Name: _____ *Period:* _____

REAL-TIME PHYSICS LAB #1: POSITION – TIME GRAPHS OF YOUR MOTION

In this experiment, you will use a Motion Detector to determine this information by plotting a real time position - time graph of *your* motion as you move across the classroom. In this lab, we will use "position" to describe your displacement from the motion detector. We can consider the motion detector to be the origin.

Procedure:

1. Find an open area at least 4 m long. Use the tape measure to mark distances of 1m, 2m, and 3m from the motion detector.
2. Ensure that the motion detector setting is the side marked with a person. Connect the motion detector to "DIG 1" port on the LabQuest and choose "New" from the "File" menu (please use the stylus when using the LabQuest touch screen).
3. On the Meter screen (icon looks like a speedometer), tap the "Duration" box to change the data-collection length to 10 seconds. Select OK.
4. When you collect data, hold the motion detector so the round, metal detector is always pointed directly at the person walking to create the graph. It detects the closest object directly in front of it (including your arms if you swing them as you walk).
5. To begin collecting data, hit the green "Collect" button in the lower right corner of the LabQuest screen on the Graphing Screen (icon looks like a graph).

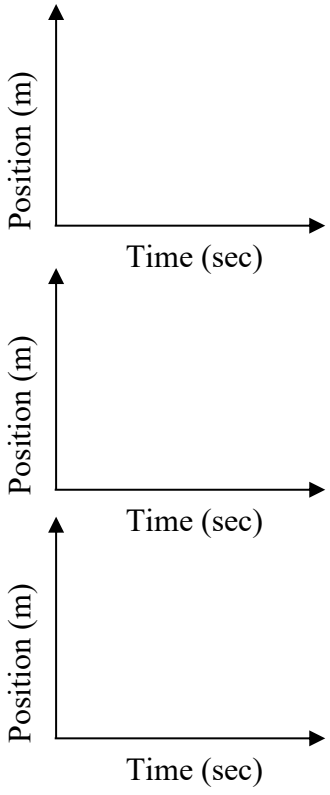
Part I: Walking the Graph

Move in front of the motion detector as describe below. Sketch the resulting graph on the axes provided on the right.

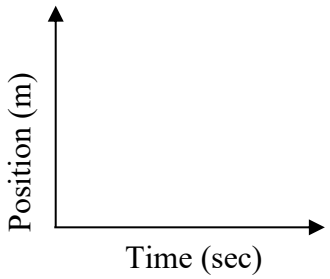
a) Start at the 1/2 meter mark and walk away from the detector (origin) slowly and steadily.

b) Walk away from the detector (origin) medium fast and steadily.

c) Walk toward the detector (origin) slowly and steadily.



d) Walk toward the detector (origin) medium fast and steadily.



1. Describe the difference between the graph you made by walking away slowly and the one made by walking away more quickly.

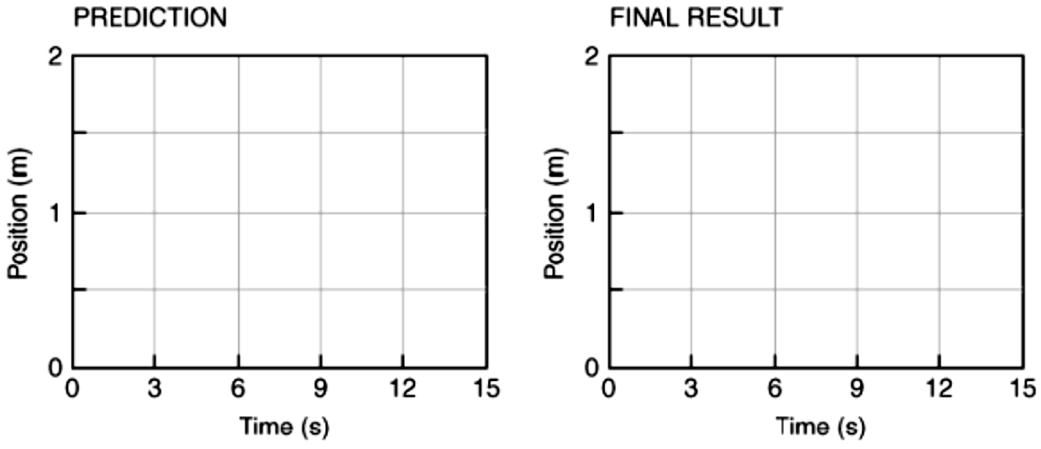
2. Describe the difference between the graph made by walking toward and the one made walking away from the motion detector.

**Note: It is common to refer to the displacement of an object from some origin as the position of the object. Since the motion detector is at the origin of the coordinate system, it is better to refer to the graphs you have made as position-time graphs rather than distance-time graphs.*

Part II: Predicting the Graph

Predict the position-time graph produced when a person starts at the 1-meter mark, walks away from the detector slowly and steadily for 5 seconds, stops for 5 seconds, and then walks toward the detector quickly. Draw your prediction on the left axes using a dotted line.

Compare predictions with the rest of your group. Once you agree, draw your group's prediction on the left axes using a different colored solid line. (Do not erase your original prediction.)



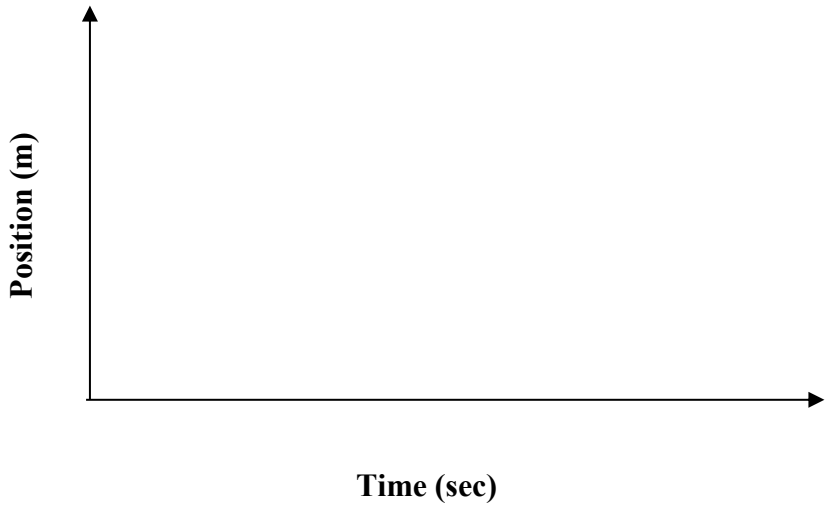
Now test your prediction. Move in the way described and graph your motion *(you will need to change the data collection duration to 15s now)*. When you are satisfied with your graph, draw your group's final result on the right axes.

3. Is your prediction the same as the final result? If not, describe how you would move to make a graph that looks like your prediction.

Part III: Matching the Graph

From the Analyze Menu, Choose Motion Match ► New Position Match. A target graph will be displayed for you to match. (Make sure that the times and positions match up!)

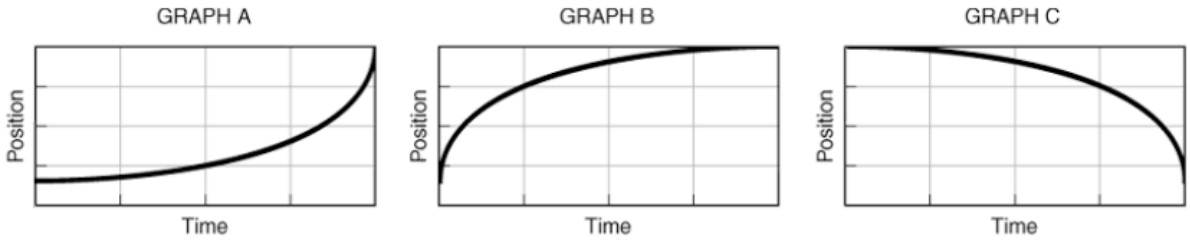
4. **Quantitatively** (using appropriate number scales) draw your matched graph in the space below. Use a ruler!



5. Describe how you had to move to match this graph. Give specific positions and times in your answer.

Part IV: Curved Graphs

Can you produce a curved position – time graph? Try to recreate each of the graphs below:



6. Describe how you had to move to match these graphs:

Graph A:_____

_____

Graph B:_____

_____

Graph C:_____

_____

Going Beyond:

If you and your partner finish the lab early, create your own position-time graph below. Then switch and see if your partner can recreate you custom graph!