Physics Lab

Name _____

Period _____

Date _____

The Passion in Number Relationships

Purpose

The purpose of this lab is to measure, calculate and compare the circumference, area and volume of different objects, to learn how to acquire accurate measurements, to produce organized tables of data, and to create graphs of relationships between the data.

Materials

1. Meter stick and ruler
2. String
3. Assortment of objects, cylinders, disks and spheres
4. Data Analysis Software (Excel)

Objectives

1. To learn to work as a team to acquire data that will lead to understanding data.
2. To produce and create graphs of relationships between the data using data analysis software like Microsoft Excel.
3. To discover how error can misinform.
4. To produce a write-up that other people can understand.

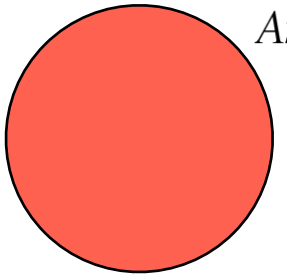
Data Acquisition

object	radius (cm)	circ. (cm)	height (cm)	area (cm^2)	volume (cm^3)
Cylinder A	1	6.8	8	50	25
Cylinder B	2.2	12.7	8	111	122
Cylinder C	3	18.6	8	151	226
Cylinder D	4	25	8	201	402
Cylinder E	5.5	34.6	8	276	760
Disk A	6	37.2		113	
Disk B	7.5	46		177	
Sphere A	8	49.9		804	2145
Sphere B	12	78		1810	7238

