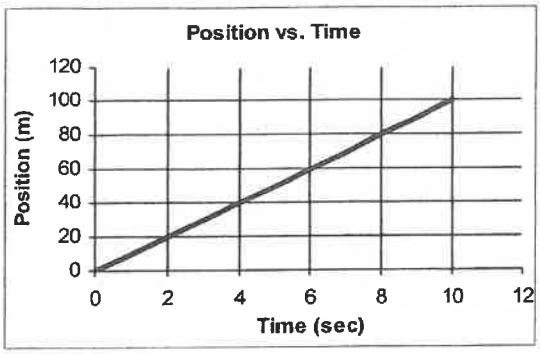
Key

1-9

Ch.1:4

1. Linear B 2. Independent variable D 3. Dependent variable A 4. Slope C	A. The variable on the vertical axis (y-axis). B. A type of graph that looks like a straight line. C. The measure of the steepness of a line. D. The variable on the horizontal axis (x-axis).	Which of the following are units for speed? km/sec (Dist.) — meters/sec — meters/sec (Dist.) — cm/sec sec (Time) — miles/hour — km/min — meter/sec² (Accel.) Must have distance over Time!



Which is the independent variable? Time (sec)

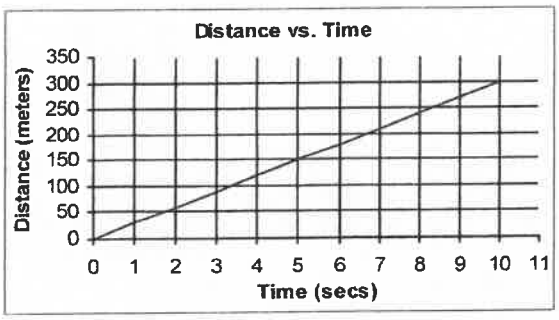
Which is the dependent variable? Position (m)

Where was the object at 4 seconds? 40 m

Find the slope of the graph (must show work)

$\frac{100\text{m}}{10\text{ sec}} = 10\text{ m/s}$

What does the slope you just found stand for? Speed



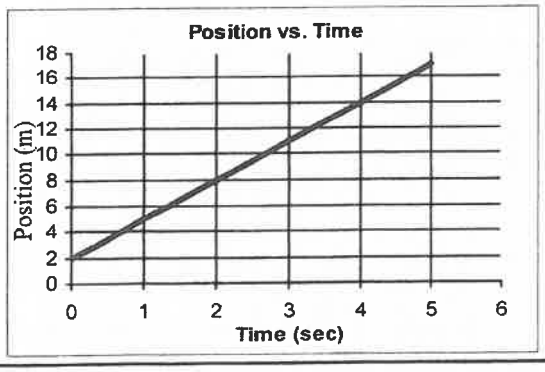
When did the object reach 150 meters? 5 sec

Where was the object at 9 seconds? ~270 m (~ = About)

Find the slope of the graph (must show work) 30 m/sec

$\frac{300\text{m}}{10\text{ sec}} = 30\text{ m/sec}$

What does the slope you just found stand for? Speed



Which is the independent variable? Time (sec)

Which is the dependent variable? Position (m)

Where was the object at 4 seconds? 14 m

Find the slope of the graph (must show work)

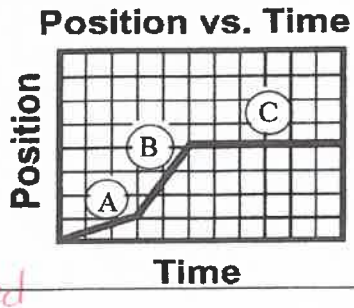
$\frac{14\text{ m}}{4\text{ sec}} = 3.5\text{ m/sec}$

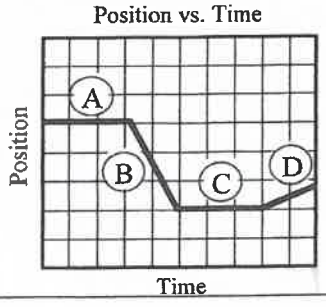
What does the slope you just found stand for? Speed

The slope of this graph means: Speed

The segment that shows fast speed: B

The segment that shows slow speed: A





Which graph segments fit the following:

