Name _____ Period _____ Date _____

The Unknown Distance

Lab 1.1

Purpose

The purpose of this lab is to understand the relationship between time, distance, and speed.

Required Equipment

- Meter stick or meter tape
- Masking tape
- Timer

Background

Student will be timing themselves over three different distances, 5 meters, 10 meters, and 15 meters and then calculating their average speed. Each student must perform a different activity. After finding their average time at each distance, students will calculate their overall average speed. Once each member has calculated their average speed students will be asked to find the length of an unknown distance using only a timer.
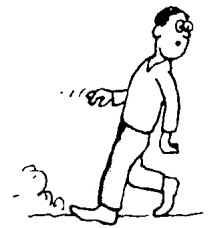
Procedure

1. If your instructor has not already done so, find an area in the building that is long enough to set-up a 15-meter course. Using masking tape, identify a start line and then mark off and identify a 5-meter mark, a 10-meter mark, and a 15-meter mark.

2. Select your activities. Each person must perform a different activity but someone must select walking forward and another person must select walking backwards. Activity can be any of the following: crawling, skipping, hopping on one foot, rolling, crab walk, marching, or make one up. Do not pick running or any other activity where the average speed will change significantly over the length of the course.

   The activity you are performing: _____

3. Each member of the group will take their turn performing their selected activity over each distance (5-m, 10-m, 15-m), always starting from the start line. It is important to try to perform the activity in the same way over each distance time and time again. You will need to do a minimum of three trials for each distance. The other members of the group will time and collect the data for the person performing their activity and record the data in the table bellow.
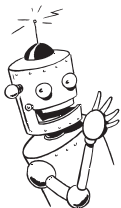
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Activity:

Distance (m)	Time (s)				Speed (m/s)
	trial #1	trial #2	trial #3	Ave Time	
5 m					
10 m					
15 m					
				Ave Speed	

Activity:

Distance (m)	Time (s)				Speed (m/s)
	trial #1	trial #2	trial #3	Ave Time	
5 m					
10 m					
15 m					
				Ave Speed	

Activity:

Distance (m)	Time (s)				Speed (m/s)
	trial #1	trial #2	trial #3	Ave Time	
5 m					
10 m					
15 m					
				Ave Speed	

Activity:

Distance (m)	Time (s)				Speed (m/s)
	trial #1	trial #2	trial #3	Ave Time	
5 m					
10 m					
15 m					
				Ave Speed	

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Complete the Data Table

4. Complete all data tables. Find that average time for each distance and record in each data table.

$$t_{ave} = \frac{t_1 + t_2 + t_3}{3}$$

5. Find that average speed for each distance and record in each data table.

$$s = \frac{d}{t_{ave}}$$

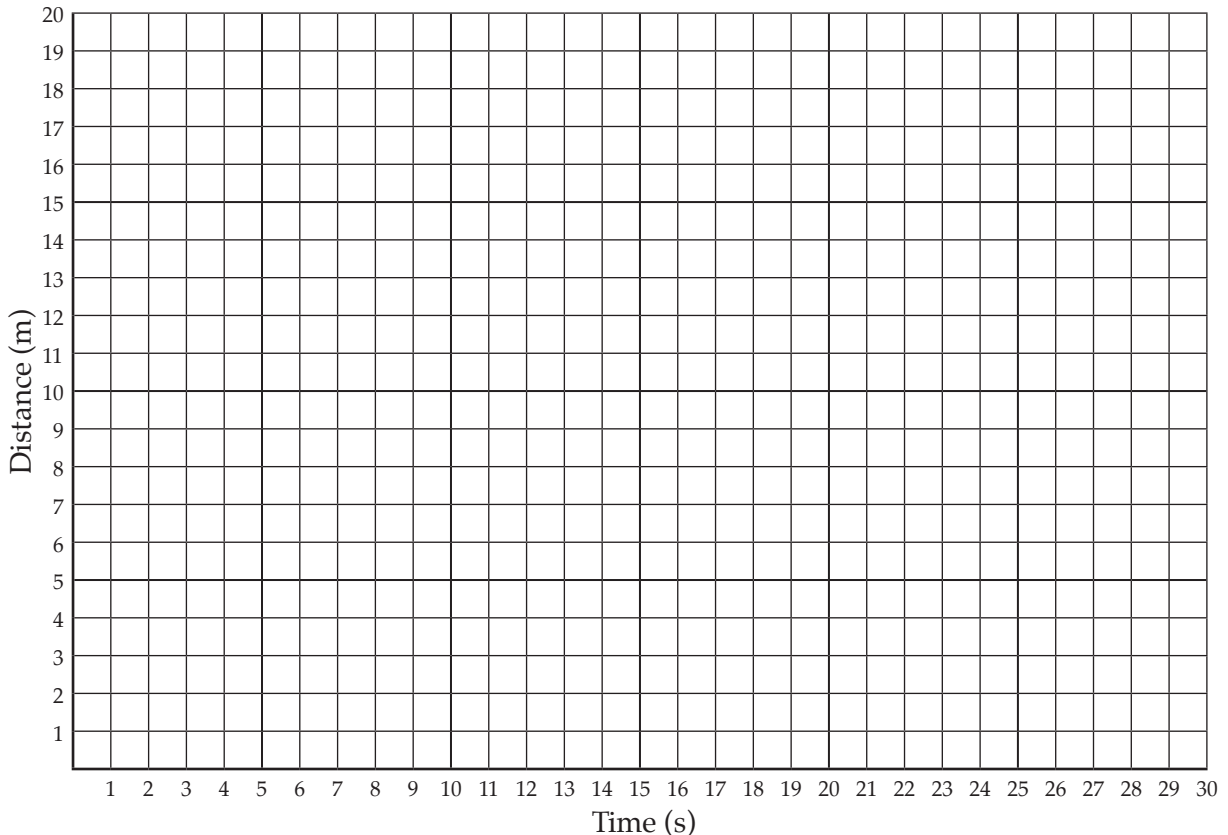**6.** Lastly, calculate the average speed for all distances and record in the data table.

$$s_{ave} = \frac{s_{5m} + s_{10m} + s_{15m}}{3}$$
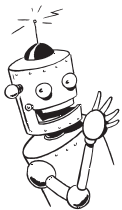
Graph The Results

7. On the graph of Distance vs. Time plot only your data. Plot your average time for each distance.

8. On your graph and starting from zero, use a ruler to connect each dot point-to-point and then label each line segment as A, B, and C.

Distance vs Time

Distance (m)

20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Time (s)

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Analyzing the Graphs

9. Look at each group members graph and determine which activity had the greatest slope.

Greatest slope: _____

10. Look at each group members graph and determine which activity was the most consistent.

Most consistent activity: _____

Calculate the Unknown Distance

11. Report to your teacher to be shown the unknown distance.

12. Select the most consistent activities and the person who performed that activity to find the unknown distance. Have the group member you selected perform their activity over the unknown distance while being timed. Repeat three times and calculate the average.

Activity:

Ave Speed (m/s)	Time (s)			
	trial #1	trial #2	trial #3	Ave Time

13. Using the formula for speed, solve for the unknown distance. Show all your work!

$$d = \bar{s}t \qquad \text{distance} = (\text{ave speed}) \times (\text{ave time})$$

Show your work:

Calculated Distance: _____ m

Actual Distance: _____ m

Percent Error

14. Get the actual distance from your teacher and calculate your percent error.

$$\% \text{ Error} = \left(\frac{\text{Calculated Distance } - \text{ Actaul Distance}}{\text{Actaul Distance}} \right) \times 100$$

Show your work:

Percent Error: _____