The Moving Man Simulation – Constant Acceleration Motion

PSI Physics – Kinematics

Name:_____ Date:_____ Period:_____

Objectives:

- Recognize graphs of position vs. time, velocity vs. time, and acceleration vs. time for motion with constant acceleration
- Determine the acceleration from the slope of the velocity vs. time graph
- Determine the distance traveled from the area under the velocity vs. time graph

Materials:

- Computer

Procedure:

- This lab is based on Interactive Simulations from University of Colorado at Boulder. Use your web browser to go to: http://phet.colorado.edu/en/simulation/moving-man
- Select either "download" or "run".
- Click the "Charts" tab.

For each run:

- Click "Reset all".
- Set the assigned acceleration, press start, and make sure that you stop the man before he hits the wall.
- For each value of acceleration, sketch the position vs. time graph, and velocity vs. time graph, and acceleration vs. time graph in the table on the next page. Pay close attention to the beginning points and the slope of your graphs.

Analysis: Part 1

1. In each of your acceleration vs. time graphs, how does:
    a. acceleration change with respect to time?

    b. velocity change with respect to time?

    c. position change with respect to time?

2. Referring to your table, what happens as the acceleration is increased to:
    a. the acceleration vs. time graphs

    b. the velocity vs. time graphs

    c. the position vs. time graphs

Acceleration	Position vs. Time graph	Velocity vs. Time graph	Acceleration vs. Time Graph
$a = 0.5\ m/s^2$			
$a = 1\ m/s^2$			
$a = 1.5\ m/s^2$			

Analysis: Part 2

Click "reset all" and set the acceleration of the man to 2 $\mathrm{m/s^2}$. Run the program, and make sure to stop the man before he hits the wall. Record the distance, velocity, acceleration and time traveled.

Using the time, and distance:

1. Calculate the slope of the velocity vs. time graph.

   a) How does this compare to the man's acceleration?

   b) Given the results of a), write an expression for the velocity in terms of acceleration and time.

2. Calculate the area under the velocity vs. time graph from the time you started (0) until you stopped the man.

   a) How does the area you calculated compare to the distance the man traveled?

   b) Given the results of a), write an expression for the distance in terms of velocity and time.

Note: Due to the error within the simulation, if your answers are within 0.2 in the above questions, you can consider your results to be accurate.

Analysis: Part 3

1. Find a way to make the man move with an initial velocity towards the right, slow him down and make him turn around (move to the left).
   a) Describe briefly what you did. (What did you do to position, velocity and / or acceleration?)

   b) Sketch (i) the position vs. time graph, (ii) the velocity vs. time graph below, and (iii) the acceleration vs. time graph.

Position vs. Time graph	Velocity vs. Time graph	Acceleration vs. Time Graph

   c) How are these graphs different from the graphs you sketched in the table?

   d) How does the area between the velocity line and the x-axis of the velocity vs. time graph in your simulation compare to the distance traveled?

   e) How does the slope of the velocity vs. time graph compare to the acceleration you used?