Data Analysis

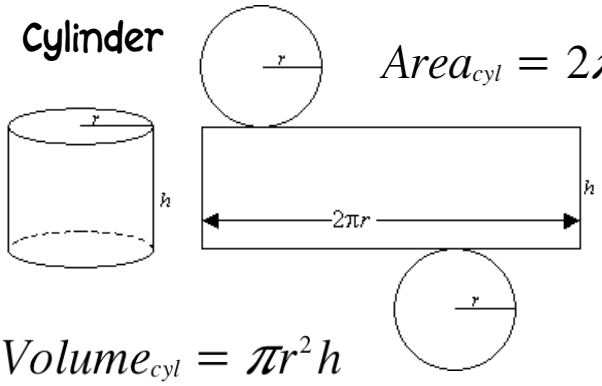
$$Circumference = 2\pi r$$

Disk



$$Area_{disk} = \pi r^2$$

Cylinder



$$Area_{cyl} = 2\pi rh$$

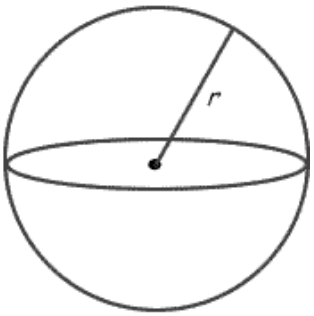
$$Volume_{cyl} = \pi r^2 h$$

Sample Calculations

Sphere

Surface Area

$A = 4\pi r^2$



Volume

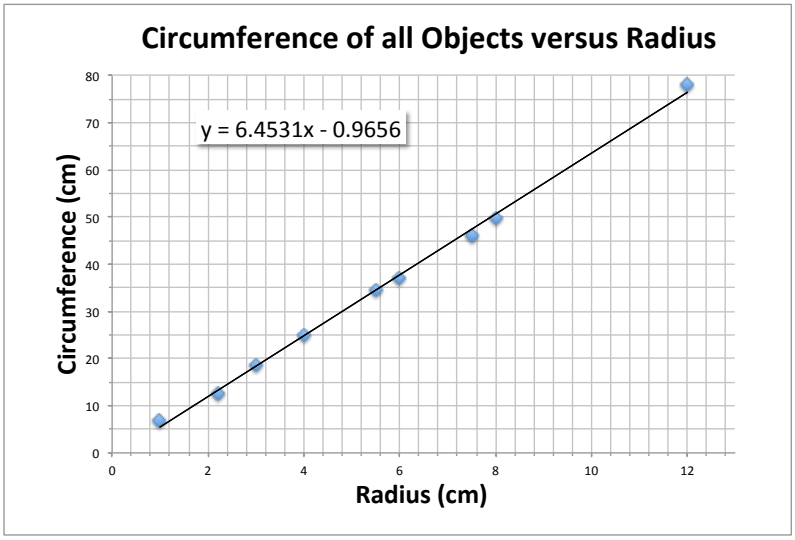
$V = \frac{4}{3}\pi r^3$

Discussion

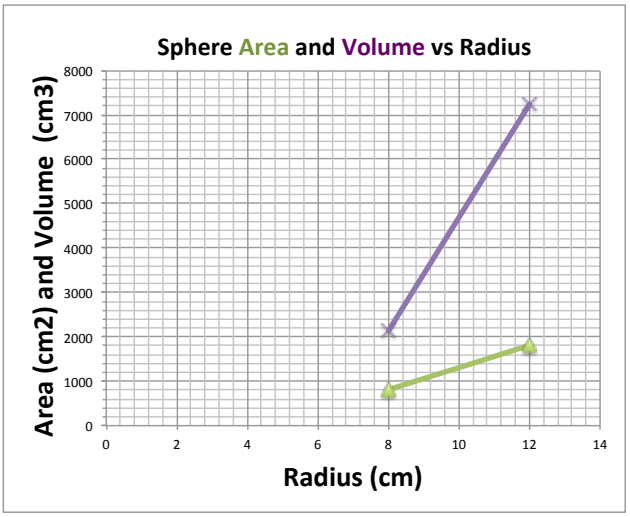
During the lab activity, I was not sure on how to get the circumference of the disks. One of my labmates suggested using the string to wrap around the object and laying it out on the meter stick. One person suggested that we mark the string but we figured it did not matter. So, we just used our fingers to mark the beginning and end.

Learning to use Excel was fun. It was quite interesting to see how easy it was to organize our data. It was neat to see that once the table was finished that we could change our data and watch the numbers change as well as the graph.

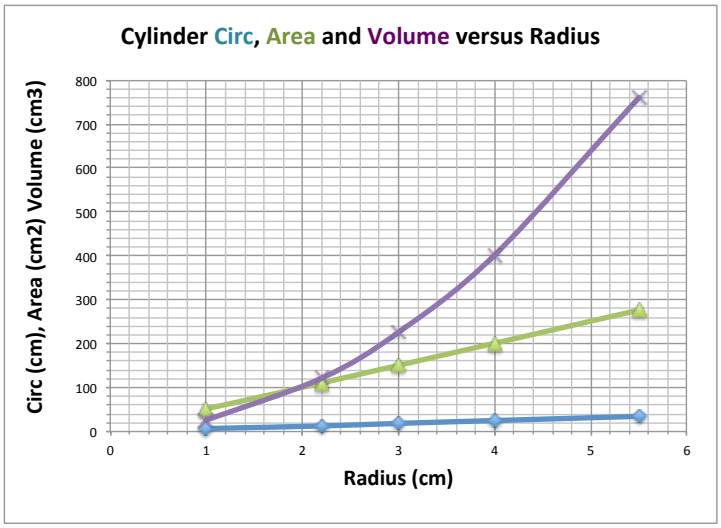
Data Analysis (Graphical)



The linear nature of this graph suggests that the circumference changes are the radius changes. The slope of the line is 2π. That is so darn cool!



It looks like the volume of the sphere changes dramatically as the radius goes up. That, implies the cubic relationship in the equation.



A very clear and organized comparison of the circumference, area and volume of a cylinder. You can see the linear relationship between the radius, area and circumference. You can also see the quadratic relationship between the area and the radius.

Conclusion

1. What did I learn?

2. Where was my error?

3. What could I do to reduce error?

4. How does using data analysis software make my work easier, or harder?

5. How did my labmates add to or hamper my experience in performing this lab activity?

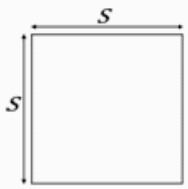
6. What could we do to enhance this activity to get more out of it/

GEOMETRY SHAPES AND SOLIDS

SQUARE

$P = 4s$

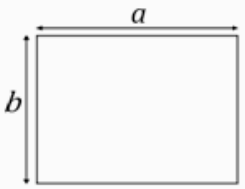
$A = s^2$



RECTANGLE

$P = 2a + 2b$

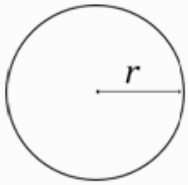
$A = ab$



CIRCLE

$P = 2\pi r$

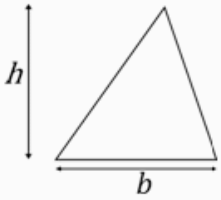
$A = \pi r^2$



TRIANGLE

$P = a + b + c$

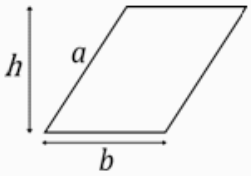
$A = \frac{1}{2}bh$



PARALLELOGRAM

$P = 2a + 2b$

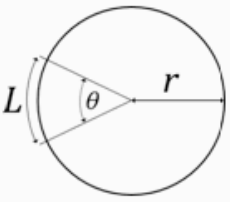
$A = bh$



CIRCULAR SECTOR

$L = \pi r \frac{\theta}{180°}$

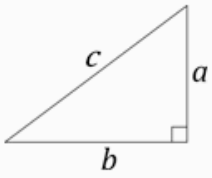
$A = \pi r^2 \frac{\theta}{360°}$



PYTHAGOREAN THEOREM

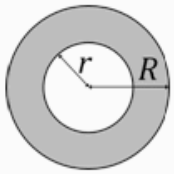
$a^2 + b^2 = c^2$

$c = \sqrt{a^2 + b^2}$



CIRCULAR RING

$A = \pi(R^2 - r^2)$



SPHERE

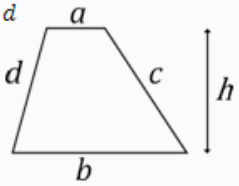
$S = 4\pi r^2$

$V = \frac{4\pi r^3}{3}$

TRAPEZOID

$P = a + b + c + d$

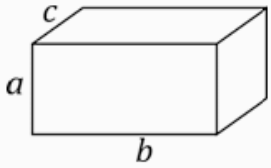
$A = h\frac{a + b}{2}$



RECTANGULAR BOX

$A = 2ab + 2ac + 2bc$

$V = abc$

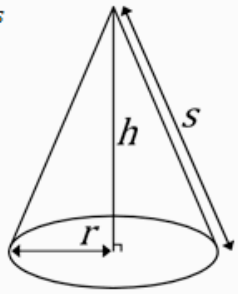


RIGHT CIRCULAR CONE

$A = \pi r^2 + \pi rs$

$s = \sqrt{r^2 + h^2}$

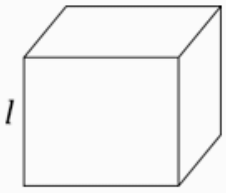
$V = \frac{1}{3}\pi r^2 h$



CUBE

$A = 6l^2$

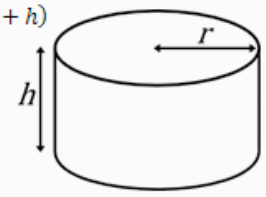
$V = l^3$



CYLINDER

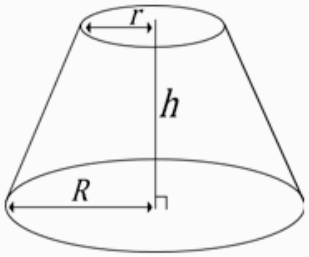
$A = 2\pi r(r + h)$

$V = \pi r^2 h$



FRUSTUM OF A CONE

$V = \frac{1}{3}\pi h(r^2 + rR + R^2)$



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Cylinder B					
Cylinder C					
Cylinder D					
Cylinder E					
Disk A					
Disk B					
Sphere A					
Sphere B					

Data Analysis

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Data Analysis (Graphical)

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