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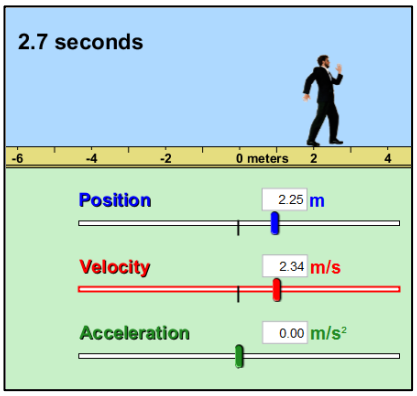
Motion Simulation: The Moving Man

Through a web browser, navigate to **http://phet.colorado.edu**. Click "Play with Sims," then "Physics," then "Motion," then choose the "Moving Man" simulation. Click "Run now" to start the simulation.



Object of the simulation

To explore position and velocity graphs of an object moving in different ways.

Familiarization

There are two tabs for this simulation, called "Introduction" and "Charts." For today's activity, you will need only the "Introduction" tab.

Play with the controls of the simulation to get used to the controls. Can you find...

- ❑ two ways to move the man around?
- ❑ how to make the man move automatically?
- ❑ how to record and playback the man's motion?
- ❑ how to playback the man's motion in slow motion?
- ❑ how to quickly reset the man to starting conditions?

Constant Velocity

1. Reset all of the man's values to zero.

2. Using the position slider, set the man to stand near the tree. Give him a velocity of 1.2 m/s (and an acceleration of 0).

3. Click ▶ to start the man in motion until he hits the wall, then hit ❚❚ to stop recording.

4. Use the playback feature to answer these questions.
   a. What happened to the blue position slider as the man moved across the screen?

   b. What happened to the red velocity slider as the man moved across the screen?

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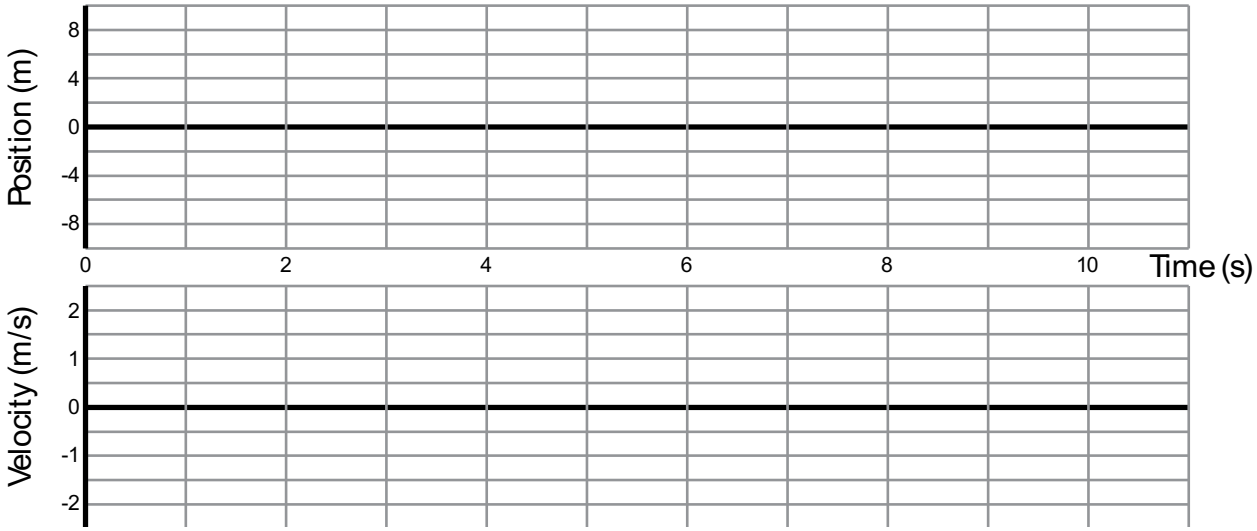
5. Use the playback feature to record the man's position and velocity data.

