Worksheet #5: Average Speed, Average Velocity, Instantaneous Speed and Instantaneous Velocity

1. Average Speed

For each of the following, calculate the average speed, distance, or time, as required.

a. The sun is located a distance of 1.49×10^{11} m from the Earth. Light travels at an average speed of 3.00×10^{8} m/s. How much time will elapse between the time a solar flare erupts from the surface of the sun and the time it is seen by an astronomer on Earth?

b. Viking I, the first spacecraft to land on Mars, travelled 7.00×10^{8} km in 7272 h. Calculate its average speed.

c. How far will a man travel in 15 min. driving his car down the highway at an average speed of 24 m/s?

d. Calculate the average speed of each of the following runners:

Ben Johnson	9.83 s	100 m
L. Edward Evans	43.86 s	400 m
Sebastian Coe	101.73 s	800 m

2. Average Velocity

For each of the following, calculate the average velocity, displacement, or time, as required.

A. A marathon runner in training runs 22 km [N], and then 32 km [S]. Assuming the entire run takes 4.2 h, answer the following questions:
   (I) What is the total displacement for the run?
   (II) What is her average velocity?

B. A rocket travels at an average velocity of 360 m/s [N] for 6.0 s. What is the rocket's resultant displacement?

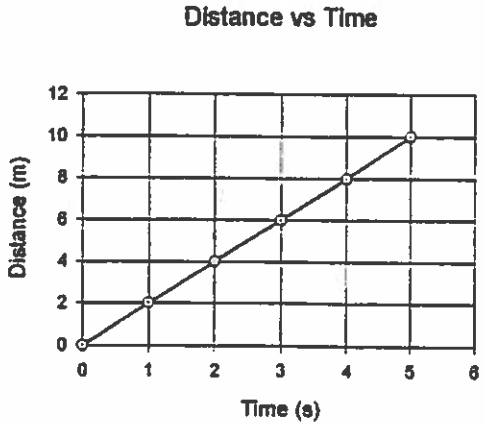
C. How long will it take a firecracker to travel 950 m [NE] at an average velocity of 19 m/s [NE]?

D. What is the average velocity of a snail that crawls 15.0 cm [W] in 11.2 s? Express your answer in m/s

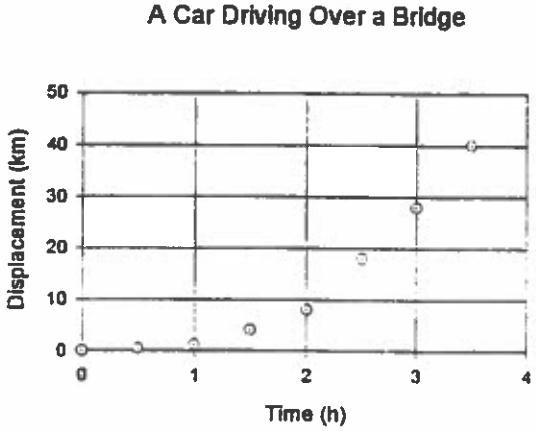
3. Instantaneous Speed and Instantaneous Velocity

For each of the following graph, determine the instantaneous speed or instantaneous velocity at the given points, as required.

a. What is the object's speed at 3.0 s?
What is the object's speed at 4.5 s?



b. What is the car's velocity at 2.5 h?



c. What is the runner's velocity at 3s?
What is the runner's velocity at 5s?