At rest: C, A

Fast speed: B

Slow speed: D

Going backwards: B

Going forward: D

C is stopped

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Understanding Concepts

1. Explain, in your own words, why a graph is sometimes more useful than an equation. Lets you easily understand the data visually.
2. What does the slope of a distance–time graph represent? speed
3. What interpretation can be made about a moving car if the line on a distance–time graph for the car has the following characteristics?
   - **(a)** a high or steep slope = high speed
   - **(b)** a low or less steep slope = slow speed
   - **(c)** a zero slope = no movement
   - **(d)** a short line on the graph = short distance in short time
   - **(e)** a long line on the graph = long distance in long time
4. Sketch a distance–time graph for a car cruising at 80 km/h.
5. A car leaves Borden-Carleton, PEI, on its way across the Confederation Bridge into New Brunswick. The distances and times from the toll booth in PEI are listed in **Table 4**. They include a short stretch of road beyond the end of the 12.9-km bridge.

Table 4 **Car Crossing Confederation Bridge**

Time (min)	Distance (km)
0.0	0.0
2.0	2.4
4.0	4.8
6.0	7.2
8.0	9.6
10.0	12.0
12.0	14.4

   - **(a)** Plot a distance–time graph using the information in **Table 4**. Draw a best-fit straight line.
   - **(b)** Using your graph, find the distance travelled after 5.0 min. 6 km
   - **(c)** Using your graph, find the time required to cross the bridge. 10.8 min (bridge is 12.9 km long)
   - **(d)** Was the speed constant during the car's trip across the Confederation Bridge? How do you know? Yes. The line is straight. The plot points are evenly spaced.
   - **(e)** Calculate the slope of the graph. What does this slope represent? Slope: 1.2 km/min (Speed)
   - **(f)** What is the speed of the car in kilometres per hour?
6. In **Figure 5**, the motion of two bicycle riders, Tom and Jerry, is described on a distance–time graph.

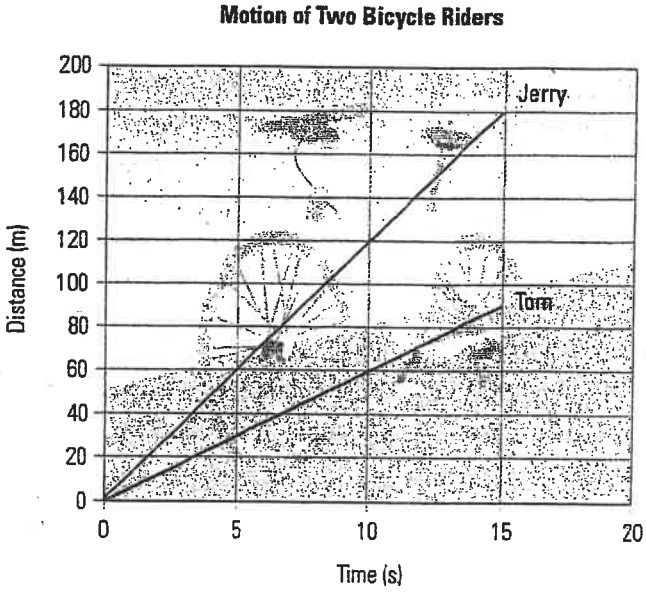

Figure 5
These two cyclists are travelling at different speeds.

   - **(a)** From a qualitative observation of the lines on the graph, which rider has the greater speed? Jerry
   - **(b)** Calculate the speed of each rider by determining the slope of each line. Does this quantitative result match your answer to (a)? J = 12 m/s T = 6 m/s Yes
   - **(c)** If one of the bicycle riders suddenly stopped, how would the graph of that rider change? The graph would be a straight horizontal line (slope = 0)

Reflecting

7. When studying motion in physics, it is customary to plot time on the horizontal axis and distance on the vertical axis even if distance is the independent variable in a particular experiment. Suggest a reason for this general rule.

Work the Web

Visit www.nelson.science.com and follow the links from Science 10, 9.7 to research the times for the top five finishers in the most recent Toronto Indy race. Compare their average speeds. Other than the characteristics of each car, what are some factors that affect the average speed over the whole race?

Challenge

3 You will need to create graphs to illustrate how cars, travelling at different speeds, cover different distances in the same amount of time. What will be plotted on each axis? What units will you use?

y=40 x=32
40÷15=2.5 32÷12=2

#5 a)

Car Crossing the Confederation Bridge