

Name: _____ Period: _____ Date: _____

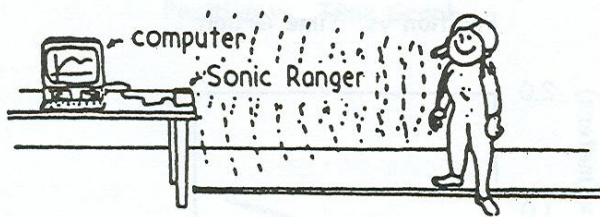
Sonic Ranger

Purpose

In this activity, you will use graphs to investigate motion. The graphs will represent your own motion and will be drawn by the computer as you move.

Required Equipment and Supplies

- sonic ranging device with appropriate equipment and software
- computer



Discussion




Graphs can be used to represent motion. For example, if you track the position of an object as time goes by, you can make a plot of position vs. time. In this activity, the sonic ranger will track your position and the computer will draw a position vs. time graph of your motion. The sonic ranger sends out a pulse of high frequency sound and then listens for the echo. By keeping track of how much time goes by between each pulse and corresponding echo, the ranger determines how far you are from it. (Bats use this technique to navigate in the dark and old Polaroid cameras used a similar technology to automatically focus) By continually sending pulses and listening for echoes, the sonic ranger tracks your position over a period of time. This information is fed to the computer, and the software generates a position vs. time graph

Procedure

Your instructor will provide a computer with a sonic ranging program installed.

- Position the sonic ranger so that its beam is about chest high and aimed horizontally.

Getting into the computer

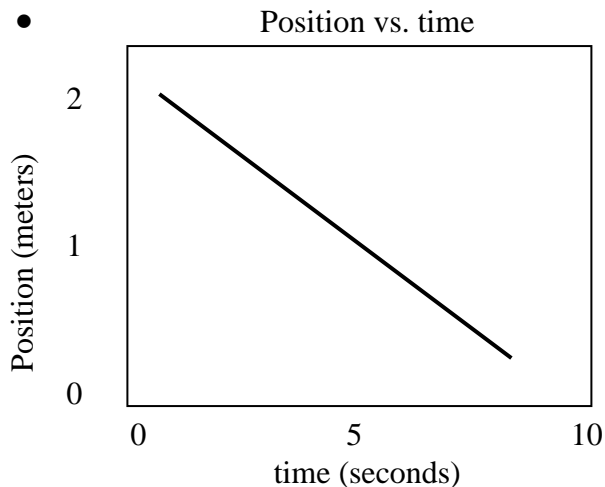
- Login to computer
- Plug sensor into USB port
- Double Click on PASPortal Icon (on top, right-hand side of the screen) 
- Click "Launch EZ-SCREEN" (in lower left of dialog box) 
- When a graph appears the upper left corner of it should say "position"
- When ready to start, a group mate should click the green button in the upper left corner of the screen 
- When finished with your motion have a group mate click the red octagon in the upper left to stop the recording
- A new graph can be created by clicking the green arrow again. **Do not save any of your data!**
- Practice to see how close and how far you can get before the readings become unreliable.

Name: _____ Period: _____ Date: _____

Sonic Ranger

Part A: Move to Match the Graph

- Generate real time graphs of each motion depicted below and write a description of each.
- ***Do not use the term “acceleration” in any of your descriptions.***
- Instead, use terms and phrases such as, “rest,” “constant speed,” “speed up,” “slow down,” “toward the sensor,” and “away from the sensor.”
- Study each graph below.
- When you are ready, initiate the sonic ranger and move so that your motion generates a similar graph.
- Then describe the motion in words on the lines provided.
- THE FIRST ONE IS DONE FOR YOU.
- Be sure that EVERYONE in the group can move to match the graph before moving on



Move toward the sensor at constant speed

Name: _____ Period: _____ Date: _____

Sonic Ranger

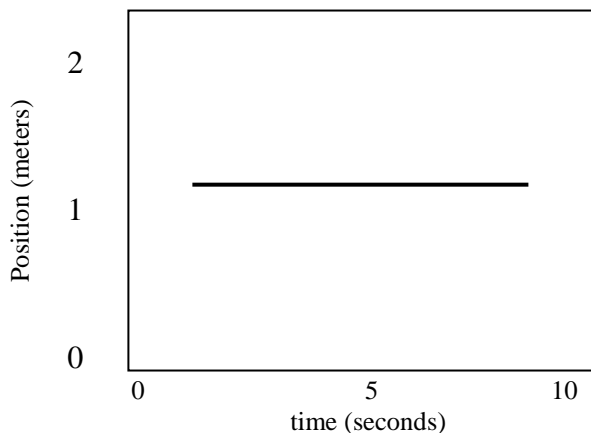
Part A: Predict and Then Move to Match the Graph

- Now you will predict what motion will create the graph BEFORE you try it.
- Write your prediction in the appropriate box.
- After creating the graph write what motion actually created the graph in the appropriate box.

