LAB 1: MOTION: POSITION VS. TIME GRAPHS

INTRODUCTION

With this lab, we will study the concept of position, and how position changes through time. The instrument we will be using is a motion detector capable of measuring your position at any given time. We will use position vs. time graphs to analyze and better understand position and how it changes through time given different motions. We will also learn how to use a graph to present data as well as interpret the information in a graph.

A position vs. time graph is a graph that plots the position of an object or person over the course of some time period. Position is plotted on the y-axis (the vertical axis) and time is on the x-axis (the horizontal axis).

OBJECTIVES

The lab has the following objectives:

- Become familiar with Motion Sensor and its use
- To explore the concept of position and its relationship to different kinds of motion
- To develop graphing skills in presenting and interpreting data

EQUIPMENT

Computer with LoggerPro Software with LabQuest or LabPro Interface
Motion Sensor

FORM A TEAM

Form 5 teams of 4 and assign the following positions:

Person 1: Team Leader / Oral Presenter
Person 2: Lab Tech 1 (Computer / Sensor Ops)
Person 3: Data Recorder / Grapher
Person 4: Lab Tech 2 (Carry out required motions)

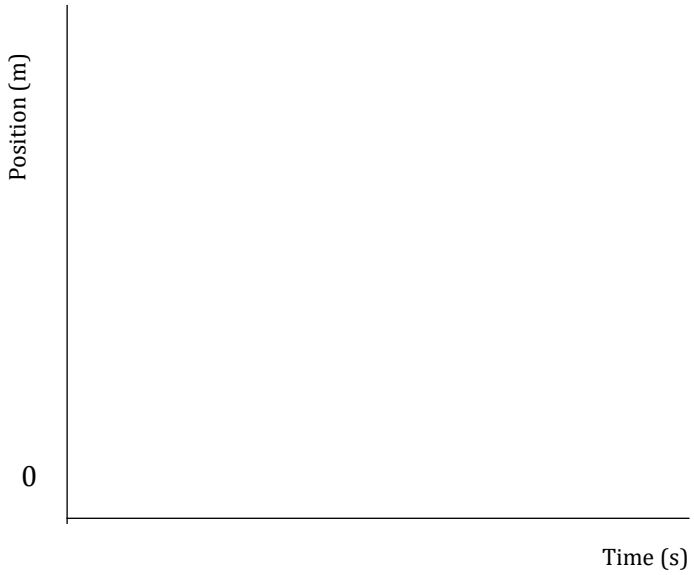
GETTING STARTED

- Log into computer using the login taped on the front of the computer
- If LabPro unit is not plugged in already, plug it in
- If Motion detector is not already plugged in, plug it in
- Open LoggerPro (the program should automatically detect the detector and open a graph)

POSITION EXPERIMENT I: STANDING STILL AT DIFFERENT DISTANCES

To start and stop the motion sensor, click the green "Collect button." You can start and stop as many times as you want.

1. Stand still at about a meter
2. Graph results below with solid line
3. Stand still at about 2 times the initial distance
4. Graph results below with dashed line



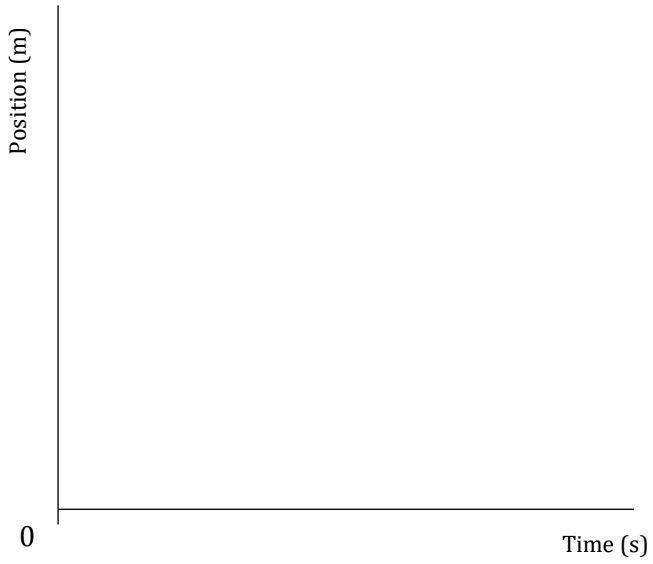
RESULTS TO REPORT:

