Name:_____ Period:___

Practice with Constant Acceleration

Problem 1

A bullet fired from a .357 magnum pistol has a speed of 410 m/s just as it leaves the barrel (this is called "muzzle velocity"). If the barrel is 11 cm long, find

a. the rate of acceleration of the bullet (760,000m/s^2).
b. the time it takes to move through the barrel (0.00054 s).

a) $2a \cdot .11 = 410^2$

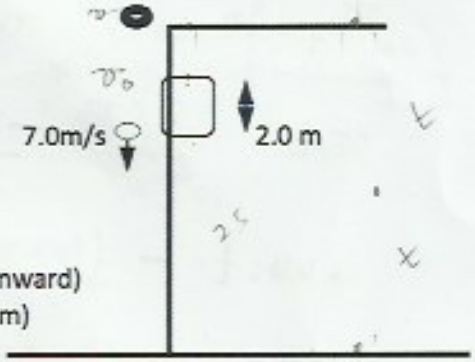
$a = \frac{410^2}{0.22}$ $a = 764090\ m/s^2$

b) $410 = 760{,}000 \cdot t$

$t \approx 0.00054 s$

Problem 2

A ball is dropped from the top of a building. Near the top of the building there is a window that is 2.0 meters tall. It takes 0.4 s for the ball to traverse the 2.0 meter height of the window and the speed of the ball at the bottom of the window is 7.0 m/s. Assume no air resistance acts on the ball.



a. What is the ball's velocity at the top edge of the window? (3.1 m/s, downward)
b. From how high above the top of the window was the ball dropped? (0.48 m)
c. If it hits the ground after two more seconds, what is the ball's displacement from the window bottom to the ground? (34 m downward))
d. If a second ball thrown upward from the ground with a speed of 14 m/s at the same moment the first ball is dropped, where do the two meet? (33 m from top)

a) $v = v_0 + at$

$7 = v + 0.4 \cdot 9.8$

$v = 7 - 0.4 \cdot 9.8$

$v = 3.08\ m/s$

b) $2(9.8)\Delta z = 3.08^2$

$\Delta z = \frac{3.08^2}{2 \cdot 9.8}$

$\Delta z = 0.484\ m$

c) $\Delta z = 7 \cdot 2 + \frac{1}{2} 9.8 \cdot 2^2$

$\Delta z = 33.6$

d) $\frac{1}{2}at^2 + (-14)t + \frac{1}{2}at^2 = 36$

$-14t = 36.48$

$t = 2.61\ s$

$\Delta z = \frac{1}{2}(9.8)\,2.61^2$

$\Delta z = 33.37$