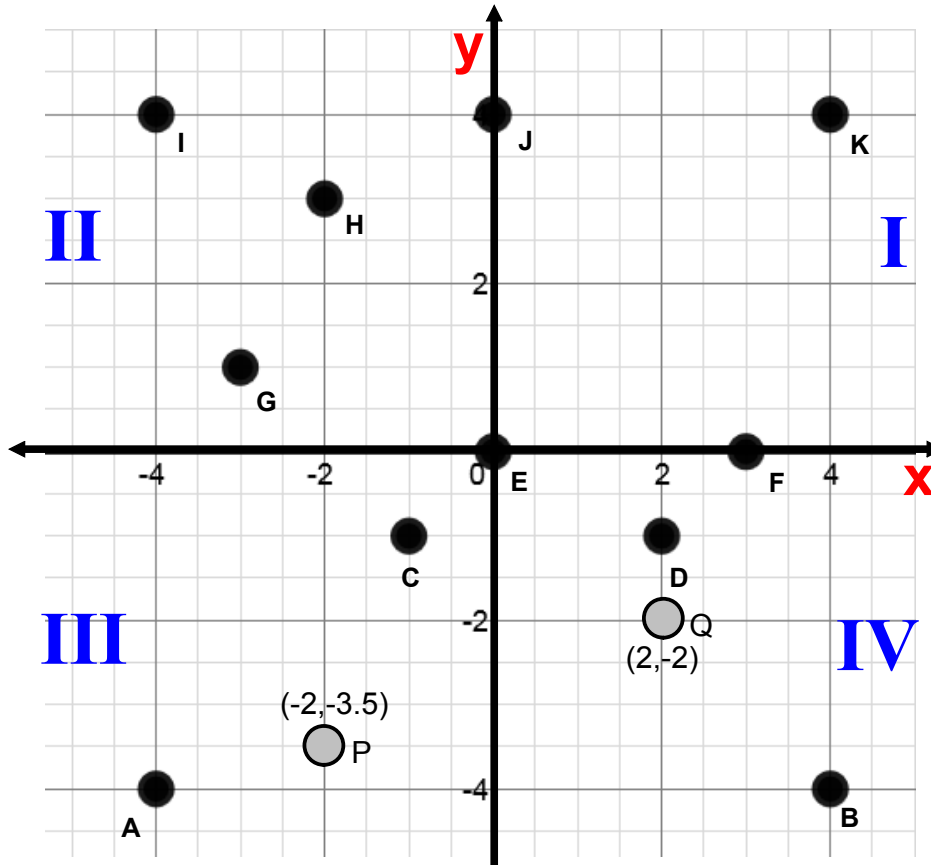


Before we continue with our motion analysis unit, we need to learn/review a math concept called slope.

Slope is a measure of how range values change with the domain values (i.e. how the y-values get larger or smaller as the x-values get larger).

Review of Plotting Points and Graphs

- Used to visualize mathematical relationships.
- 2 axes divide grid into four quadrants: I, II, III, IV
- Coordinates are written as (x,y) and called an order pair or points.
- (0,0) is called the origin.



Slope = Rise/Run

Rise = change in y - values

Run = change in x - values

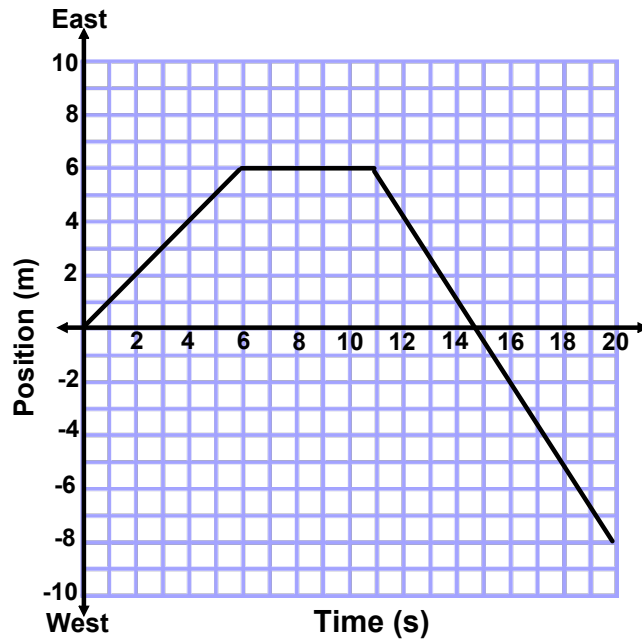
$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

Example: Calculate the slope between P & Q.

Example: Calculate the slope between D & B.

