

Teaching Suggestions

Science and Mathematics Lab

(Course 2, Lesson 2-2)

Distance, Velocity, and Time (continued)

TEACHING THE LAB

1. Have students work in groups of four.
2. Mark distances on the floor with masking tape. Start 0.5 meter from a table and place a piece of tape every 0.5 meter for 3 meters.
3. Review the steps required to create velocity-time graphs. On the calculator, press **ENTER** and select SET UP/SAMPLE from the Main Menu. Position the cursor to the right of REALTIME. Press **ENTER** until NO appears. Move the cursor down to TIME by pressing the arrow buttons on the calculator. Enter 5 to change TIME to 5 seconds. Position the cursor at DISPLAY and select VEL for velocity. Continue in this manner to set the defaults as follows: BEGIN ON: TRIGGER, SMOOTHING: LIGHT, UNITS: METERS. Position the cursor at START NOW and press **ENTER**.

Answers and Conclusions

Sample data:

X (Time)	D (Distance)	Y (Velocity)
1	0.298	0.187
2	0.604	0.368
3	0.962	0.375
4	1.311	0.363
5	1.423	0.286

1. Sample answer: 0.3158 m/s
2. Sample answer: 0.285 m; 17.08 m
3. Sample answer: 1,025 m
4. Sample answer: about 90 hours

EXTENSION

The amount of time it takes one person to travel a particular distance may differ from another person if their average velocities differ from each other.

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INTRODUCTION

Velocity is speed in a given direction. You may not think there is much difference between speed and velocity, but the direction indicated by velocity can be very important. Air-traffic controllers and pilots must use velocity to prevent accidents. They must not only know the speed of airplanes, they must also know the direction in which the planes are flying. This helps them to predict where and when a particular plane will be at any given time.

OBJECTIVES

In this lab, you will:

- create a graph of the movement of a member of your group using the CBR.
- measure the distance traveled by this person.
- determine several pairs of coordinates from your graph.
- determine the average velocity.
- predict the distance this person could travel in a given amount of time.

MATERIALS

- masking tape
- Calculator-Based Ranger (CBR)
- TI graphing calculator
- meterstick

PROCEDURE

1. Place the CBR on a table and point it in the direction that one of the group members will walk. Mark the starting position of this person with a piece of tape on the floor. The person walking should move slowly and steadily away from the CBR. Press **TRIGGER** on the CBR as soon as the person begins to walk. When the CBR stops clicking, tell the person to stop. Mark his or her final position on the floor with a

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piece of tape. Write the person's name on the tape. Press on the calculator until your data appear in graph form. This graph will display distance in meters over time. Move the cursor along the line and record the distance traveled at each second in the table below.

- Measure the actual distance this person traveled with a meterstick. Record this distance to check the accuracy of your data.
- Press again and choose 2: VEL-TIME by pressing . Press again to display the graph of velocity in meters/second.
- Determine the velocity at each second from the graph on the calculator by moving the cursor along the line. Record these numbers in the Data Table.

DATA AND OBSERVATIONS

X (Time)	D (Distance)	Y (Velocity)
1		
2		
3		
4		
5		

Questions and Conclusions

- Calculate the average velocity based on these data.
- Determine the average distance traveled per second. Predict how far this person would travel in 60 seconds.
- Predict how far this person would travel in 1 hour.
- Predict how long it would take this person to travel 100 km.

EXTENSION

Compare the answers to Question 4 for people in different groups. Are they different? Why or why not?