

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

**Accelerated Intro Physics**

**Introduction to Motion Lab**

**PART I: Calculating Average Speed**

**PURPOSE:** To calculate average speed, to determine an unknown distance, and to distinguish the concept of distance from displacement.



**MATERIALS:** Stopwatch, meter stick

**PROCEDURE:**

- A. Work in groups of 3 or 4 students.
- B. Measure out a distance of 6.0 meters and note the starting and ending positions.
- C. Select one activity (skipping, hopping, twirling, etc.) and determine the time it takes to traverse 6 meters. Just to make things interesting – every member must do a different activity and walking is not allowed.
- D. Record the data in the table below.
- E. Determine the average speed of each student in meters per second (m/s).

Name	Activity	Time (s)	Average Speed (m/s)

**PART II: Solving for an Unknown Distance**



- F. Repeat your activity from Part I for the unknown distance. Record the group's times in the table below.
- G. Calculate the unknown distance by using your data from parts I and II.
- H. Obtain the value of the unknown distance from your teacher and record: \_\_\_\_\_
- I. Calculate the percent error for each member of the group and place the value in the chart.

$$\%Error = \frac{\text{Experimental value} - \text{Accepted value}}{\text{Accepted value}} \times 100\%$$

Name	Time	Unknown Distance (m)	% Error

**PART III: Distance vs. Displacement**



- J. Return to your original 6.0-meter path.
- K. Time how long it takes the first member to travel 6.0 meters down and 2.0 meters back.
- L. Time how long it takes the second member to travel 6.0 meters down and 4.0 meters back.
- M. Time how long it takes the third member to travel 6.0 meters down and 6.0 meters back.
- N. If there is a fourth member, time how long it takes that person to travel 6.0 meters down and 1.0 meter back.
- O. Record the distance traveled and displacement for each member of the group.  
Note – displacement is change in position. In other words, displacement is "how far the person is from home."

Name	Time	Distance Traveled	Displacement

**INTERPRETATIONS:**

1. If given an object's distance and time, how can the object's average speed be determined?
  
2. Convert the distance in Part I to the following units:
  - a. Feet (1 meter = 3.281 feet)
  
  - b. Miles (1 mile = 5280 feet)
  
3. Convert a time of 4.0 seconds to the following units:
  - a. Minutes
  
  - b. Hours
  
4. If it takes Malcom 4.0 seconds to leap the distance in Part I, calculate his average speed in the following units:
  - a. Meters per second
  
  - b. Feet per minute
  
  - c. Miles per hour
  
5. How did you calculate the unknown distance in Part II? What assumption did you make?
  
6. Which group member had the lowest percent error for Part II? What does that tell you about this person?
  
7. If someone traveled faster in Part II than in Part I, his/her calculated distance would not match the actual distance traveled. Would the calculated distance be too low or too high? Explain.
  
8. If Vivian traveled 8 meters forward, 3 meters backward, and then 4 meters forward again, determine the following:
  - a. The distance she traveled
  
  - b. Her displacement
  
9. In what type of scenario would an object's distance traveled equal its displacement?
  
10. The formula to calculate average velocity is displacement divided by time. Calculate the average speed and the average velocity for each member in Part III. Enter your results in the table below.

Name	Average Speed	Average Velocity