Time (s)	Position (m)	Velocity (m/s)
0.0		
1.0		
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		

6. Plot your data in the graphs below: [Note the "charts" tab …]



7. According to your graphs...
   a. What shape is your position graph?

   b. What does the slope of your position graph represent, physically?

   c. Does your answer to part b make sense given how you set up the simulation?

   d. What shape is your velocity graph? Is it horizontal, vertical, or diagonal?

   e. Why is your velocity graph the way it is?

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Constant Acceleration

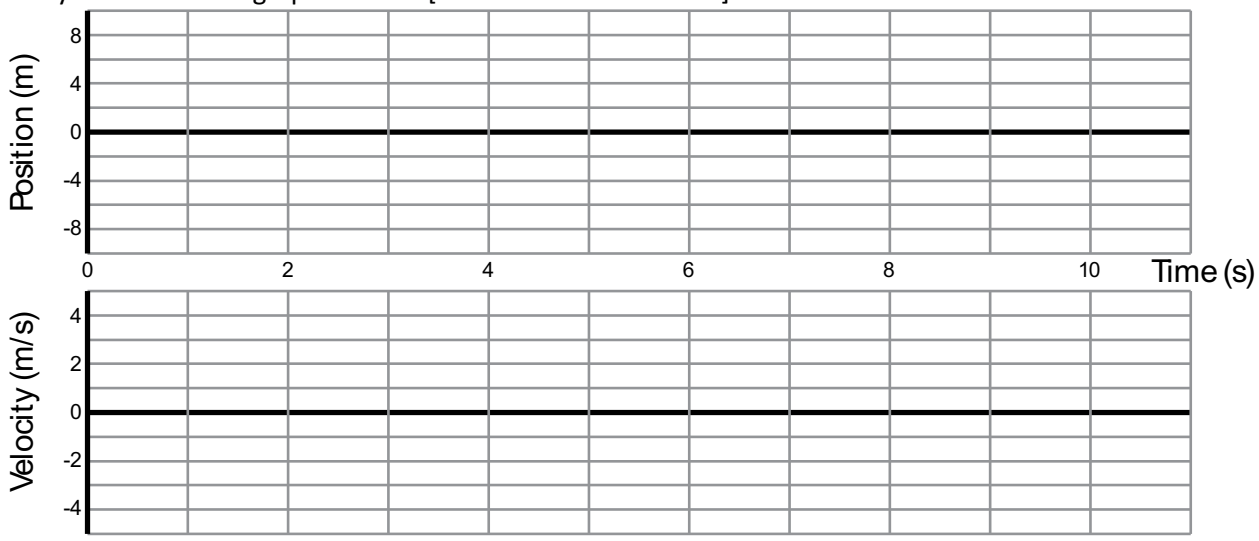
1. Reset all of the man's values to zero.
2. Using the position slider, set the man to stand near the tree. Give him a velocity of 0 m/s and an acceleration of 0.5 m/s^2.
3. Click ▶ to start the man in motion until he hits the wall, then hit ❚❚ to stop recording.
4. Use the playback feature to answer these questions.
    a. What happened to the blue position slider as the man moved across the screen?

    b. What happened to the red velocity slider as the man moved across the screen?

5. Use the playback feature to record the man's position and velocity data.

Time (s)	Position (m)	Velocity (m/s)
0.0		
1.0		
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		

6. Plot your data in the graphs below: [Note the "charts" tab ...]



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7. According to your graphs...
    a. What shape is your position graph?

    b. Why should it be shaped the way it is??

    c. What shape is your velocity graph?

    d. Why is your velocity graph shaped the way it is?

    e. What is the slope of your velocity graph?

    f. What does the slope of the velocity graph represent, physically?

Making Connections

1. What happens to the man when he is accelerating?

2. What is the difference between an object with constant acceleration and an object with constant speed?

3. Complete the following sentences:
    a. *"The slope of a linear position graph tells us the _____ of the object."*

    b. *"The slope of a linear velocity graph tells us the _____ of the object."*

    c. *"For an object moving at a constant speed, we would expect to see a position graph with a _____ shape and a velocity graph with a _____ shape."*

    d. *"For an object moving at a constant acceleration, we would expect to see a position graph with a _____ shape and a velocity graph with a _____ shape."*