1. What is serving as the origin of your coordinate system?
2. How would you describe the shape of the graph for a person standing still?
3. How is the graph different for a person standing still but twice as far from the origin? How is it the same?
4. In theory, where would you have to stand in order to have a negative position?

POSITION EXPERIMENT II: MOVING AWAY AND TOWARDS THE ORIGIN

To start and stop the motion sensor, click the green "Collect Button." You can start and stop as many times as you want.

1. Start close to the motion sensor and move away from it at a constant speed
2. Graph results below with solid line
3. Start far away from the motion sensor and move towards it at a constant speed
4. Graph results below with dashed line



RESULTS TO REPORT:

1. How would you describe the shape of the graph for a person moving towards the origin?
2. How would you describe the shape of the graph for a person moving away from the origin?

POSITION EXPERIMENT III: MOVING SLOWER AND FASTER

To start and stop the motion sensor, click the green "Collect Button." You can start and stop as many times as you want.

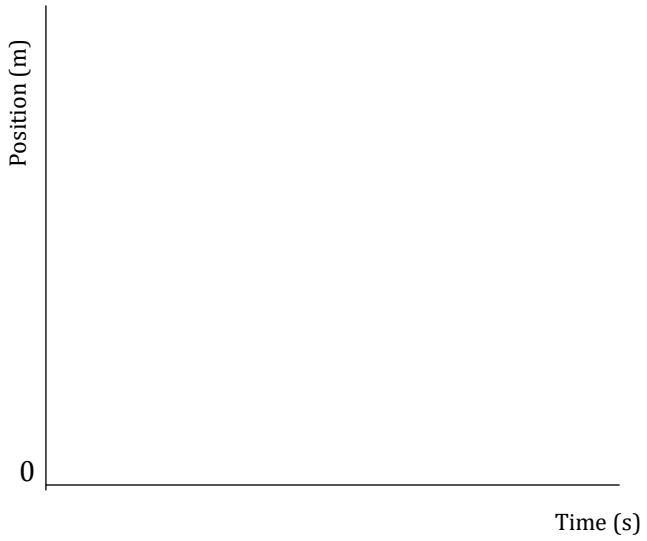
1. Start close to the motion sensor and move away from it at a constant slow speed
2. Graph results below with solid line
3. Start far away from the motion sensor and move towards it at a constant fast speed
4. Graph results below with dashed line

RESULTS TO REPORT:

1. How would you describe the difference in shapes of the graphs for a person moving at a constant slow speed and a person moving at a constant fast speed?

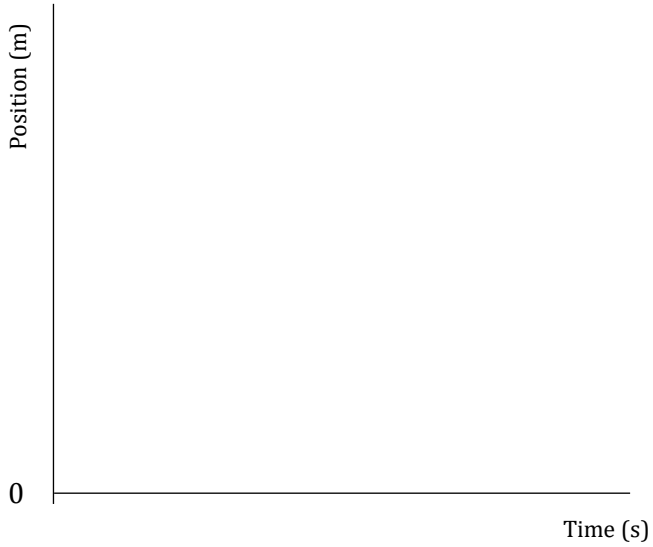
EXPERIMENT IV: PREDICTION 1

1. Predict: What will the graphs look like if you move toward the detector at slow and fast constant speeds? Draw your predictions on the graph with dashed lines.
2. Test your prediction: did you get it right? Draw the actual graph in solid lines.



