

W1.11B

Physics 1

Linear Motion Problems

- 1) A marble is shot vertically upwards at 45 m/s. How high is it above the ground after 6.6 seconds? How long is marble in the air?
- 2) A ball is thrown straight downward from a height of 450 m with an initial velocity of -20 m/s. How long does it take to hit the ground? What is the speed of the ball the instant before it hits the ground?
- 3) A rock is thrown downward off of a tall building. The initial speed of the ball is -15 m/s. If the ball hits the ground in 6 seconds, how high is the building?
- 4) A ball is thrown vertically upwards with an initial velocity of $+20$ m/s and attains a final downward velocity of -40 m/s.
 - a) How much time does it spend in the air?
 - b) What was its maximum height above its initial starting point?
 - c) Where is it, relative to its starting position, when it attains its final velocity?
- 5) A 60 meter race is run between a person who accelerates at 0.5 m/s^2 until he reaches a speed of 6 m/s and another who accelerates at 1 m/s^2 until reaching a speed of 4 m/s.
 - a) Who wins the race AND by how much time?
 - b) How far from the finish line was the loser when the winner crossed it?
- 6) A truck starts from rest and accelerates to 15 m/s in a distance of 75 m. It continues at a constant speed for 10 seconds and accelerates once again at 1 m/s^2 until it reaches a speed of 25 m/s.
 - a) How long did the entire trip take?
 - b) How much distance was covered during the entire trip?
 - c) Draw a velocity vs. time graph for the entire trip.
- 7) A driver in a car sees a traffic light turn red 360 meters ahead while traveling at 30 m/s. She continues to travel at this velocity for some time and then brakes with a constant acceleration till coming to a stop 17 seconds after initially seeing the light turn red. How long after seeing the light turn red did she take until applying the brakes?

ANSWERS:

1. 79.2 m; 9 sec
2. 7.7 sec; -96.95 m/s
3. 270 meters
4.
 - a. 6 sec
 - b. 20 m
 - c. -60 m (60 meters below the starting point)
5.
 - a. Person A wins by 1 second
 - b. Person B is 4 meters from the finish line when Person A wins
6.
 - a. 1st leg: 10 sec; 2nd leg: 10 sec; 3rd leg: 10 sec; total: 30 seconds
 - b. 1st leg: 75 m; 2nd leg: 150 m; 3rd leg: 200 m; total: 425 m
 - c. I don't suspect you had any problem with the v vs. t!
7. 7 seconds