REMEMBER:

- **Do not use the term “acceleration” in any of your descriptions.**
- Instead, use terms and phrases such as, “rest,” “constant speed,” “speed up,” “slow down,” “toward the sensor,” and “away from the sensor.”

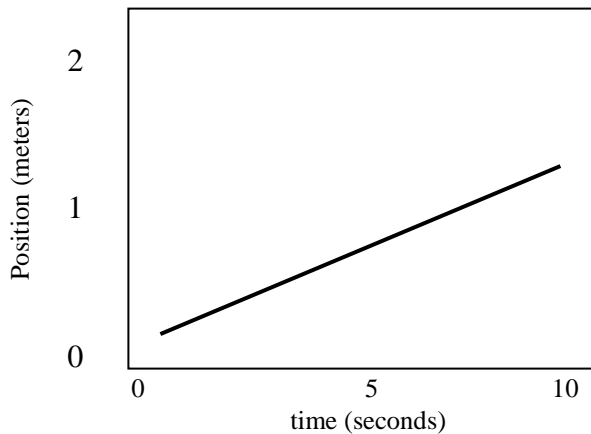
Position vs. time



Prediction:

Actual motion:

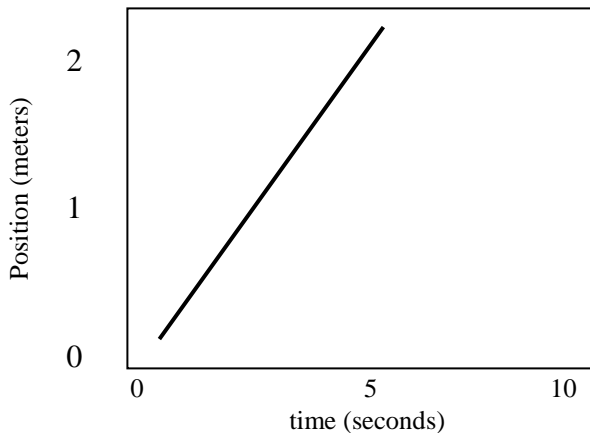
Position vs. time



Prediction:

Actual motion:

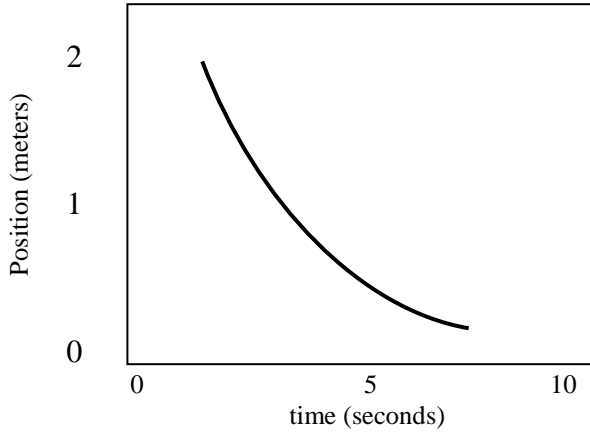
Position vs. time



Prediction:

Actual motion:

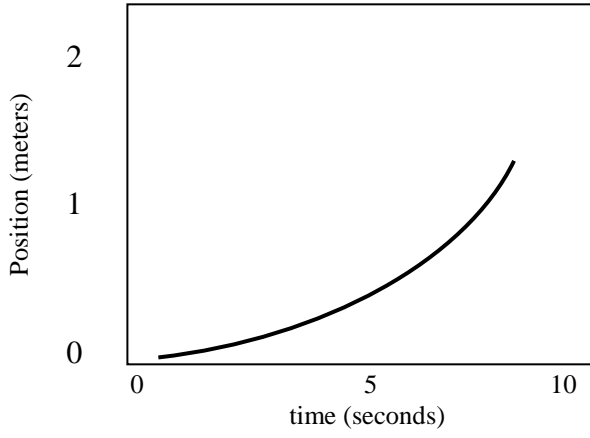
Position vs. time



Prediction:

Actual motion:

Position vs. time



Prediction:

Actual motion:

Name: _____ Period: _____ Date: _____

Sonic Ranger

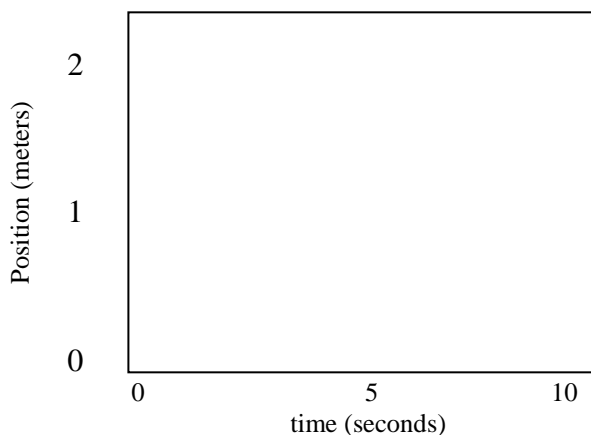
Part B: Predict and Then Move to Match the Words

- Now you will predict what GRAPH will be created by the described motion BEFORE you try it.
- Draw your prediction in the appropriate box.
- After following the directions for the motion, draw the graph you actually created in the appropriate box.

Move toward the sensor at constant speed, stop and remain still for 1 second then walk away from the sensor with constant speed

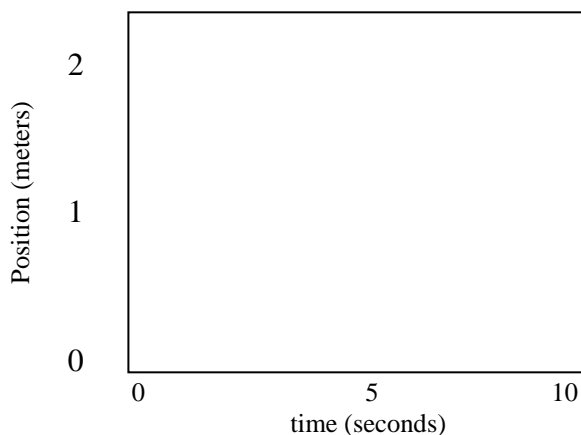
PREDICTION

Position vs. time



ACTUAL

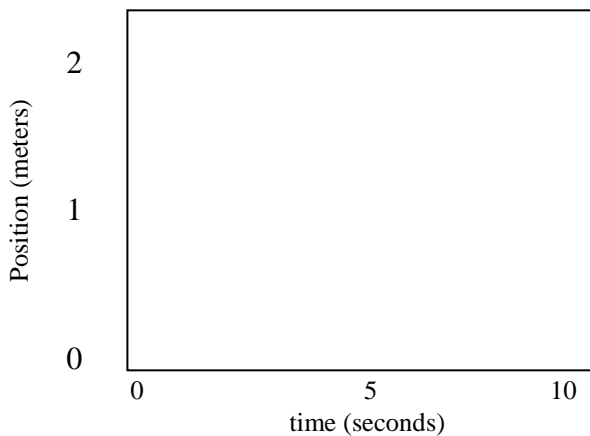
Position vs. time



Move toward the sensor with decreasing speed, then just as you come to rest, move away from the detector with increasing speed.