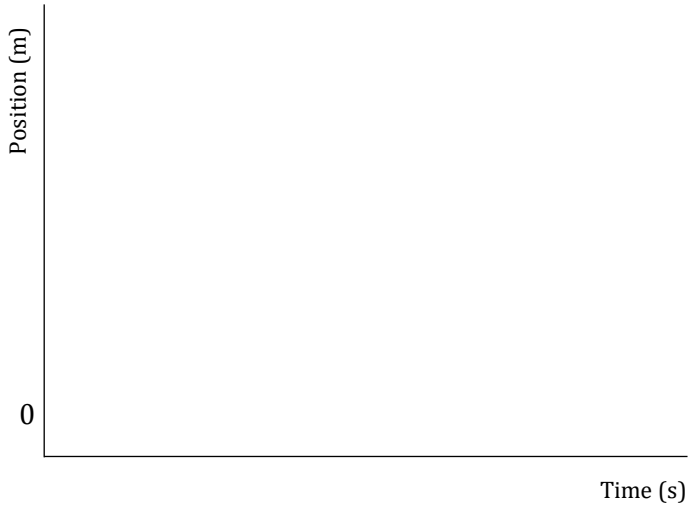
EXPERIMENT V: PREDICTION 2

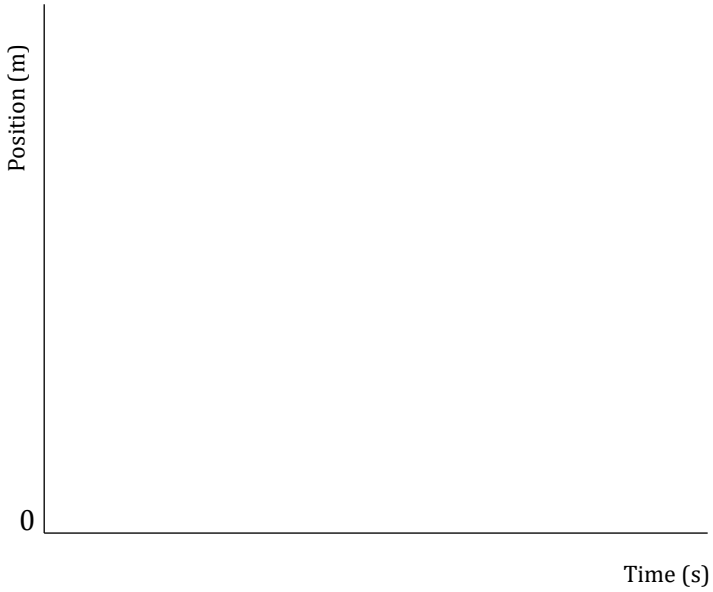
1. Prediction: What will the graph look like for a person moving away from the origin starting at a slow speed, but *accelerating* (changing speed) to a faster speed? Draw your predictions on the top graph with dashed lines. On the bottom graph do the same for motion starting at the origin, moving away at a fast speed and slowing down.
2. Test your prediction: did you get it right? Draw the actual graph in solid lines.



EXPERIMENT VI: PREDICTION 3

1. Prediction: What will the graph look like for a person moving toward the origin starting at a slow speed, but *accelerating* (changing speed) to a faster speed? Draw your predictions on the top graph with dashed lines. On the bottom graph do the same for motion moving toward the origin, starting at a fast speed and slowing down.
2. Test your prediction: did you get it right? Draw the actual graph in solid lines.





MOTION CHALLENGE

If time permits, the teams will participate in the Motion Challenge