LECT 3: GRAPHING & MOTION

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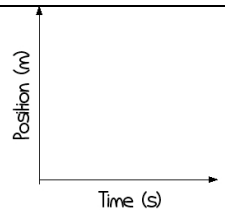
Motion & Graphs

Motion graphs are an important tool used to show the relationships between position, speed, and time. It's an easy way to see how speed or position changes over time These types of graphs are called **kinematic** graphs. There are two types:

- _____ graphs
- _____Graphs

Position Vs. Time

- Used to show an object's position at a given time.
- Position: on **y**-axis
- Time: on **x**-axis



Position vs. Time Graph

You Try It: Graphing Position vs. Time #1

Suppose you are helping a friend who is training for a track meet. She wants to know if she is running at constant speed. You mark the track in 50-meter increments and measure her time at each position during a practice run.

Create a position-time graph using her data.

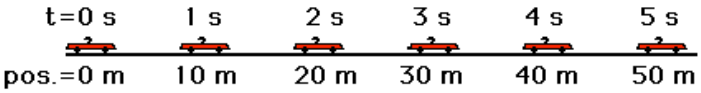
What would her speed be?

Notice that this is a straight line - why??

She is moving at a **constant speed** - neither slowing down nor accelerating

You Try It: Graphing Position Vs. Time #2

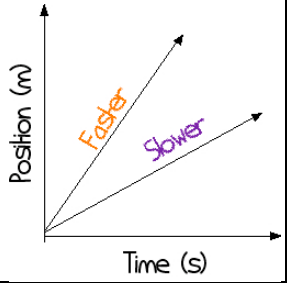
Graph the motion of this car.



What is this car's velocity?

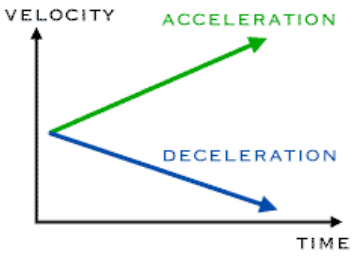
What does slope have to do with it?

Slope is the ratio of the _____ (y-axis) to the _____ (x-axis) of a line on a graph. A _____ slope means a _____ line which means a _____ speed.



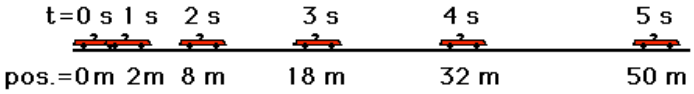
Negative Slopes

What does this graph mean??? And this one? They show an object that is _____ - or _____. The first graph is slowly decelerating, while the second graph is quickly decelerating



Position Vs. Time - Changing Velocity

Now consider a car that has a changing velocity. It is not moving at a constant rate, but getting faster by the second. What would this graph look like?

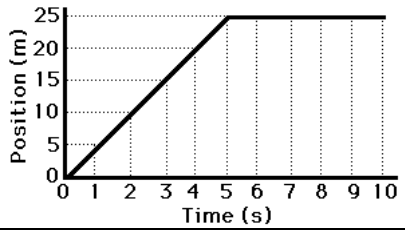


You Try It: Graphing Position Vs. Time #3

What would the graph look like for a car that traveled 10 m in the 1st second, 15 m by the 2nd second, 25 by the 3rd second, and 40 m by the 4th second?

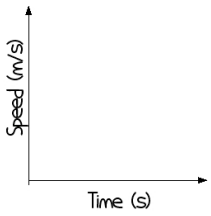
Predict: What does THIS GRAPH show?

The straight line means its position is _____.



Speed Vs. Time

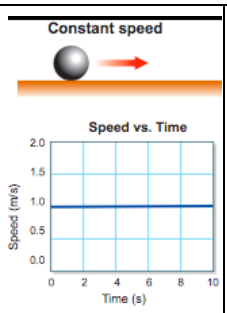
- Used to show an object's speed at a given time.
- Speed: on ____-axis
- Time: on ____-axis



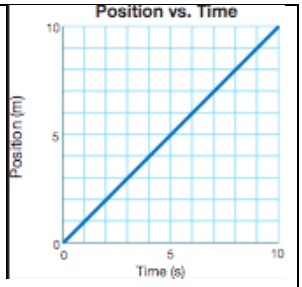
Speed vs Time Graph

Speed Vs. Time - Constant Speed

This graph shows the speed versus time for a ball rolling at constant speed on a level floor. On a speed vs. time graph, constant speed is shown with a _____ _____line. If you look at the speed on the y-axis, you see that the ball is moving at 1 m/s for the entire 10 seconds.



Compare this speed-time graph to the position-time graph for the ball. Both of the graphs show the exact same motion, even though they look different. If you calculate the slope of the lower graph, you will find that it is still 1 m/s.

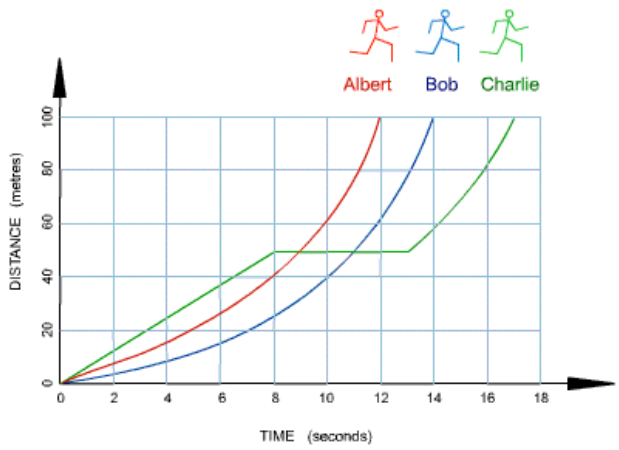


You Try It: Graphing Speed Vs. Time #1

Maria walks at a constant speed of 6 m/s for 5 seconds. Then, she runs at a constant speed of 10 m/s for 5 seconds. Create a speed-time graph using her data.

Speed Vs. Time - Changing Speed

As we know, most objects don't move at a constant speed. If a speed vs. time graph slopes up, then the speed is _____. If it slopes down, then the speed is _____. If the graph is horizontal, then the object is moving at a _____ speed.



Putting it All Together

1. Which runner won the race?
2. Which runner stopped for a rest?
3. How long did he stop for?
4. How long did Bob take to complete the race?
5. Calculate Albert's average speed.