Worksheet 2.8 – Projectiles in 1D

1) A baseball pitcher makes a big mistake and throws the ball straight up. If it reaches a maximum height of 15 m find...

a) the initial velocity he threw it up with. ( 17 m/s )

b) the total time the ball spent in the air. ( 3.5 s )

c) the ball’s average velocity on the way up to the top. ( 8.6 m/s )

d) the ball’s velocities when its displacement was equal to 8.0 m. ( ± 12 m/s )

e) the times when the ball was 8.0 m above the ground. (0.55 s, 2.9 s )

2) A ball bearing rolls down a very long slope, starting from rest. After 3.0 s the ball has traveled 3.0 m. The ball continues on down the slope. Determine…

a) the ball’s acceleration. (0.67 m/s2 downslope)

b) the velocity of the ball after 6.0 s. (4.0 m/s downslope)

c) the ball’s displacement after 4.0 s. (5.3 m downslope)

3) A blue basketball (or let’s say Papa Smurf) is thrown down at 20.0 m/s off of a 100. m cliff. Find…

a) the velocity at which the he hits the ground. ( -48.6 m/s )

b) the time between throw and impact.. ( 2.9l s )

c) his displacement when it is traveling at –34.7 m/s. ( - 41.0 m )

4) A rifle bullet travels the length of a gun barrel 0.75 m in 0.0050 s when the gun is fired and the expanding hot gases from the explosion push it down the tube. Find…

a) the bullet’s acceleration in the gun barrel. ( 6.0 x 104 m/s2 )

b) the velocity at which the bullet leaves the barrel. ( 3.0 x 102 m/s )

5) A stone is dropped off of a cliff. 2.0 s later a second stone is dropped off of the same cliff. How far apart are they when the first stone reaches a velocity of – 40 m/s? ( 60 m )

6) A helicopter is ascending vertically with a velocity of 8.0 m/s at a height of 120 m when a package is dropped out of the door. How much time passes before the package hits the ground? ( 5.8 s )

7) The Jolly Green Giant throws his mountain bike upwards at 15 m/s on the edge of a 40.0 m cliff.

a) How high above him does the bike fly? (1l m)

b) When does the bike pass him on the way down? (3.1 s)

c) At what velocity does it smite terra firma? (-32 m/s)

d) How much time passes between hurl and destruction? (4.8 s)

8) Superman tosses a 10 storey building upwards at 20.0 m/s (has he turned evil?) on the edge of a 300. m cliff. Determine…

a) when (two times) the building’s displacement is equal to 10 m. ( 0.58 s, 3.5 s )

b) when the building’s displacement is equal to –50. m. ( 5.8 s )

c) when the unfortunate tower hits the ground below. ( 10 s )

d) at what speed the building meets the ground. ( 79 m/s )

9) The newly revamped Physicsmobile is going 200.0 kmh when it blows by a Chemwagon going 100.0 kmh. The Chemwagon accelerates immediately after being passed reaching 220 km/h in 10.0 s. It then maintains this velocity. The innocent Physicsmobile continues on at 200 km/h, unaware of the madman approaching...

a) How far apart are the cars when the Chemwagon reaches 220 kmh? (111 m)

b) How long does it take the Chemwagon to catch the Physicsmobile, from the moment the Chemwagon is passed? (30. s)

c) Draw v vs t lines for both cars on the same graph.