

Measurement Lab

Purpose: To learn how to measure with a vernier caliper, measure mass, use excel, excel graph.

Procedure: Obtained some pennies and different size metal spheres

Measure odd numbers of pennies stacked, at least five different amounts and recorded.

Measured the diameter of five different size metal spheres

Set up the data table as below with correct formulas in excel

Graphs in excel

calculations in excel

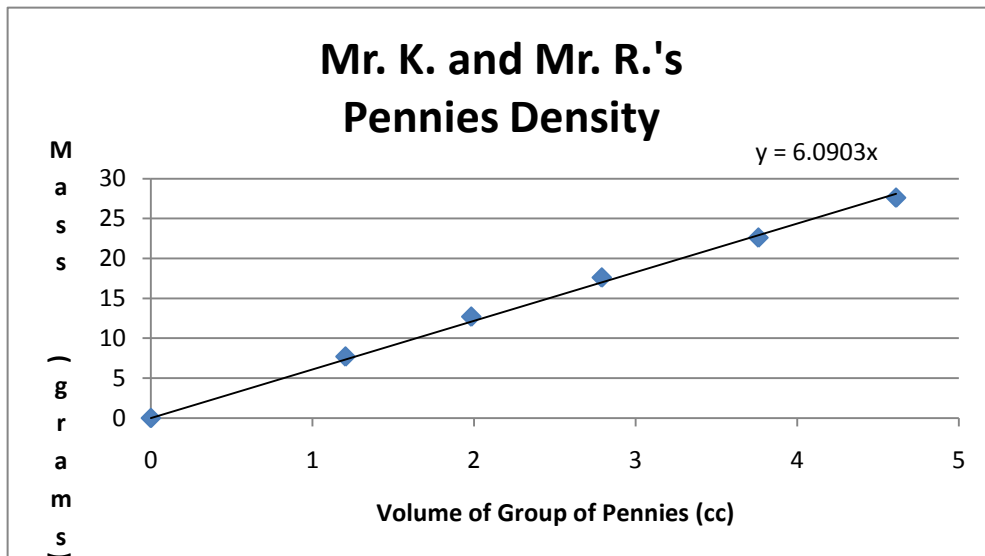
conclusion

summary

Slide from your H: drive to our correct R: drive location. One lab per group.

DATA TABLE #1: PENNIES

pennies	# of pennies	measured thickness (cm)	measured mass (g)	calculated	calculated
				$A = \pi \cdot r^2$ Base Area (sq. cm)	$V = B \cdot h$ volume (cc)
	0	0.00	0.00	2.7464588	0
	3	0.41	7.7	2.7464588	1.126048
	5	0.68	12.7	2.7464588	1.85386
	7	0.95	17.6	2.7464588	2.609136
	9	1.28	22.6	2.7464588	3.515467
	11	1.57	27.6	2.7464588	4.31194



Calculations:

$$A = \pi * r^2 = 3.14159 * 0.935^2 = 2.7464588 \text{ sq. cm}$$

$$V = B * h = 2.937389 * 0.41 = 1.1260481 \text{ cubic cm}$$

Note from the equation of the graph: Our graph claims the density of pennies is 6.09

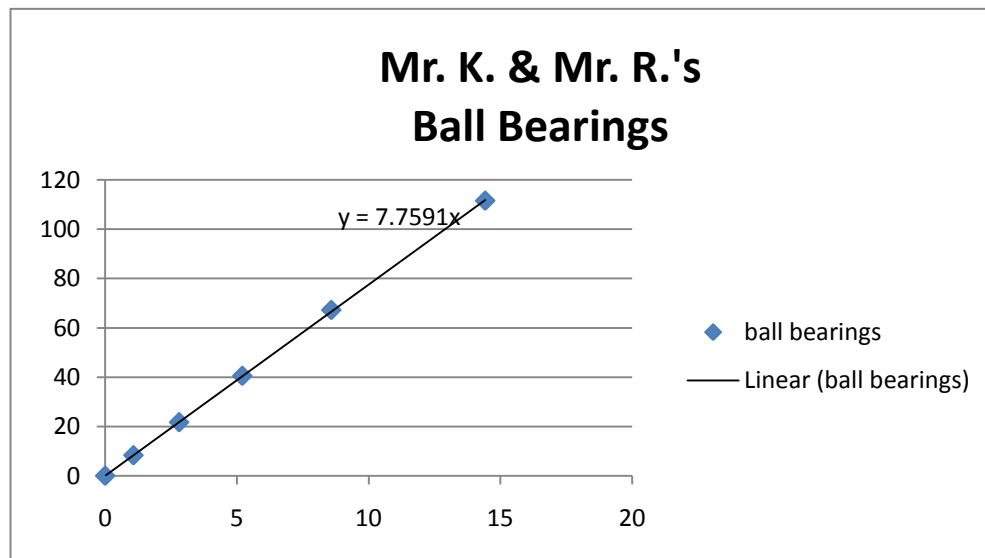
$$\% \text{ error: } = (6.09 - 5.7) / 5.7 * 100 = 6.8421053$$

less than 10% so acceptable error

DATA TABLE #2: BALL BEARINGS

$$V = 4 * \pi * r^3 / 3$$

diameter thickness (cm)	radius thickness (cm)	mass (g)	volume (cc)
0.00	0.00	0	0
1.27	0.635	8.3	1.072531
1.75	0.875	21.7	2.806162
2.15	1.075	40.5	5.203721
2.54	1.27	67.2	8.580247
3.02	1.51	111.5	14.4218



$$\% \text{ error: } = (7.9 - 7.7591) / 7.9 * 100 = 1.7835443$$

only 2% error! Cool, way to go Mr. R.!

Calculations:

$$V = 4 * \pi * r^3 / 3 = 4 * \pi * 0.635^3 / 3 = 1.0725308$$

Density from Graph Equation is: 7.7591

$$\% \text{ error: } = (7.9 - 7.7591) / 7.9 * 100 = 1.783544$$

only 2% error! Cool, way to go Mr. R.!

Questions:

1. Why might the way we measured the thickness of our penny be faulty?
(and thus the volume of our penny)
2. Would the answer to #1 cause our volume to be too high or too low?
3. Would the answer to #1 cause your error to be higher or lower?

Group Conclusion:

Group Summary: