

Reading Response 1 - due Sun. Oct. 5 6:00 pm

Due: --

You will receive no credit for items you complete after the assignment is due. [Grading Policy](#)

Kinematic Vocabulary I

One of the difficulties in studying mechanics is that many common words are used with highly specific technical meanings, among them *velocity*, *acceleration*, *position*, *speed*, and *displacement*. The series of questions in this problem is designed to get you to try to think of these quantities like a physicist.

Answer the questions in this problem using words from the following list:

- A. position
- B. direction
- C. displacement
- D. coordinates
- E. velocity
- F. acceleration
- G. distance
- H. magnitude
- I. vector
- J. scalar
- K. components

Part A

Velocity differs from *speed* in that *velocity* indicates a particle's _____ of motion.

Enter the letter from the list given in the problem introduction that best completes the sentence.

ANSWER:

Part B

Unlike *speed*, *velocity* is a _____ quantity.

Enter the letter from the list given in the problem introduction that best completes the sentence.

ANSWER:

Part C

Speed differs from *velocity* in the same way that _____ differs from *displacement*.

Enter the letter from the list given in the problem introduction that best completes the sentence.

You did not open hints for this part.

ANSWER:

Part D

A vector has, by definition, both _____ and direction.

Enter the letter from the list given in the problem introduction that best completes the sentence.

ANSWER:

Part E

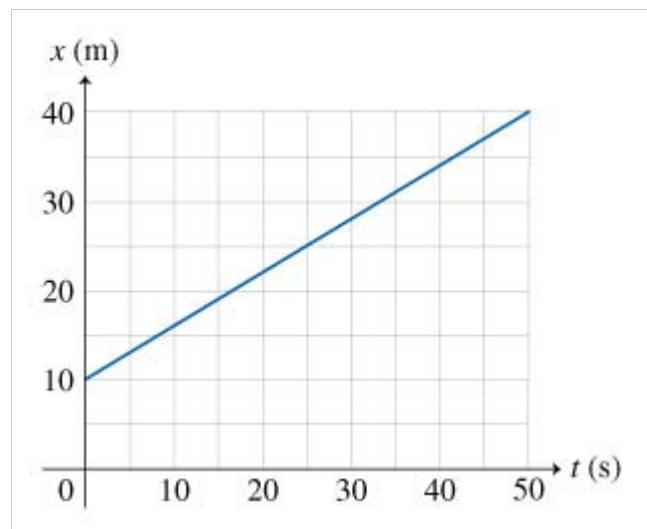
Identify the following physical quantities as scalars or vectors. position, velocity, displacement, speed
 acceleration, average velocity, distance

ANSWER:

What x vs. t Graphs Can Tell You

To describe the motion of a particle along a straight line, it is often convenient to draw a graph representing the position of the particle at different times. This type of graph is usually referred to as an x vs. t graph. To draw such a graph, choose an axis system in which time t is plotted on the horizontal axis and position x on the vertical axis. Then, indicate the values of x at various times t . Mathematically, this corresponds to plotting the variable x as a function of t . An example of a graph of position as a function of time for a particle traveling along a straight line is shown below. Note that an x vs. t graph like this does *not* represent the path of the particle in space.

Now let's study the graph shown in the figure in more detail. Refer to this graph to answer Parts A, B, and C.



Part A

What is the total distance Δx traveled by the particle?

Express your answer in meters.

ANSWER:

$\Delta x =$ m

Part B

What is the average velocity v_{av} of the particle over the time interval $\Delta t = 50.0$ s ?

Express your answer in meters per second.

ANSWER:

$$v_{av} = \quad \text{m/s}$$

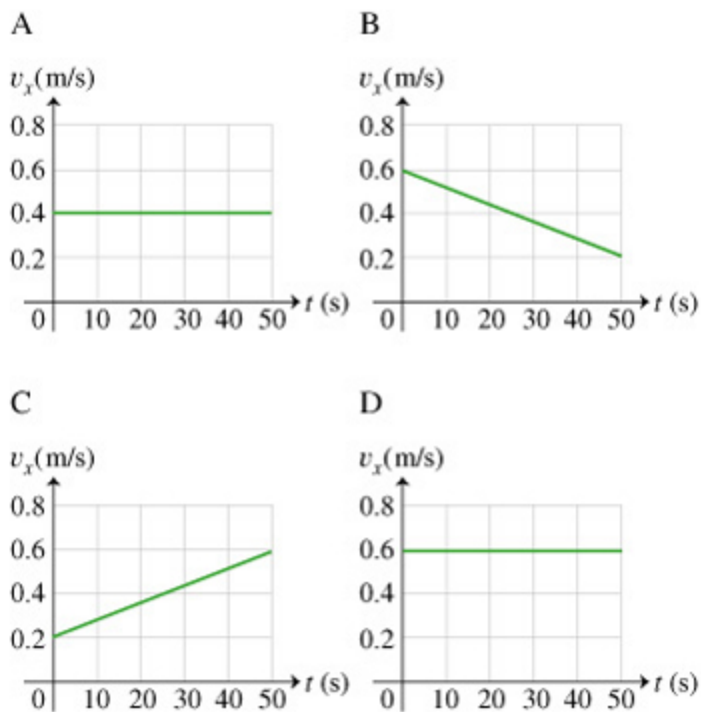
Part CWhat is the instantaneous velocity v of the particle at $t = 10.0$ s?**Express your answer in meters per second.**

ANSWER:

$$v = \quad \text{m/s}$$

Another common graphical representation of motion along a straight line is the v vs. t graph, that is, the graph of (instantaneous) velocity as a function of time. In this graph, time t is plotted on the horizontal axis and velocity v on the vertical axis. Note that by definition, velocity and acceleration are vector quantities. In straight-line motion, however, these vectors have only one nonzero component in the direction of motion. Thus, in this problem, we will call v the velocity and a the acceleration, even though they are really the components of the velocity and acceleration vectors in the direction of motion.

Part DWhich of the graphs shown is the correct v vs. t plot for the motion described in the previous parts?



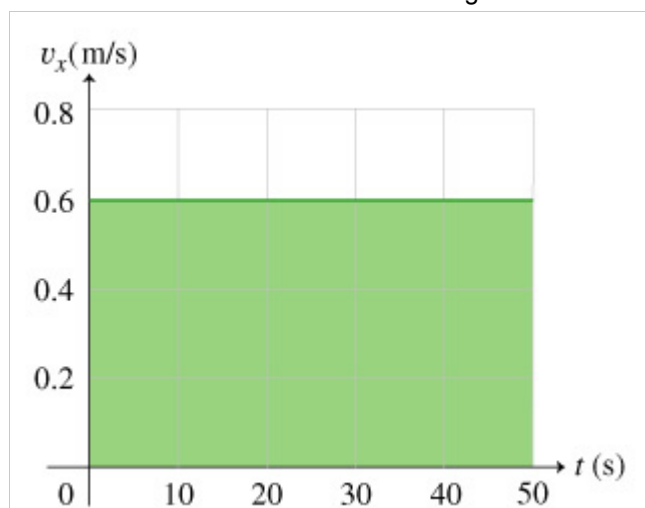
ANSWER:

- Graph A
 Graph B
 Graph C
 Graph D

Part E

Shown in the figure is the v vs. t curve selected in the previous part. What is the area A of the shaded region under the curve?

Express your answer in meters.

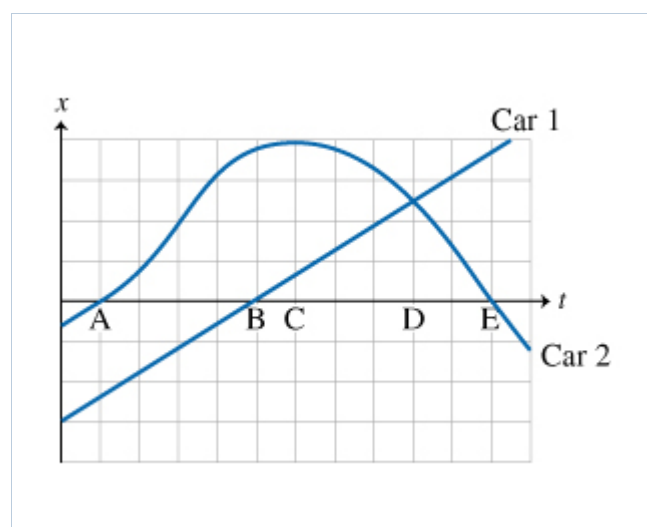


ANSWER:

$A =$ m

Analyzing Position versus Time Graphs: Conceptual Question

Two cars travel on the parallel lanes of a two-lane road. The cars' motions are represented by the position versus time graph shown in the figure. Answer the questions using the times from the graph indicated by letters.



Part A

At which of the times do the two cars pass each other?

ANSWER:

- A
- B
- C
- D
- E
- None
- Cannot be determined

Part B

Are the two cars traveling in the same direction when they pass each other?

ANSWER:

- yes
- no

Part C

At which of the lettered times, if any, does car #1 momentarily stop?

ANSWER:

- A
- B
- C
- D
- E
- none
- cannot be determined

Part D

At which of the lettered times, if any, does car #2 momentarily stop?

ANSWER:

- A
 B
 C
 D
 E
 none
 cannot be determined

Part E

At which of the lettered times are the cars moving with nearly identical velocity?

ANSWER:

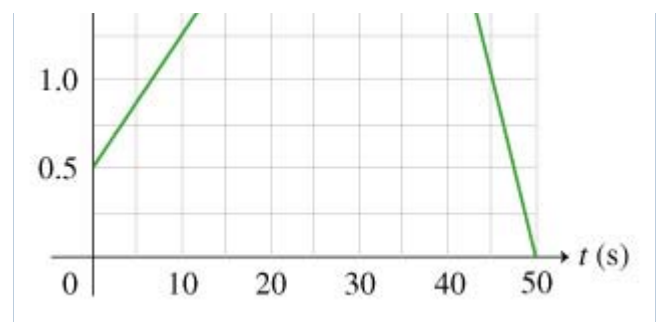
- A
 B
 C
 D
 E
 None
 Cannot be determined

What Velocity vs. Time Graphs Can Tell You

A common graphical representation of motion along a straight line is the v vs. t graph, that is, the graph of (instantaneous) velocity as a function of time. In this graph, time t is plotted on the horizontal axis and velocity v on the vertical axis. Note that by definition, velocity and acceleration are vector quantities. In straight-line motion, however, these vectors have only a single nonzero component in the direction of motion. Thus, in this problem, we will call v the velocity and a the acceleration, even though they are really the components of the velocity and acceleration vectors in the direction of motion, respectively.

Here is a plot of velocity versus time for a particle that travels along a straight line with a varying velocity. Refer to this plot to answer the following questions.





Part A

What is the initial velocity of the particle, v_0 ?

Express your answer in meters per second.

You did not open hints for this part.

ANSWER:

$v_0 =$ m/s

Part B

What is the total distance Δx traveled by the particle?

Express your answer in meters.

You did not open hints for this part.

ANSWER:

$\Delta x =$ m

Part C

What is the average acceleration a_{av} of the particle over the first 20.0 seconds?

Express your answer in meters per second per second.

You did not open hints for this part.

ANSWER:

$a_{\text{av}} =$ m/s^2

Part D

What is the instantaneous acceleration a of the particle at $t = 45.0$ s?

You did not open hints for this part.

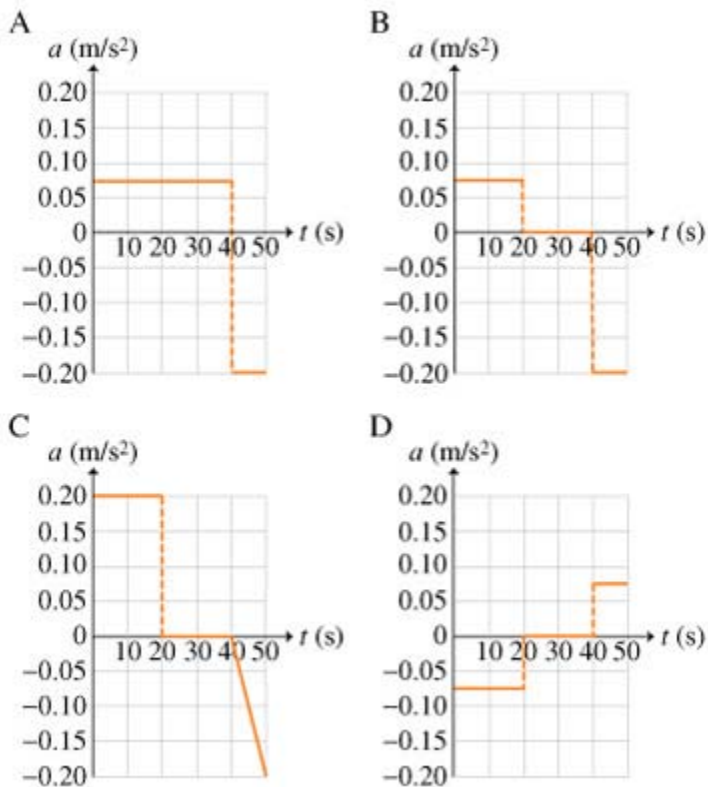
ANSWER:

- $a =$
- 1 m/s²
 - 0.20 m/s²
 - 0.20 m/s²
 - 0.022 m/s²
 - 0.022 m/s²

Now that you have reviewed how to plot variables as a function of time, you can use the same technique and draw an acceleration vs. time graph, that is, the graph of (instantaneous) acceleration as a function of time. As usual in these types of graphs, time t is plotted on the horizontal axis, while the vertical axis is used to indicate acceleration a .

Part E

Which of the graphs shown below is the correct acceleration vs. time plot for the motion described in the previous parts?



You did not open hints for this part.

ANSWER:

- Graph A
- Graph B
- Graph C
- Graph D

Problem 2.42

Consider two vectors along the x axis, one with x component $A_x = 4$ m and the other with x component $B_x = -6$ m .

Part A

What is $\vec{A} + \vec{B}$?

ANSWER:

$$\vec{A} + \vec{B} = \quad \text{m} \cdot \hat{i}$$

Part B

What is $\vec{A} - \vec{B}$?

ANSWER:

$$\vec{A} - \vec{B} = \quad \text{m} \cdot \hat{i}$$

Prelecture Concept Question 3.02

Part A

What shape do we expect for a graph showing the position of a motorcycle versus time if the motorcycle is speeding up with a constant acceleration?

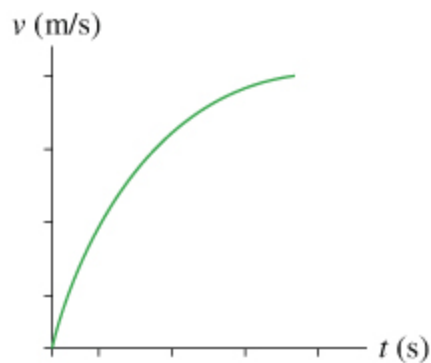
ANSWER:

- The position versus time graph is a horizontal line.
- The position versus time graph is a line with a negative slope.
- The position versus time graph is parabolic.
- The position versus time graph is a line with a positive slope.

Prelecture Concept Question 3.04

Part A

The figure shows the velocity versus time graph for a car driving on a straight road. Which of the following best describes the acceleration of the car?



ANSWER:

- The acceleration of the car is negative and decreasing.
- The acceleration of the car is positive and increasing.
- The acceleration of the car is positive and decreasing.
- The acceleration of the car is negative and increasing.
- The acceleration of the car is constant.

Prelecture Concept Question 3.05**Part A**

Suppose that you toss a rock upward so that it rises and then falls back to the earth. If the acceleration due to gravity is 9.8 m/sec^2 , what is the rock's acceleration at the instant that it reaches the top of its trajectory (where its velocity is momentarily zero)? Assume that air resistance is negligible.

ANSWER:

- The rock has a *downward* acceleration of 19.6 m/s^2 .
- The rock has an *upward* acceleration of 9.8 m/s^2 .
- The acceleration of the rock is zero.
- The rock has a *downward* acceleration of 9.8 m/s^2 .
- The rock has an *upward* acceleration of 19.6 m/s^2 .

Prelecture Concept Question 3.06**Part A**

On a straight road, a car speeds up at a constant rate from rest to 20 m/s over a 5 second interval and a truck slows at a constant rate from 20 m/s to a complete stop over a 10 second interval. How does the distance traveled by the truck compare to that of the car?

ANSWER:

- There is not enough information to answer the question.
- The truck travels the same distance as the car.
- The truck travels twice as far as the car.
- The truck travels half as far as the car.

Open Response

Part A - Upcoming Material

What material from the current reading would be the most useful for us to spend class time on? Be as specific as you can.

ANSWER:

Essay answers are limited to about 500 words (3800 characters maximum, including spaces).

3785 Character(s) remaining

(none provided)

Part B - Previous Material

What material from last week are you still struggling with?

ANSWER:

Essay answers are limited to about 500 words (3800 characters maximum, including spaces).

3785 Character(s) remaining

(none provided)

Part C - Feedback

Any feedback for your faculty?

ANSWER: