

MND Physics

Developing Measurement Skills

To build good measurement lab skills by understanding and applying correct measurement techniques with common lab instruments. To properly record all measurements and calculations in correct significant figures. To predict experimental results utilizing graphing techniques.

EQUIPMENT:

Meter stick, balance scale, micrometer, wood block, textbook, wire samples.

PROCEDURE:

PART I: Measuring the volume of a wood block

1. Measure and record in a table the length, width, and height in millimeters of a wood block to the nearest millimeter, and then estimate to a tenth of a millimeter. The estimated number and all numbers to the left of it are significant. Each student should measure the block.
2. Repeat the process with a 2 x 4 wood block and record data as trial 2.

PART II: Measuring the thickness of a text book page

1. Place a meter stick next to the edge of one page of your textbook. Estimate the thickness of the page in millimeters. Record your estimate in a table.

2. Measure the thickness of 50, 100, 150, and 200 pages. Record your results in a table. For each quantity of pages, calculate the average thickness of a single page.
3. Repeat the above process using a micrometer; record your measurements and repeat the calculations.

PART III: Predicting the weight of an unknown with a graph

1. Measure the length in millimeters of 4 wire samples. Record your results in a Table.
2. Weigh each wire sample; weight should be reported in grams. Record your data in the Table.
3. Create a graph, plotting *length vs. weight*. Draw a straight line that best fits all the points.
4. Measure the length of an unknown sample (obtain from Mr. P.); DO NOT WEIGH THE UNKNOWN. Plot the unknown on your graph (find and mark the length on the y-axis, draw a horizontal line over to your plotted sloped line. From this point of intersection, draw a vertical line down to the x-axis and read the resulting weight).
5. Using your graph data, make a prediction of the unknown's weight. Record the predicted weight, then compare the estimate to the actual and calculate the % error (get the standard or actual value for your unknown from Mr. P.)

ANALYSIS:

1. Why is it less accurate to use either end of a meter stick for measuring length?
2. What is parallax and how does it effect instrument readings?
3. Of all the measurements you made, which one do you feel was less precise? Give a reason for your answer.
4. Of all the measurements you made, which one do you feel was most precise? Give a reason for your answer.
5. Are measuring instruments with a high degree of precision always preferred? Explain using an example.

DATA:

TABLE 1A

WOOD BLOCK AND 2 x 4 MEASUREMENTS USING A **METER STICK**

	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)	VOLUME (mm ³)
TRIAL 1				
TRIAL 2				

TABLE 2A

TEXTBOOK PAGE THICKNESS USING A **METER STICK**

NUMBER OF PAGES	TOTAL THICKNESS (mm)	AVERAGE THICKNESS (mm)
1		
50		
100		
150		
200		

TABLE 2B

TEXTBOOK PAGE THICKNESS USING A **MICROMETER**

NUMBER OF PAGES	TOTAL THICKNESS (mm)	AVERAGE THICKNESS (mm)
1		
50		
100		
150		
200		

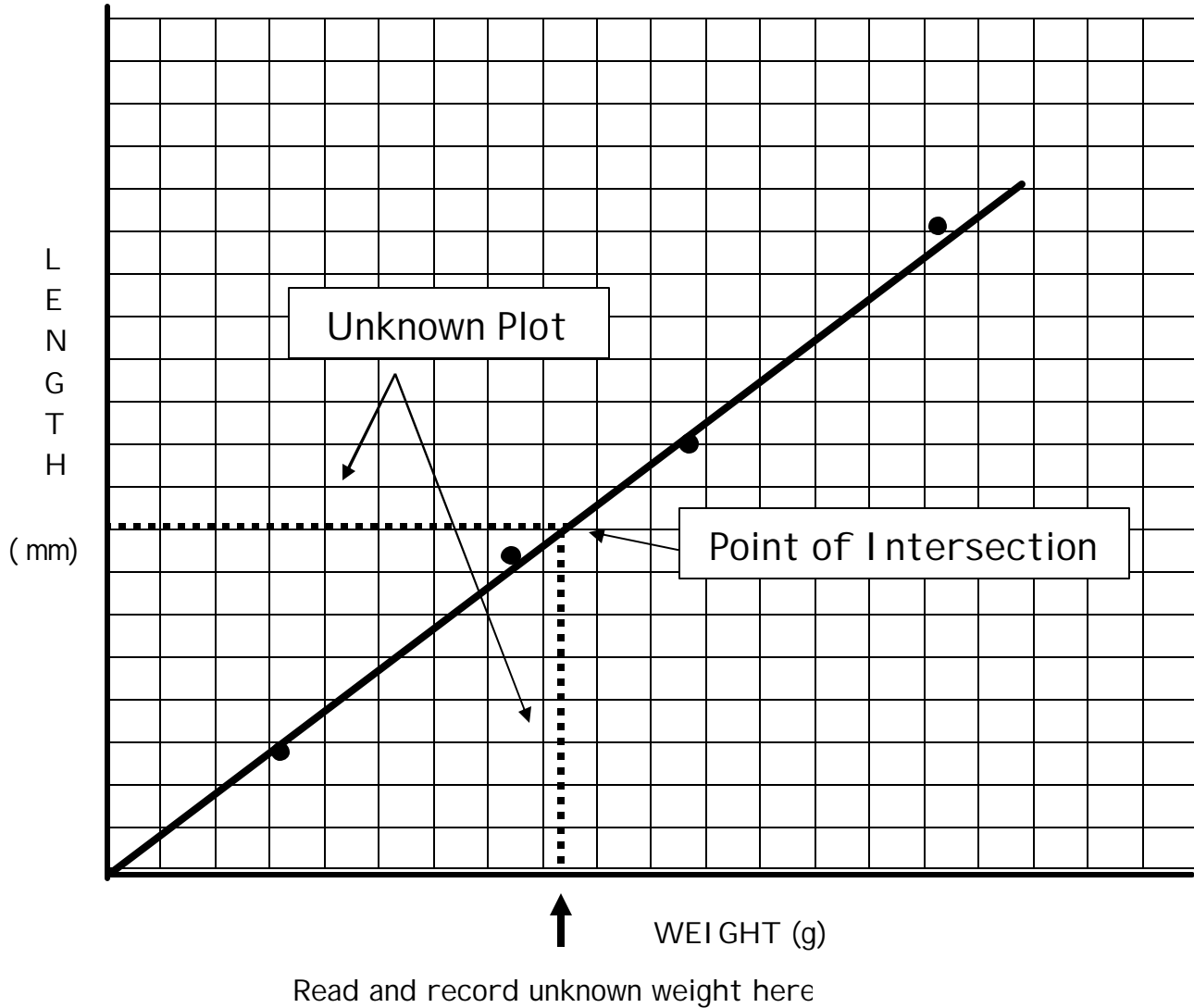
TABLE 3

WIRE SAMPLE MEASUREMENTS

SAMPLE #	LENGTH (mm)	WEIGHT (g)
1		
2		
3		
4		
UNKNOWN		

REFERENCE - EXAMPLE

TYPICAL GRAPH: (you must create your own graph in your lab book)



$$\% \text{ ERROR} = \left[\frac{|\text{Accepted Value} - \text{Experimental Value}|}{\text{Accepted Value}} \right] \times 100$$