

ACTIVITY 1

Which Way?

When you move toward or away from an object, your distance from that object at any time can be plotted. From this graph, you can study how different types of motion affect the behavior of your plot. Changes in direction and other factors affect the shape of your plot.

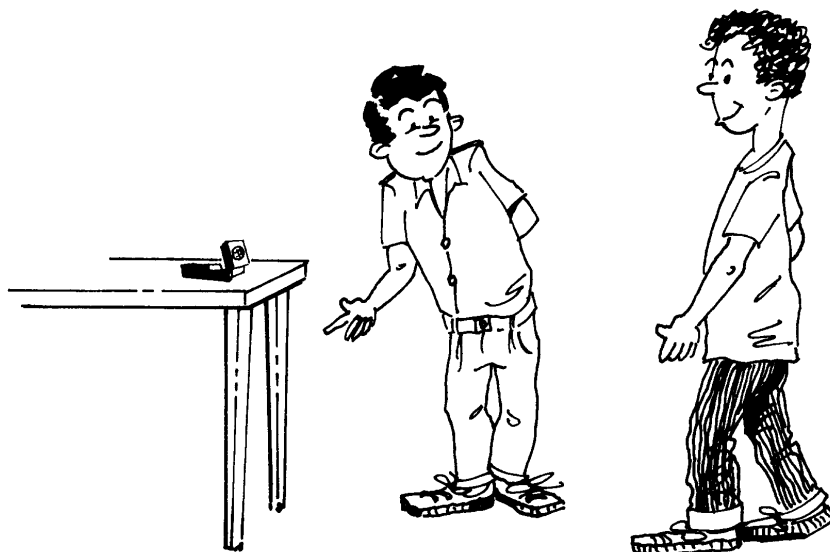
Objectives

In this activity you will:

- ◆ Observe the effect of moving away from the CBR on a Distance-Time plot.
- ◆ Observe the effect of moving toward the CBR on a Distance-Time plot.
- ◆ Observe the effect of not moving on a Distance-Time plot.

You'll Need

- ◆ CBR unit
- ◆ TI-82 or TI-83 and calculator-to-CBR cable



CBR Setup

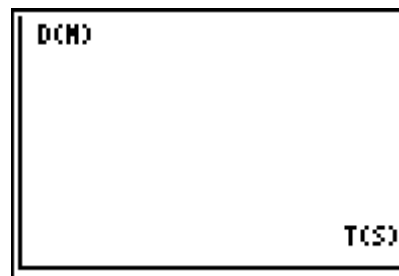
1. Connect the CBR to the calculator using the link cable.
2. Turn on your calculator. If you have not already loaded the RANGER program into your calculator, follow these steps:
 - a. Press $\boxed{2\text{nd}}$ $\boxed{[\text{LINK}]}$ $\boxed{\blacktriangleright}$ $\boxed{[\text{ENTER}]}$. The calculator displays *Waiting ...*
 - b. Press the $\boxed{82/83}$ transfer button on the CBR.
3. Run the RANGER program on your calculator:
 - a. Press $\boxed{[\text{PRGM}]}$.
 - b. Choose RANGER.
 - c. Press $\boxed{[\text{ENTER}]}$.
4. From the MAIN MENU, select 2: SET DEFAULTS.
5. With the selector arrow \blacktriangleright at START NOW, press $\boxed{[\text{ENTER}]}$.

Collecting the Data

The plot that you are about to make will have a horizontal axis representing the time in seconds that has elapsed since the data collection began and a vertical axis representing the distance in meters, from the walker to the CBR. When collecting data in these observations, be sure to stand between 0.5 and 6 meters from the CBR. Remember always to stay directly in front of the CBR and not to move to the side.

Trial 1

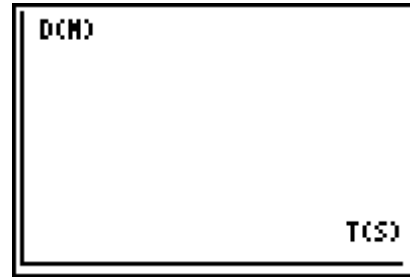
1. Stand a minimum of 0.5 meters, but not more than 1 meter, from the CBR. You will move directly away from the CBR at a slow and steady rate. The CBR will collect data for 15 seconds. Try to end up at a distance of approximately 5 meters from the CBR when time is up.
2. Press $\boxed{[\text{ENTER}]}$ when you are ready to collect data. Your data should look like a straight line rising from left to right. If you are satisfied with your plot, sketch it on the axes to the right and go to Trial 2. If not, press $\boxed{[\text{ENTER}]}$, choose 3: REPEAT SAMPLE, and then try again.



Trial 2

1. Press $\boxed{[\text{ENTER}]}$ and choose 3: REPEAT SAMPLE.
2. Stand approximately 5 meters away from the CBR. You will move at a slow constant *rate* toward the CBR. You have 15 seconds to walk. Be careful not to get closer than 0.5 meters to the CBR.

3. Press **ENTER** when you are ready to begin data collection. Your data should look like a straight line falling from left to right. If you are satisfied with your plot, sketch it on the axes to the right and go to Trial 3. If not, press **ENTER**, choose **3: REPEAT SAMPLE**, and then try again.



Trial 3

1. Press **ENTER** and choose **3: REPEAT SAMPLE**.
2. In this trial, stand approximately 2 meters from the CBR. During data collection you should remain motionless for the entire time that the data is being collected.
3. Press **ENTER** when you are ready to collect data. The plot should be a flat line. If you are satisfied with your data, sketch the plot on the axes to the right and go to the next section. If not, press **ENTER**, choose **3: REPEAT SAMPLE**, and then try again.



Looking at the Results

1. Why does the plot of Trial 1 go up as it moves from left to right? (Be sure to use the words “time” and “distance” in your explanation.)

2. Why does the plot of Trial 2 appear to be moving downward? (Be sure to use the words “time” and “distance” in your explanation.)

3. Why is the plot of Trial 3 a flat line? (Be sure to use the words “time” and “distance” in your explanation.)

4. Write a short paragraph summing up how the direction in which you move affects a plot of your distance from the CBR with respect to time.

Going Further

Answer these questions on a separate sheet of paper. Show all work.

1. If you combined the three previous trials into one trial by first walking away, then standing still, and finally walking toward the CBR, describe in words what the resulting plot would look like.
2. Make a sketch of the motion you described in question 1.
3. Next, try the trial. Make a sketch of the plot you created. Discuss any differences between the prediction that you made and the plot that resulted from the data collection by the CBR.