Manage this Assignment: Print Version with Answers

HW01_CH1_2

Due: 11:30pm on Tuesday, September 8, 2009

Note: You will receive no credit for late submissions. To learn more, read your instructor's Grading Policy

Significant Figures Conceptual Question

Description: Conceptual question on the importance of significant figures by having students compare identical simple arithmetic expressions with different significant figures.

In the parts that follow select whether the number presented in statement A is greater than, less than, or equal to the number presented in statement B. Be sure to follow all of the rules concerning significant figures.

Part A

- Statement A: 2.567 , to two significant figures.
- Statement B: 2.567 , to three significant figures.

Hint A.1 Rounding and significant figures

Rounding to a different number of significant figures changes a number. For example, consider the number 3.4536. This number has five significant figures. The following table illustrates the result of rounding this number to different numbers of significant figures:

Four significant figures	3.454
Three significant figures	3.45
Two significant figures	3.5
One significant figure	3

Notice that, when rounding 3.4536 to one significant figure, since 0.4536 is less than 0.5, the result is 3, even though if you first rounded to two significant figures (3.5), the result would be 4.

Determine the correct relationship between the statements.

ANSWER: Statement A is greater than Statement B.

Part B

- Statement A: (2.567 + 3.146), to two significant figures.
- Statement B: (2.567 , to two significant figures) + (3.146 , to two significant figures).

Determine the correct relationship between the statements.

ANSWER: Statement A is equal to Statement B.

Evaluate statement A as follows: (2.567 + 3.146) = 5.713 to two significant figures is 5.7 . Statement B evaluates as 2.6 + 3.1 = 5.7 . Therefore, the two statements are equal.

Part C

- Statement A: Area of a rectangle with measured length = 2.536 and width = 1.4 .
- Statement B: Area of a rectangle with measured length = 2.536 and width = 1.41 .

Since you are not told specific numbers of significant figures to round to, you must use the rules for multiplying numbers while respecting significant figures. If you need a reminder, consult the hint.

Hint C.1 Significant figures and multiplication

When you multiply two numbers, the result should be rounded to the number of significant figures in the less accurate of the two numbers. For instance, if you multiply 2.413 (four significant figures) times 3.81 (three significant figures), the result should have three significant figures: . Similarly, , when significant figures are respected (i.e., 15.328646 rounded to one significant figure).

Determine the correct relationship between the statements.

ANSWER: Statement A is greater than Statement B.

Evaluate statement A as follows: (2.536) (1.4) = 3.5504 to two significant figures is 3.6 . Statement B evaluates as (2.536) (1.41) = 3.57576 to three significant figures is 3.58 . Therefore, statement A is greater than statement B.

Problem 1.32

Description: The speed, v, of an object is given by the equation v = At^3 - Bt, where t refers to time. (a) What is the dimension of A? (b) What is the dimension of B?

The speed, , of an object is given by the equation , where refers to time.

Part A

What is the dimension of ?

ANSWER:

Part B

What is the dimension of ?

ANSWER:

Problem 1.10

Description: (a) What is the area of a circle of radius r * 10^4 (cm)? (b) What is the approximate uncertainty in the area of a circle of radius r * 10^4 (cm)?

Part A

What is the area of a circle of radius ?

Express your answer using two significant figures.

ANSWER:

=

Part B

What is the approximate uncertainty in the area of a circle of radius ?

Express your answer using one significant figure.

ANSWER:

=

Analyzing Position versus Time Graphs: Conceptual Question

Description: Conceptual question on analyzing the position versus time graphs of two different cars.

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?

Hint A.1 **Two cars passing**

Two objects can pass each other only if they have the same position at the same time.

ANSWER: D

Part B

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

ANSWER:

yes
no

C

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

Hint C.1 **Determining velocity from a position versus time graph**

The slope on a position versus time graph is the "rise" (change in position) over the "run" (change in time). In physics, the ratio of change in position over change in time is defined as the velocity. Thus, the slope on a position versus time graph is the velocity of the object being graphed.

ANSWER: none

D

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

Hint D.1 **Determining velocity from a position versus time graph**

The slope on a position versus time graph is the "rise" (change in position) over the "run" (change in time). In physics, the ratio of change in position over change in time is defined as the velocity. Thus, the slope on a position versus time graph is the velocity of the object being graphed.

ANSWER: C

Part E

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

Hint E.1 **Determining Velocity from a Position versus Time Graph**

The slope on a position versus time graph is the “rise” (change in position) over the “run” (change in time). In physics, the ratio of change in position over change in time is defined as the velocity. Thus, the slope on a position versus time graph is the velocity of the object being graphed.

ANSWER: A

The Graph of a Sports Car's Velocity

Description: Find an object's acceleration and distance traveled from a graph of velocity as a function of time.

The graph in the figure shows the velocity of a sports car as a function of time . Use the graph to answer the following questions.

Part A

Find the maximum velocity of the car during the ten-second interval depicted in the graph.

Hint A.1 **How to approach the problem**

Because the graph displays the car's velocity at each moment in time, the maximum velocity of the car can be found simply by locating the maximum value of the velocity on the graph.

Express your answer in meters per second to the nearest integer.

ANSWER: =

Part B

During which time interval is the acceleration positive?

Hint B.1 Finding acceleration from the graph

Recall that acceleration is the rate of change of velocity with respect to time. Therefore, on this graph of velocity vs. time, acceleration is the slope of the graph. Recall that the slope is defined by for a graph of vs. , or in this case. If the graph is increasing from left to right, then the slope is positive.

Indicate the best answer.

ANSWER:
to
to
to
to
to

Part C

Find the maximum acceleration of the car.

Hint C.1 How to approach the problem

The car's acceleration is the rate of change of the car's velocity with respect to time . In this problem, the car's velocity is given graphically, so the car's acceleration at a given moment is found from the *slope* of the vs. curve at that moment. If the vs. curve over some time interval is represented by a straight line, the *instantaneous* acceleration anywhere in that interval is equal to the slope of the line, that is, to the *average* acceleration over that time interval.
To find the maximum acceleration, find the value of the curve's greatest positive slope.

Hint C.2 Find the final velocity on the interval with greatest acceleration

The slope of the curve is greatest during the first second of motion. The slope of the graph on this interval is given by the change in velocity divided by the change in time over the interval from to . At time , the car's velocity is zero. Find the velocity of the car at time .

Express your answer in meters per second to the nearest integer.

ANSWER: =

Express your answer in meters per second per second to the nearest integer.

ANSWER: =

Part D

Find the minimum magnitude of the acceleration of the car.

Hint D.1 How to approach the problem

To find the minimum magnitude of the acceleration of the car, you must find the point where the absolute value of the slope is smallest.

Express your answer in meters per second per second to the nearest integer.

ANSWER: =

Part E

Find the distance traveled by the car between and .

Hint E.1 How to approach the problem

In this problem, the car's velocity as a function of time is given graphically, so the distance traveled is represented by the area under the vs. graph between and .

Hint E.2 Find the distance traveled in the first second

What is the distance traveled between and ?

Hint E.2.1 The area of a triangle

Observe that the region in question is a triangle , whose area is therefore one-half the product of the base and the height.

Express your answer in meters.

ANSWER: d_0,1 =

Hint E.3 Find the distance traveled in the second second

What is the distance traveled between and ?

Hint E.3.1 The shape of the region

The region under the graph between 1 and 2 seconds can be seen as consisting of a rectangle and a triangle.

Express your answer in meters.

ANSWER: =

Express your answer in meters to the nearest integer.

ANSWER: =

Problem 2.32

Description: A person driving her car at 45 km/h approaches an intersection just as the traffic light turns yellow. She knows that the yellow light lasts only 2.0 s before turning red, and she is 28 m away from the near side of the intersection (see the figure). (...

A person driving her car at 45 approaches an intersection just as the traffic light turns yellow. She knows that the yellow light lasts only 2.0 before turning red, and she is 28 away from the near side of the intersection (see the figure).

Part A

Should she try to stop, or should she speed up to cross the intersection before the light turns red? The intersection is 15 wide. Her car's maximum deceleration is -5.8 , whereas it can accelerate from 45 to 65 in 6.0 . Ignore the length of her car and her reaction time.

ANSWER:

She should stop.
She should speed up.

Problem 2.3

Description: (a) If you are driving v along a straight road and you look to the side for t, how far do you travel during this inattentive period?

Part A

If you are driving 110 along a straight road and you look to the side for 2.9 , how far do you travel during this inattentive period?

Express your answer using two significant figures.

ANSWER:

=

Problem 2.9

Description: A person jogs eight complete laps around a quarter-mile track in a total time of t. (a) Calculate the average speed, in m/s. (b) Calculate the average velocity, in m/s.

A person jogs eight complete laps around a quarter-mile track in a total time of 13.5 .

Part A

Calculate the average speed, in .

ANSWER:

=

Part B

Calculate the average velocity, in .

ANSWER:

=

Problem 2.22

Description: A car slows down from v to rest in a distance of d. (a) What was its acceleration, assumed constant?

A car slows down from 22 to rest in a distance of 71 .

Part A

What was its acceleration, assumed constant?

Express your answer using two significant figures.

ANSWER:

=

Problem 2.78

Description: A stone is dropped from the roof of a building; Deltat after that, a second stone is thrown straight down with an initial speed of v, and the two stones land at the same time. (a) How long did it take the first stone to reach the ground? (b) How...

A stone is dropped from the roof of a building; 1.70 after that, a second stone is thrown straight down with an initial speed of 24.0 , and the two stones land at the same time.

Part A

How long did it take the first stone to reach the ground?

ANSWER: =

Part B

How high is the building?

ANSWER: =

Part C

What are the speeds of the two stones just before they hit the ground?

Enter your answers numerically separated by a comma.

ANSWER: , =

Problem 2.83

Description: You stand at the top of a cliff while your friend stands on the ground below you. You drop a ball from rest and see that it takes t for the ball to hit the ground below. Your friend then picks up the ball and throws it up to you, such that it just...

You stand at the top of a cliff while your friend stands on the ground below you. You drop a ball from rest and see that it takes 1.6 for the ball to hit the ground below. Your friend then picks up the ball and throws it up to you, such that it just comes to rest in your hand.

Part A

What is the speed with which your friend threw the ball?

Express your answer using two significant figures.

ANSWER: =

Score Summary:

Your score on this assignment is 0%.
You received 0 out of a possible total of 11 points.