

# Match Graph

## Student Instruction Sheet

### Challenge

To understand how your movement relates to position versus time with respect to particular frame of reference.

### Equipment and Materials

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| <ul style="list-style-type: none"> <li>• Computer with USB Port</li> <li>• PASPORT USB interface</li> <li>• PASPORT Motion Sensor</li> <li>• DataStudio software</li> </ul> | <ul style="list-style-type: none"> <li>• Motion Sensor Reflector Board</li> <li>• <i>Student Instruction Sheet</i></li> <li>• <i>Student Response Sheet</i></li> </ul> |
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### Safety Precautions

*Remember, follow the directions for using the equipment.*

### Background

Speed is the rate at which an object moves, and velocity is the speed and direction of the motion. The change in position (distance traveled) divided by the time gives the magnitude of the object's average velocity.

The position of a moving object traveling along a straight line can be described by a series of ordered pairs of numbers. The first number is the time when the object was at a certain position and the second number is the distance from a reference point.

A position-time graph is a picture of the motion of an object. The picture has dots to show the object's position relative to the reference point and the corresponding time from a starting point. Each "dot" has a distance from the x axis that represents time and a distance from the y axis that represents position.

## Predict

Before beginning the eLab, complete the prediction portion of the *Student Response Sheet*.

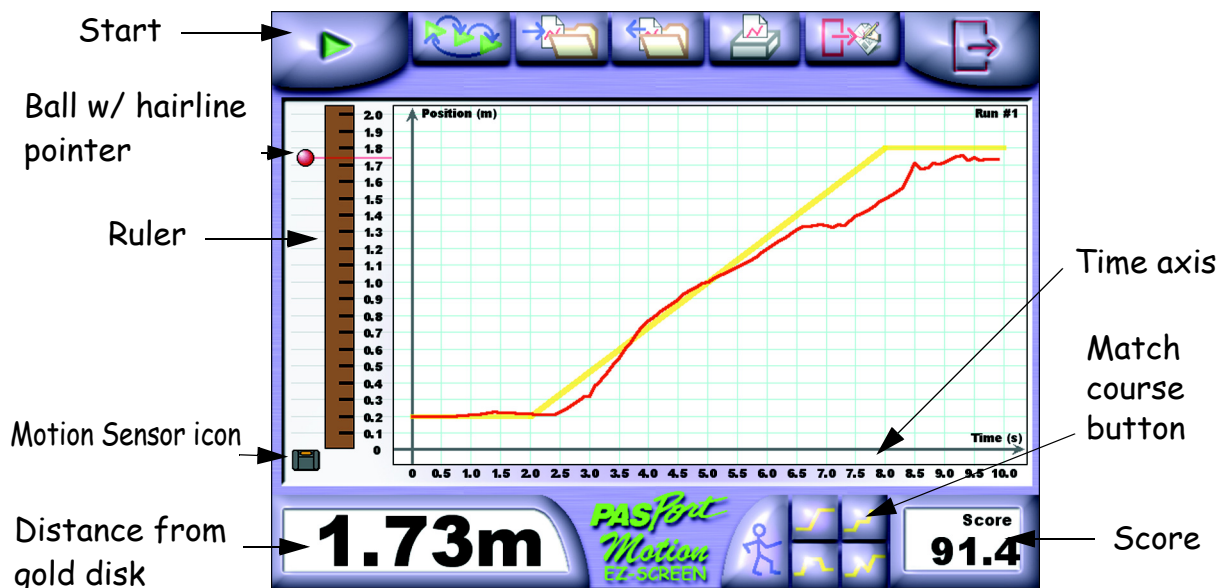
## Explore

### Computer Setup

1. Plug the PASPORT USB interface into the computer's USB port or USB hub.
2. Plug the Motion Sensor into the USB interface. This will automatically launch the PASPort window.



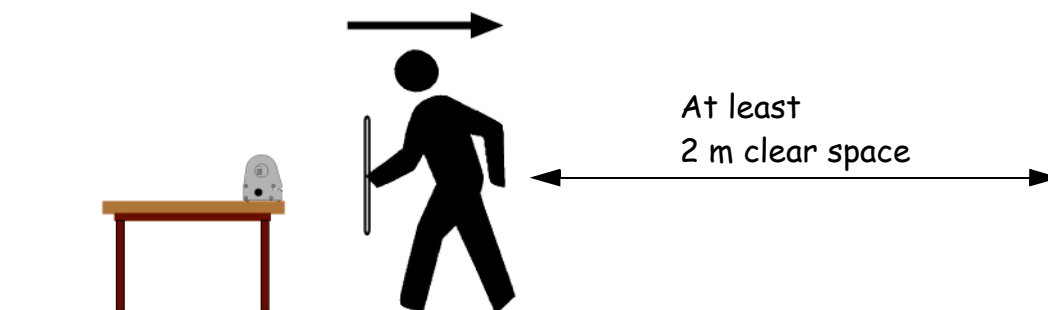
3. Choose the EZscreen option and click the **Match Graph Button** (  ).



4. Choose your first Match Course. Remember, you will complete each course by the end of the session

## Equipment Setup


1. Set up the equipment as shown in the figure.



2. Place the Motion Sensor on the edge of the table. Set the 'range select switch' on the top of the Motion Sensor to the 'Person' icon (long range).
3. With the reflector board at waist level insure that the gold-colored disc is aimed at your midsection.
4. Position the computer monitor so you can see the screen while you are moving.



## Record Data


1. The object of the game is to try and match your movements to the graph shown. Each member of the team will get three chances to get a perfect score.
2. Select a group member to go first; that person will be the *Target*. Select another group member to be the *Clicker*; that person will control the computer.
3. Have the *Target* hold the reflector board waist high. Make sure the gold-colored disk is aimed at the reflector board and the *Target* can see the computer monitor. Remember to make sure nothing is in the way.
4. When the *Target* is in position in front of the Motion Sensor and ready to move, the *Clicker* can click the **Start** button (  ) to begin a run of data.
  - When the *Clicker* clicks **Start**, the program begins a 5-second countdown.

- The *Target* can adjust his or her position by aligning the small circle with hair-line on the vertical axis.
- When data recording begins, the graph will plot the *Target's* position. Data recording lasts 10 seconds and stops automatically.
- Notice the **Score** value in the lower right corner. This **Score** is based on how well the movement of the *Target* matched the graph. A score of 100 is a perfect match. You will record this value in the *Student Response Sheet*.

There are four Match Graphs available. Each group member will get three chances to get a perfect score. Record your score for each run of data on the *Student Response Sheet*.

## Analyze

Find the group's champion.

1. Average your score for each run of data.
2. Once you have averaged each run of data, take a final average to get your total **Score** for all the Match Graphs.
3. If there is a tie, either choose a winner or have a tie-breaker Match Graph contest.
4. Save your EZ Screen file by clicking the **Save button** (  ) to the location specified by your teacher.
5. Answer the questions and define the vocabulary words on the *Student Response Sheet*.
6. Follow your teacher's instructions regarding cleaning up your work space.

**Student Response Sheet****Match Graph****Vocabulary**

Use available resources to find the definitions of the following terms:

distance: \_\_\_\_\_

\_\_\_\_\_

distance traveled: \_\_\_\_\_

\_\_\_\_\_

frame of reference: \_\_\_\_\_

\_\_\_\_\_

position: \_\_\_\_\_

\_\_\_\_\_

velocity: \_\_\_\_\_

\_\_\_\_\_

constant velocity: \_\_\_\_\_

\_\_\_\_\_

**Predict**

1. Imagine that a graph shows the position and time for a moving object. Do you think it would be difficult to match the objects movement?

\_\_\_\_\_

\_\_\_\_\_

## Data

Record the **Score** for Match Course #1.

Student Name:	Run #1	Run #2	Run #3	Average Score

Record the **Score** for Match Course #2.

Student Name:	Run #1	Run #2	Run #3	Average Score

Record the **Score** for Match Course #3.

Student Name:	Run #1	Run #2	Run #3	Average Score

Record the **Score** for Match Course #4.

Student Name:	Run #1	Run #2	Run #3	Average Score

Record the **Final Average** for all Match Courses.

Student Name:	Final Average

## Analyze

Determine the person with the closest score to 100 in each of the four above tables and circle their name. Then determine the overall Match Graph champion from your group.

1. Describe in detail how you determined the big winner?

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2. Why did this person win?

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## Synthesize

1. How do you think the computer calculated the match score? Describe in detail.

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2. Do your results support your predictions?

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