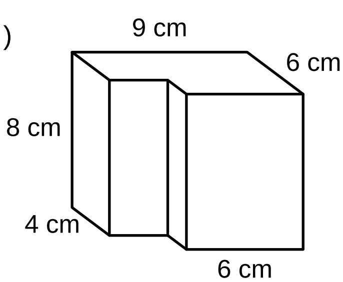
Volume: ____________

(3)



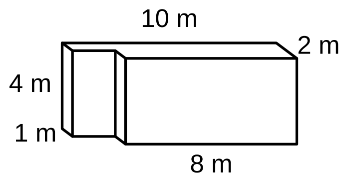
Volume: ____________

(4)



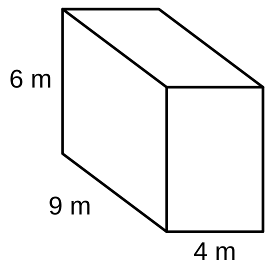
Volume: ____________

(5)



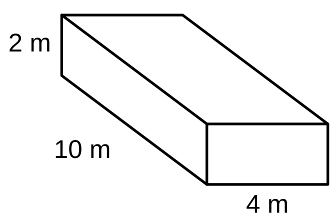
Volume: ____________

(6)



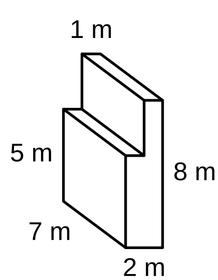
Volume: ____________

(7)



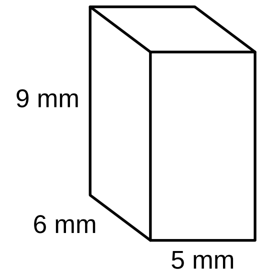
Volume: ____________

(8)



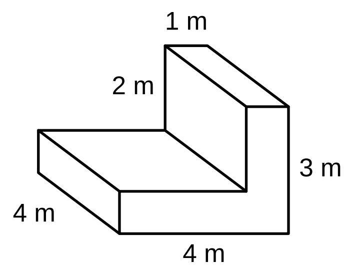
Volume: ____________

(9)



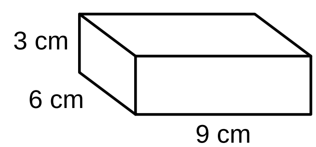
Volume: ____________

(10)



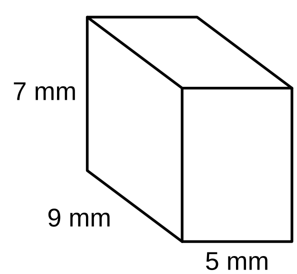
Volume: ____________

(11)



Volume: ____________

(12)



Volume: ____________

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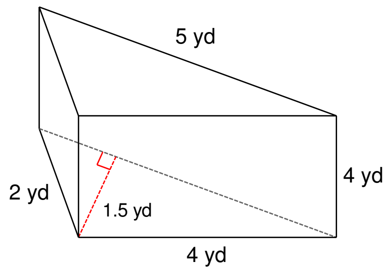
Volumes of Solids

Date________________ Period____

Find the volume of each figure. Round to the nearest tenth.

1)



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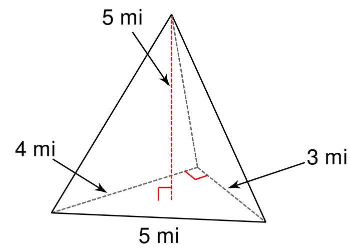

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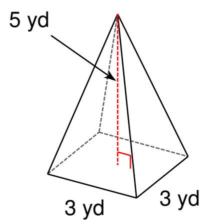
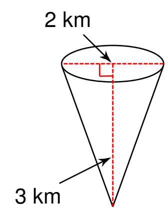
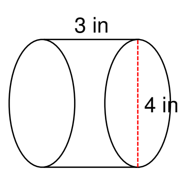


4)



5)



