Name/Date:

Scale Drawing Project

Standards:

Standards for Mathematical Practice:

1. Make sense of the problem and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.

Common Core Standards:

8.G.1- Students will know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

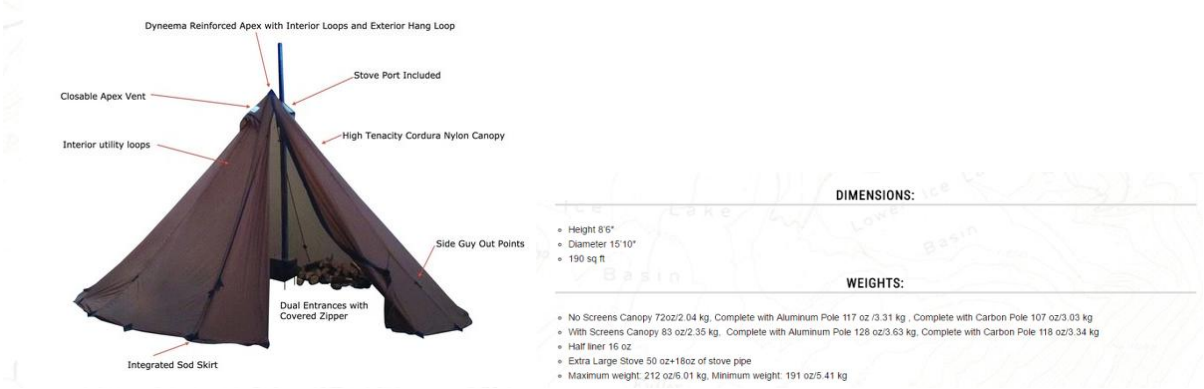
Objective: You are assigned to do internet search to find examples of the three shapes we have studied in this chapter- a cylinder, a cone, and a sphere. Furthermore, you just went through an assignment where scale factor is a concern for both volume and area, and we will be drawing scale models (to the best of our ability).

Procedure:

1) One the first day, we will be in the computer lab, and you will need to find examples of each type of solid in real life. Furthermore, you will need to provide measurements of the actual dimensions of each example.

Example: I did a quick image search for the following site;

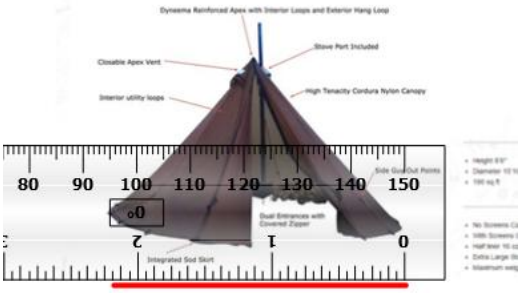
https://seekoutside.com/8-person-tipi-xl-stove-half-liner-bundle/



(It was convenient to find this at a shopping site because they provide information of the solid!)

2) You will then use the dimensions to find the surface area and volume of each shape. You MUST show work, and use the dimensions that you have found to find each piece of information. *(in the previous example, I will use the diameter and height, and will need to find the slant height. To avoid confusion, I will convert all measurement to inches. So the height of 8 feet 6 inches changes to 102 inches, and the diameter of 15 feet 10 inches changes to 190 inches. DO NOT USE 190 square inches, you must find it yourself!)*

https://seekoutside.com/8-person-tipi-xl-stove-half-li



(It was convenient to find this at a shopping site becau

2 3/12 in., or 2.25 in.

3) You will then measure the pictures that you copied and pasted on your worksheet. Use the measurements found in step 2 and divide it by the corresponding measurements from your pictures. Remember, you can control how big the picture can be, why not change the size of the picture so that you can manipulate easier calculations? *(For example, the tent that I have has a diameter of 15'10", or 15x12= 180 + 10 = 190 inches. When I measured the picture, it came out to be about 2.25 inches:*

4) Find the scale factor between your measurements to the actual measurement. *(For example, I can divide 190 by 2.25 to get a scale factor from the actual size to the found measurements. So 190/2.25 = 84.444…, or 84.44* ****fair warning; scale factor might be different if you use a different variable, such as height****.)*

5) Find the surface area and volume of the original solid and of the scale model, on your paper.

