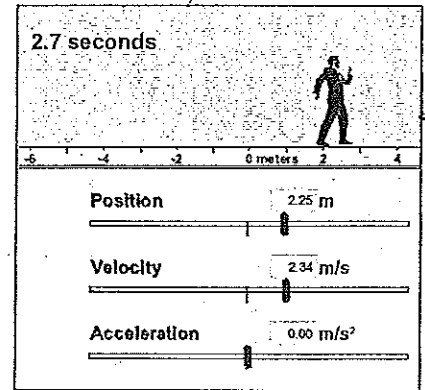


# Motion Simulation: The Moving Man

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 II 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?

*Increases slowly. (moves to the right)*

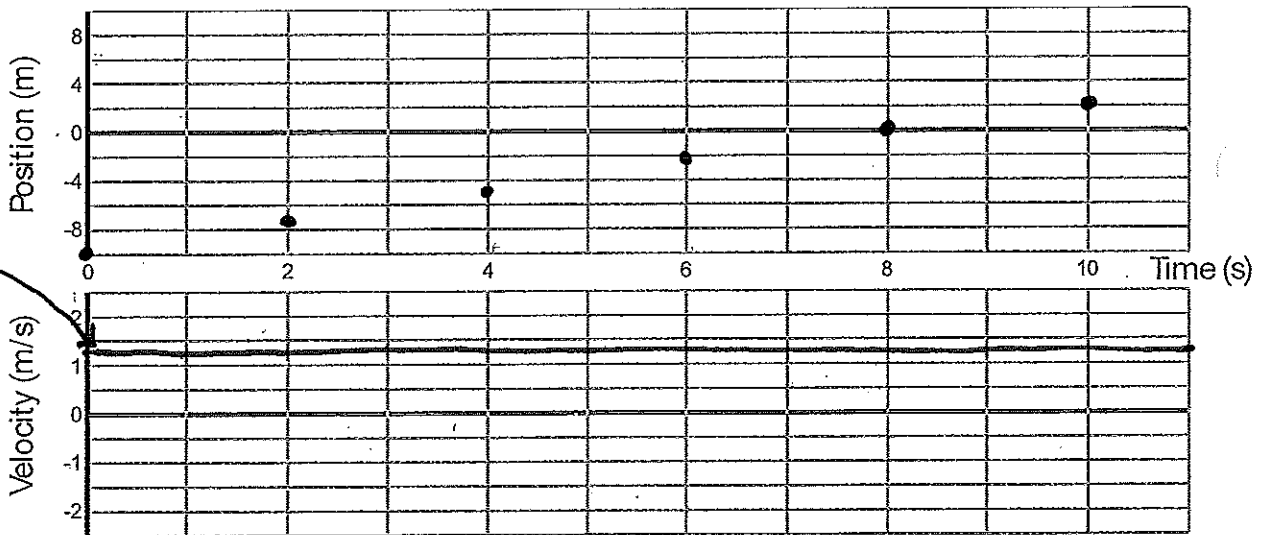
- b. What happened to the red velocity slider as the man moved across the screen?

*Stays at zero.*

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

Time (s)	Position (m)	Velocity (m/s)
0.0	-10	1.2
1.0	-8.75	1.2
2.0	-7.60	1.2
3.0	-6.35	1.2
4.0	-5.20	1.2
5.0	-4.05	1.2
6.0	-2.75	1.2
7.0	-1.60	1.2
8.0	-0.40	1.2
9.0	0.75	1.2
10.0	2.00	1.2

6. Plot your data in the graphs below:



Straight horizontal line at 1.2 m/sec.

7. According to your graphs...

- What shape is your position graph? *A straight line.*
- What is the slope of your position graph? *Slope = 1.2 m/sec.*
- Why does or doesn't your answer to b. make sense?  
*This makes sense because the velocity was set at 1.2 m/sec. That means for every second, the*
- What shape is your velocity graph? Is it horizontal, vertical, or diagonal? *man moved 1.2 meters. A horizontal line.*
- Why does or doesn't your answer to d. make sense?  
*It makes sense because the velocity stayed the same for the entire time interval.*

### 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<sup>2</sup>.
3. Click ▶ to start the man in motion until he hits the wall, then hit II 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?

*It moves up at an increasing rate.*

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

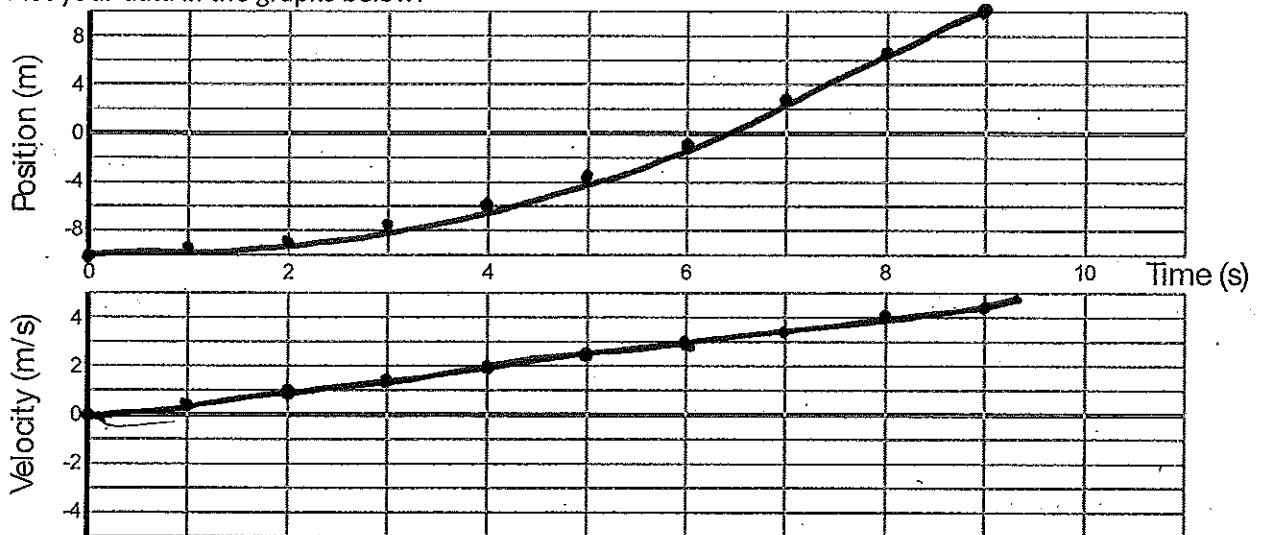
*It moves up at a constant rate.*

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

Time (s)	Position (m)	Velocity (m/s)
0.0	-10	0
1.0	-9.73	0.52
2.0	-9.00	1.00
3.0	-7.81	1.48
4.0	-6.08	1.98
5.0	-3.75	2.50
6.0	-1.12	2.98
7.0	2.40	3.52
8.0	6.17	4.02
9.0	10.00	4.48
10.0		

← Hit Wall!

6. Plot your data in the graphs below:



7. According to your graphs...

- a. What shape is your position graph?  
*A curved line. (This is actually part of a parabola)*
- b. Why does or doesn't your answer to a. make sense?  
*This makes sense because every second, the man's speed is increasing. That means that the distance*
- c. What shape is your velocity graph? *he covers in each time interval*  
*A straight line. gets bigger and bigger.*
- d. Why does or doesn't your answer to c. make sense?  
*This makes sense because the acceleration is set to 0.5 m/sec/sec. This means every second, the speed*
- e. What is the slope of your velocity graph?  
*0.5 m/sec/sec. increases 0.5 m/sec.*
- f. What does the slope of the velocity graph represent?  
*The slope of a velocity/time graph is acceleration.*

### Making Connections

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

*He moves faster and faster every second.*

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

*An object that is accelerating has a different speed for each time interval (faster & faster). An object with constant speed always has the same speed.*

3. Complete the following sentences:

a. "The slope of a linear position graph tells us the SPEED (or velocity!) of the object."

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

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

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