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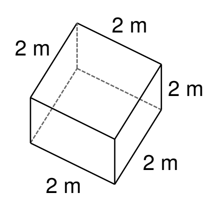
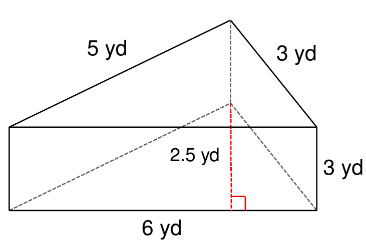
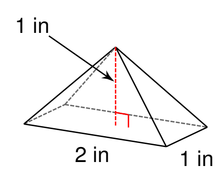


7)



8)

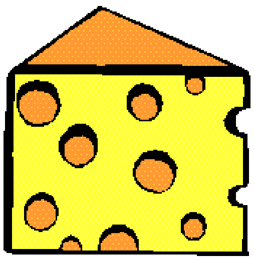


Volume of Triangular Prisms

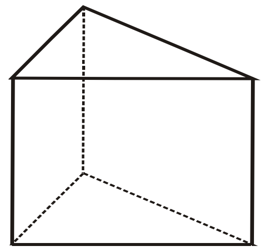
Show your work using good form and be prepared to tell how you solved the problem.

1. Determine the volume of the piece of cheese.
   Create a problem based on the volume.

Picture

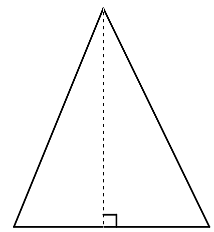


Skeleton



H = height of prism = 5.0 cm
length of rectangle = 6.3 cm

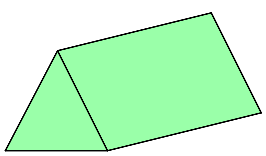
Base



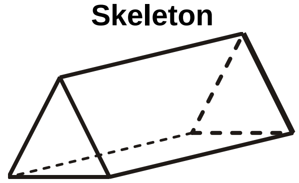
height of triangle = 6.0 cm
base of triangle = 4.0 cm

2. Determine the volume of the nutrition bar.
   Create a problem based on the volume.

Picture

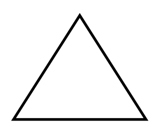


Skeleton



Length of rectangle = 5.0 cm

Base

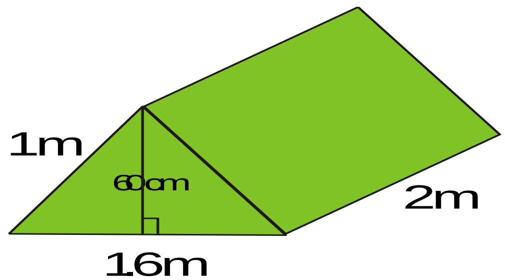


Equilateral triangle with:
height = 3.0 cm
base = 3.5 cm

Volume of Triangular Prisms (continued)

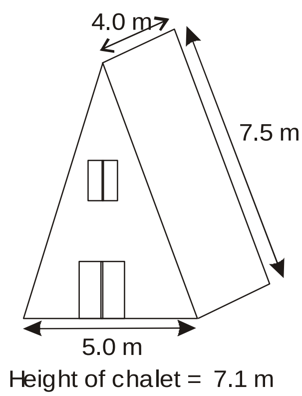
3. Determine the volume of air space in the tent.
   The front of the tent has the shape of an isosceles triangle.

   Create a problem based on the volume.



4. a) If you could only have 1 person per 15 m^3 to meet fire safety standards, how many people could stay in this ski chalet?

.



Hint:
Think about whether the height of the chalet is the same as the height of the prism.

Which measurements are unnecessary for this question?

   b) How much longer would the chalet need to be to meet the safety requirements to accommodate 16 people?