(In this example, I did my best to measure the height and slant height. I then used these measurements to find my surface area and volume of the smaller tent, with a radius of 2.25/2= 1.125;

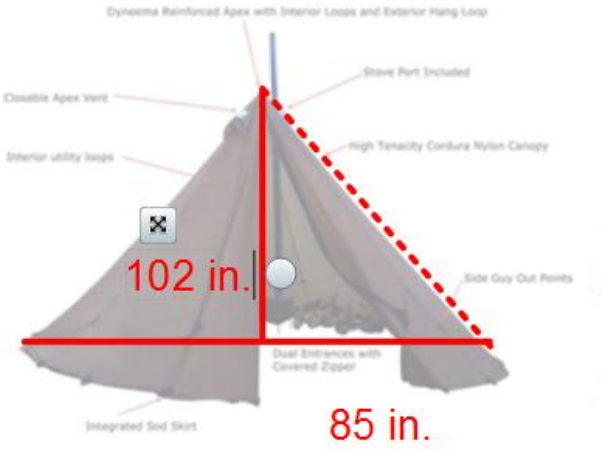
Volume:

$\pi(1.125)^2(1.25)$
4.970097753
$Ans/3$
1.656699251

Surface Area:

$\pi(1.125)(1.5)$
5.301437603
$Ans+\pi(1.125)^2$
9.277515805

As for the original shape, I am not given the slant height from my website, so I have to find it. I found the diameter of 190 inches, and a height of 102 inches. Use half the diameter and the height to find the slant height, by using the Pythagorean Theorem.



$a^2 + b^2 = c^2$
$85^2 + 102^2 = c^2$
$c^2 = 17629$

Slant height = 132.77 in.

Total Surface Area:

$\pi(85)(132.77)$
35454.28681
$Ans+\pi(85)^2$
58152.29373

Volume:

$\pi(85)^2(102)/3$
771732.2354

)

6) Using your volume and surface area for the smaller solid found in 5), and multiply by the scale factor found 4) to find the total surface area and volume. *(In this example, I will use 84.44 for my scale factor, and 9.27 in.^{2} and 4.97 in.^{3} for my theoretical surface area and volume. For area it is the* square of the scale factor, *and for volume it is* the cube of the scale factor. *So 9.27(84.44)^2 and 1.6567(84.44)^3 will be used;*

$9.27(84.44)^2$
66096.15307
$1.6567(84.44)^3$
997444.0549

7) Compare the original surface are and volume with the calculated results from the picture by dividing them. *(In this example, I will do 66096.15307/58152.29373= 1.13, or about 113% for the surface area, and 997444.0549/771732.2354= 1.29, or about 129% for the volume).*

8) Describe the results. Why do you think there was an error? **Be specific.** *(In this example, both calculations where over the actual amount, with the surface area above 13% and the volume above by 29%. I noticed that the picture was taken at an angle from above, which could distorted the actual measurements of both the height and slant height. Maybe that was why my calculations of the surface area and volume was off).*

9) **Check your calculations**. Remember, there isn't an answer key to check my answers; I'm using YOUR measurements to find YOUR answers. You want to write out enough work so that I can follow it. *(Look at all of the examples done on this handout. YOU need to show the same rigor for your calculations).*

10) Repeat the process for a cylinder and a sphere.

On the space provided below, describe the process on how you collect your data. Write about your strategies: Using complete sentences, describe the math you used to solve the project, *including why you got any errors in your calculations*;

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Data Sheet

Please attach all shapes to this Data Sheet, show all work!

Cylinder

	radius	height	surface area	volume
original				
picture				

% error of volume: _____ % error of surface area:_____

Cone

	radius	height	Slant height	surface area	volume
original					
picture					

% error of volume: _____ % error of surface area:_____

Sphere

	radius	surface area	volume
original			
picture			

% error of volume: % error of surface area:

Rubric

	1	2	3	4
Description of Procedure	Incomplete/ fragmented sentences are used, little to no explanation were made about anything done.	Incomplete sentences are used, most calculations, calculation errors, and measurements are explained	Complete sentences are used, most calculations, calculation errors, and measurements are explained	Complete sentences are used, all calculations, calculation errors, and measurements are explained.
Data Collection	There aren't three shapes attached, given measurements are missing, and no calculations are shown.	All three pictures are printed and attached, along with given measurements, but no calculations are shown.	All three pictures are printed and attached, along with given measurements, and some calculations are shown.	All three pictures are printed and attached, along with given measurements, and all calculations are shown.
Calculations of volumes, surface area and % error	Little to none of the calculations are correct.	Most of calculations for measurements, surface area, and volume are correct.	Most of calculations for measurements, surface area, and volume are correct.	All calculations for measurements, surface area, and volume are correct.

Each point rewarded will be multiplied by 2.

Total points:____/ 24

Agenda: 3/9: Go to computer lab, collect data.

3/10, 3/11, & 3/12- Do calculations.

3/13- Bring to class, check calculations

3/14- Turn in project!