

Motion Problems 1

1. A car is traveling along a long, straight road. Starting at a stop sign, the car speeds up with a constant acceleration of 4 m/s^2 for 6 seconds. It then maintains that speed for 450 m before it comes to a stop over the final 8 seconds.

- a. Draw a motion diagram for the given motion.

- b. Setting the stop sign as zero position, what is the car's position at the end of the first 6 seconds?

- c. How long (time) did the car maintain a constant velocity?

- d. What was the car's final position at the end of the motion?

2. Superman slams head-on into a runaway train that is speeding along at 60 km/h . He brings it smoothly to rest in $1/10 \text{ s}$.

- a. What is the train's average acceleration (assume it is constant)?

- b. If Lois Lane was tied to the tracks only 1 m from the point where Superman hits the train, how far away is the train when it comes to a stop?

3. The drivers of two cars in a demolition derby are facing each other at rest 100 meters apart. They begin to accelerate at 2.5 m/s^2 at the same time.

- a. How long before they collide?

- b. What is the velocity of each car when they collide?

4. A rocket-launcher contains several solid-propellant missiles that are fired horizontally at 1-second intervals. Each rocket has an initial velocity of 60 m/s and a constant acceleration of 20 m/s^2 .

- a. What is the horizontal separation of the rockets as the second rocket is launched?

- b. What is the horizontal separation of the first two rockets when the third rocket is launched?