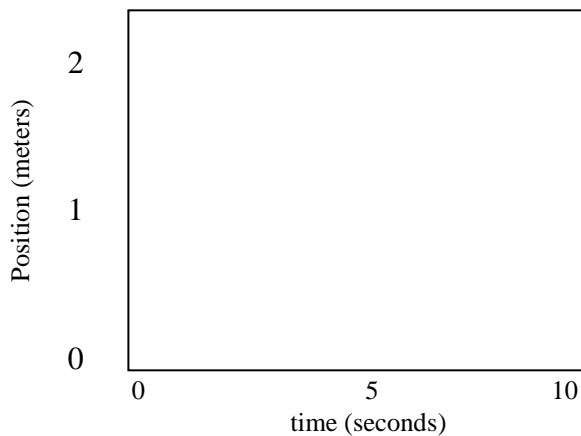
PREDICTION

Position vs. time



ACTUAL

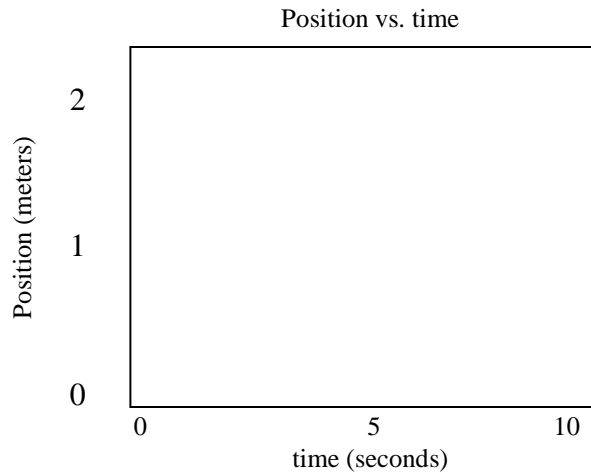
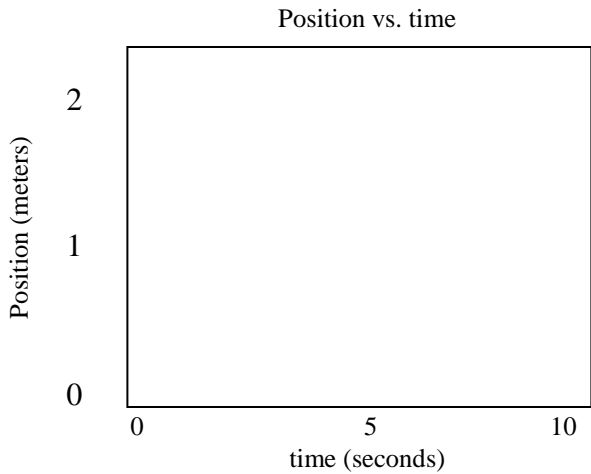
Position vs. time



Move away from the sensor with decreasing speed until you come to a stop. Then move toward the sensor with decreasing speed until you come to a stop.

PREDICTION

ACTUAL



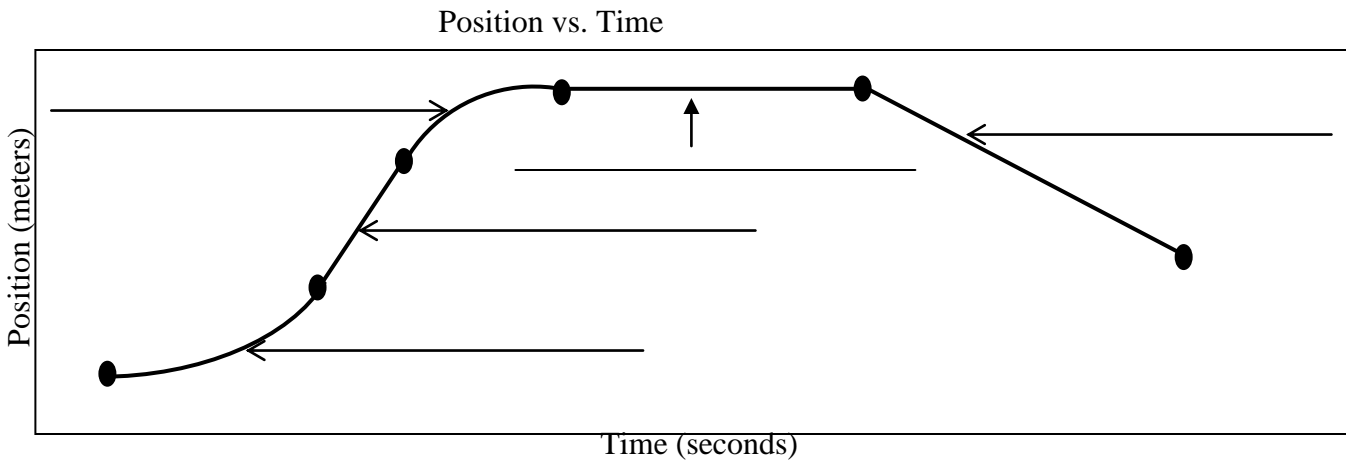
Summing it Up

1. Explain in a sentence: How does the graph show a difference between motion towards the sensor and motion away from the sensor?

