

Introduction to Graphing and Measurement PART 1

Circumference Analysis [FORMAL LAB]

Purpose:

You are going to be given 8 cylinders and ask to determine if there is a relationship between the circumference and the diameter of each. **Write** a purpose statement for this information that describes what the problem is you are going to try to solve. It will be something like this: "The purpose of this lab is to ..."

Theory:

Write a paragraph about the history of the 3.141592....

Write a second paragraph about how to solve for the circumference of a circle. Make sure to be specific. What is the diameter? What is the radius? Make sure to include an example.

Cite parenthetically your research. Create a bibliography of your sources.

Hypothesis:

In Sentence form **write** what you believe the ratio of the circumference to the diameter of the cylinders will be equal to? Make sure to state this as a hypothesis by saying something like "The hypothesis of the researcher is that the ratio of the circumference to the diameter will be _____."

Materials:

- metric cloth rulers
- Vernier Caliper
- pencil
- several cylindrical objects of varying size

Procedure:

As a group measure the diameter of each lid with a vernier caliper and record in Table 1 in an excel spreadsheet to the nearest thousandth of a centimeter. Use a cloth tape measure to circumference to the nearest hundredth of a centimeter and record in the table as well. Using Excel graph the data with circumference on the y-axis and diameter on the x-axis. Make sure to include the line-of-best-fit.

Table 1

Measurement	Cylinder Number	Diameter (cm)	Circumference (cm)	$\frac{\text{Circumference}}{\text{Diameter}}$	Deviation (Absolute)	Deviations Squared
1						
2						
3						
4						
5						
6						
7						
8						
				$\bar{x} =$	$D_{\bar{x}} =$	$s^2 =$
						$s =$
						$s_{\bar{x}} =$

Questions/Things you need to do individually:

1. Make an entry in your lab notebook with the title of this lab, the date, a note that you submitted this lab formally. Use this space to jot down any observations, measurements, or thoughts you make while performing the lab.
2. Create a document following the rubric provide.
3. Use excel to plot data with the circumference points on the y-axis and the diameter points on the x-axis. Place the graph in the data section of your report.
4. Show example calculations for Percent Error, Average $\frac{\text{Circumference}}{\text{Diameter}}$, Absolute Deviation, and Deviation Squared
5. Calculate Variance, Standard Deviation, and Standard Deviation from the mean. You do not need to show how you calculated them. You will have to calculate them on your next exam.
6. Write an error analysis section.
7. Write a results section
8. Submit your completed document to TurnItIn.

Introduction to Graphing and Measurement PART 2 Density [NOTEBOOK LAB]

Purpose / Problem:

What are the most accurate densities of cylinders 5 and 6 as well as the copper wire and the irregular solid that you can calculate using the tools available to you?

Theory:

- Density = mass / volume
- Volume of a cylinder = $\pi r^2 h$
- 1 mL = 1 cm³

Hypothesis:

Write a hypothesis predicting to what percent error you believe you can calculate the densities.

Materials:

- Digital Balance
- Metric Ruler
- Vernier caliper
- Micrometer caliper
- Two different cylinders
- Length of copper wire
- 100-mL graduated Cylinder

Procedure:

1. Create your Lab Notebook Entry. All information will be entered into the notebook.
2. Write a purpose statement and a hypotheses
3. Using the metric ruler measure the length of the copper wire 4 separate times. Start at various locations on the ruler to verify that the ruler itself is accurate. Record you data in table 1 in excel. Use excel for all tables.
4. Calculate the lengths and the average deviations in table 1
5. Close the Vernier Caliper and zero it.
6. Open and close your Vernier Calipers 4 different times, each time record what the measurement of the closed jaws reads. It should read zero, but if it does not you need to adjust for it. Record your zero readings in table 2 on the zero reading line.
7. Using the Vernier calipers measure the length and diameter of cylinder 5 and 6 each 4 times. Record your measurements in table 2.
8. Calculate the average measurements for each row in Table 2.
9. Calculate the final length and measurements by adjusting for the zero readings.
10. Open and close your Micrometer Calipers 4 different times, each time record what the measurement of the closed jaws reads. It should read zero, but it most likely will not. Record your zero readings in table 3 on the zero reading line.
11. Measure the diameter of the wire with the micrometer in 4 different places along the wire. Record each value in table 3.
12. Average the values in table 3 and record them.
13. Calculate the final diameter of the wire.
14. Measure the mass of each cylinder using the balance and record it in table 4.
15. Measure out exactly 70mL of water into the graduated cylinder.
16. Take the irregular solid with the hook and dip it into the water.
17. Record in table 4 the change in volume of the liquid that is equal to the volume of the irregular solid.
18. Record the mass of the irregular solid.
19. Calculate the density of each of the cylinders in table 4.
20. Look up the theoretical densities of the objects in table 4.
21. Calculate the percent error of each calculated measurement.

Table 1: Measurement of Wire Length Using a Metric Ruler

Ruler Reading		Lengths	Deviations
Left End	Right End		
Average Value			

- Length = Right End – Left End

Table 2: Length and Diameter of Metal Cylinders using a Vernier Caliper

	Vernier Caliper Readings				Average
	1	2	3	4	
Zero Reading					
Length Reading, Cylinder 5					
Length Reading, Cylinder 6					
Inner Diameter Reading, Cylinder 5					
Inner Diameter Reading, Cylinder 6					

Length of Cylinder 5 = (Average Length Reading, Cylinder 5) – (Average Zero Reading) = _____

Length of Cylinder 6 = (Average Length Reading, Cylinder 6) – (Average Zero Reading) = _____

Inner Diameter of Cylinder 5 = (Average Diameter Reading, Cylinder 5) – (Average Zero Reading) = _____

Inner Diameter of Cylinder 6 = (Average Diameter Reading, Cylinder 6) – (Average Zero Reading) = _____

Table 3: Diameter of a Copper Wire Using a Micrometer Caliper

	Micrometer Readings				Average
	1	2	3	4	
Diameter Reading with Wire					

Final Diameter of Wire = (Average Reading with Wire) - (Average Zero Reading) = _____

Table 4: Determination of Density

Object Used	Mass (g)	Length (cm)	Outer Diameter (cm)	Inner Diameter (cm)	Volume of Material (cm ³)	Density computed	Density from table	Percent Error
Cylinder 5								
Cylinder 6								
Copper Wire								
Irregular Solid								

Radius = Diameter / 2

Volume of Cylinder 5 and 6 = [((Outer radius)²* Pi) – ((Inner Diameter/2)²* Pi)] * Length= _____

Name: _____
Dr. Croom's Physics

Date: _____
Lab 01-7B

Questions/Things you need to do individually:

Purpose (5pt)
Include

Hypothesis (5pt)
Include

Data (10pt)
Print and attach the data tables into your notebook.

Calculations (10 pt)
Show an example of how to calculate the volume of cylinder 5 and 6.

Error Analysis (10pt)
Write a strong error analysis section

Results (10pt)
Explain the result. Make sure you include how they relate to the purpose of this lab.