1. What points have an y -value of -2 ? _____
2. What points have an x -value of 0 ? _____
3. Place a dot at $(2,3)$ and $(-3,-2)$.
4. What points form the corners of a perfect square? _____
5. Going from G to H: _____ up and _____ right.
6. Going from H to J: _____ up and _____ right.
7. Going from E to D: _____ down and _____ right.
8. Going from I to C: _____ down and _____ right.
9. Calculate the slope for questions 5 - 8. (slope = rise/run)
10. Place a dot 3 units to the right and 1 unit up from point A.
11. Place a dot 2.5 units to the right and 1.5 units down from point J.
12. Calculate the slope between points: I & G, A & D, C & D, I & F, A & J, and H & B.

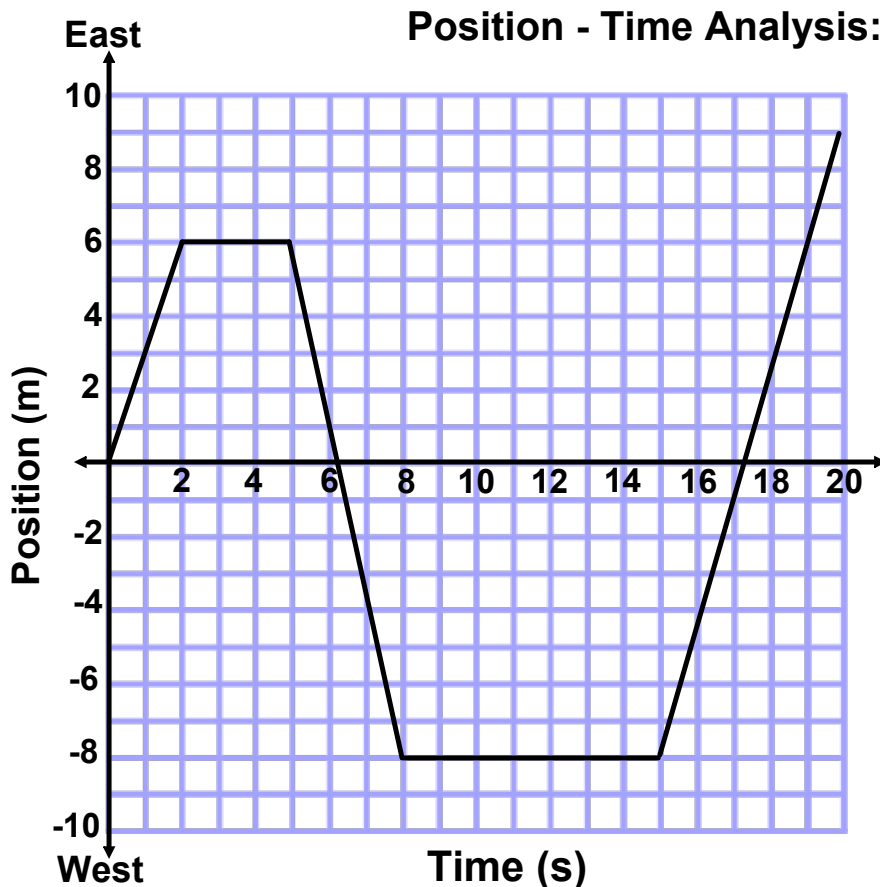
Analyzing Position - Time Graphs



- Slope at any point is the instantaneous velocity.
- Sign of the slope indicates the direction the object is travelling.
- Distance is the sum of the displacements in both directions.
- Average *velocity* is the object's *displacement* divided by the time.
- Average *speed* is the object's *distance* divided by the time.

Examples

1. What was the object's position at the 4 second mark? 10 s mark? 18s mark?
2. Calculate the distance traveled during the first 14 seconds.
3. Calculate the average speed during the first 14 seconds.
4. Calculate the average velocity during the first 14 seconds.
5. Calculate the instantaneous velocity at the 16 second mark.
6. Calculate the object's total distance traveled and final position.
7. Calculate the object's average speed and velocity for the full 20 seconds.



1. Calculate the instantaneous velocity at 1, 6 and 20 seconds.
2. Calculate the distance covered during the first 8 seconds.
3. What was the displacement at 3, 10, and 18 seconds.
4. During which time interval was the highest speed obtained?
5. Other than the start, at what times was the object back at the origin?
6. During what time interval(s) was the object traveling west?
7. Calculate the average speed and velocity during the first 6 seconds.
8. How long was the object not moving?
9. During what time intervals was the object east of the starting position but traveling west?
10. During what time intervals was the object west of the starting position but traveling east?
11. Calculate the average speed and velocity for the entire 20 seconds.

Attachments

moving-man_all.jar