2. Explain in a sentence: How does the graph show a difference between slow motion and fast motion?

3. Study the graph of position vs. time below. Write a label on the arrow of the graph where the object is:

- A) At rest
- B) Moving toward the sensor at constant speed
- C) Moving away from the sensor at constant speed
- D) Speeding up
- E) Slowing down

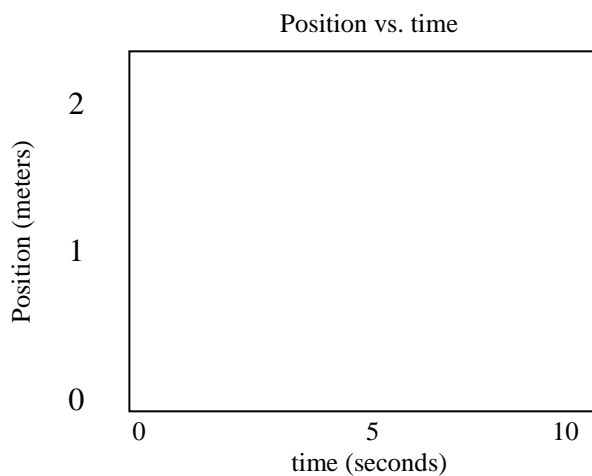


WHEN GROUP IS FINISHED – RAISE YOUR HANDS & SEE TEACHER FOR EXTENSION

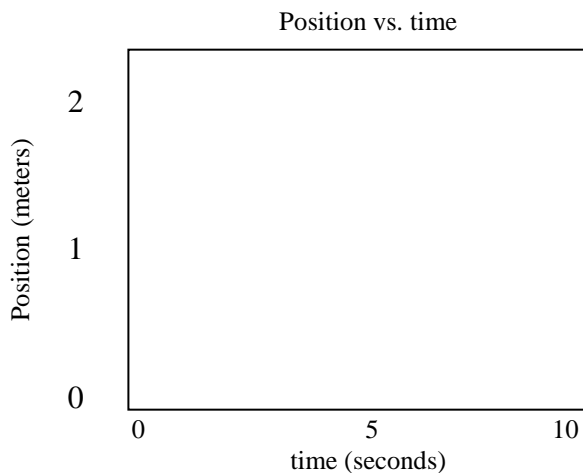
Sonic Ranger

EXTENSION

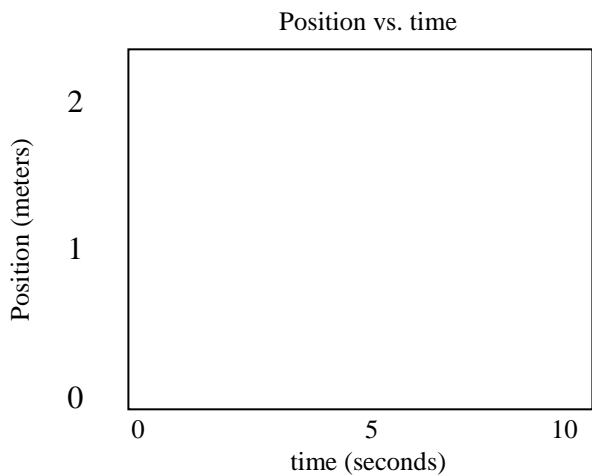
1. In each graph below: Draw each of the lines found in the graphs in lower right of the screen (next to the “stick figure”)
2. When ready, click on one of the graphs on the screen and try to create it by your movement
3. When finished, the computer will give you a score. Record the score in the box next to the graph
4. **EACH PERSON should try to create the graph and record his/her score on his/her paper.**
5. Move on to the next graph.
6. Record the score in the box next to this graph. Again everyone should try to create the graph and record his/her score.
7. Once everyone has tried all 4 graphs you may go back and try each again. Record the new score and circle the HIGHEST score for each graph



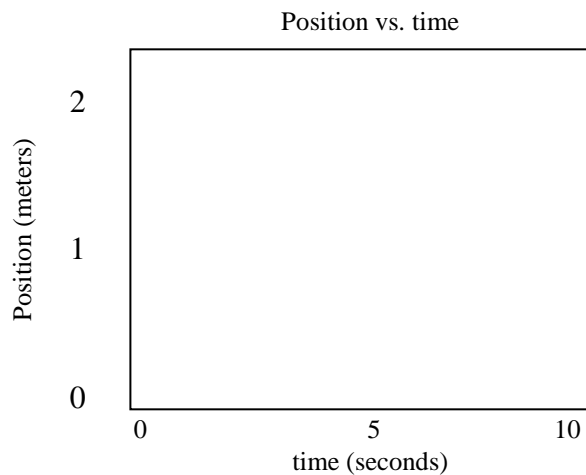
	First try	Second try
Score		



	First try	Second try
score		



	First try	Second try
Score		



	First try	Second try
score		