Student Name: ___________________________ **Score:**

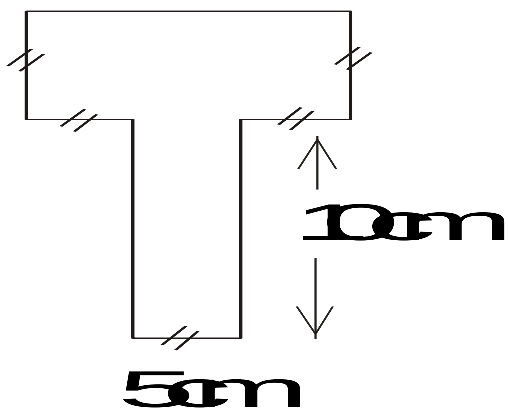
Volume of Cylinder Worksheet

Radius = 8 ft; Height = 7 ft Volume = _________________	Diameter = 9 yd; Height = 6 yd Volume = _________________
Radius = 7.5 m; Height = 4.4 m Volume = _________________	Diameter = 12.5 in; Height = 6.8 in Volume = _________________
Radius = 4 yd; Height = 5 yd Volume = _________________	Diameter = 7 ft; Height = 7 ft Volume = _________________
Radius = 21 mm; Height = 19 mm Volume = _________________	Diameter = 8.8 cm; Height = 9 cm Volume = _________________

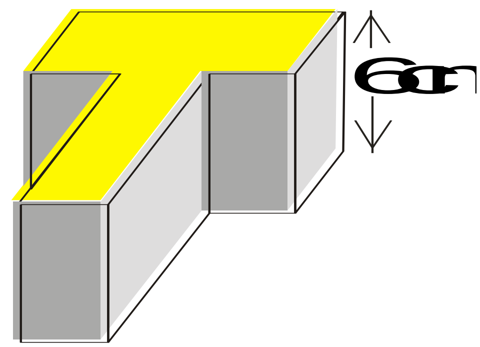
Designing a Gift Box

Determine the volume of the gift box designed by the students from Trillium School.

Shape of the base of the box:



Side view of the box:

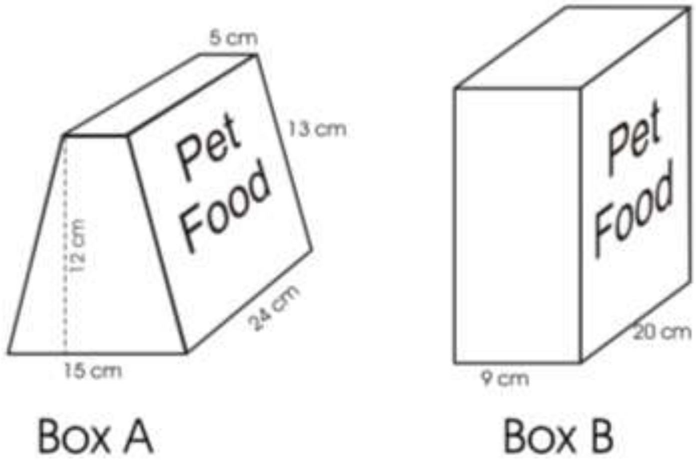


Volume of the box:

Capacity of the box:

Designing a Box (cont'd)

A local pet food company wishes to package their product in a box. The preliminary box design is shown on the left.



1. Determine the volume of the box on the left. Verify your calculation using an alternate method.

2. Box B has the same volume as Box A. What is the height of Box B? Explain how you know.

3. Design a new box, Box C, with the same volume as the two boxes above.

Surface Area and Volume Workbook

Teacher Name: **Mr. Leavitt**
Student Name: ____

CATEGORY	4	3	2	1
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.
Strategy/Procedures	Typically, uses an efficient and effective strategy to solve the problem(s).	Typically, uses an effective strategy to solve the problem(s).	Sometimes uses an effective strategy to solve problems, but does not do it consistently.	Rarely uses an effective strategy to solve problems.
Completion	All problems are completed.	All but one of the problems are completed.	All but two of the problems are completed.	Several of the problems are not completed.
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in an organized fashion but may be hard to read at times.	The work appears sloppy and unorganized. It is hard to know what information goes