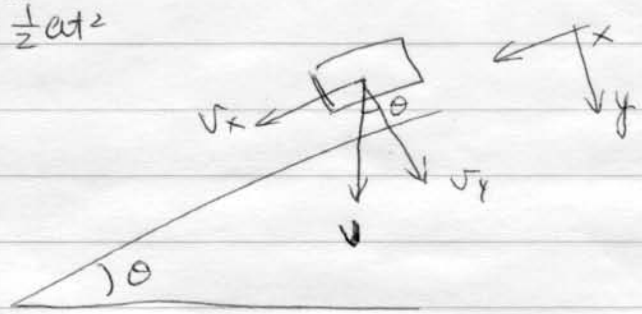
2. Before it hits the slope, the block drops freely

$$\begin{cases} v = at \\ a = g \\ h = \frac{1}{2}at^2 \end{cases} \Rightarrow v = \sqrt{2gh} = \sqrt{2\times 9.8\times 0.84} \doteq 4.06\ m/s$$



$$\begin{cases} v_x = v\sin\theta = \sqrt{2gh}\sin\theta \\ v_y = v\cos\theta = \sqrt{2gh}\cos\theta \end{cases}$$

So, right after it hits the slope, it moves in the x direction with original velocity $v_x = \sqrt{2gh}\sin\theta \doteq 1.39\ m/s$

3. Chap 7. 14   4. Chap 7. 38

3. During a period of time Δt, there are $A\Delta t$ ($A = 100$ bullets/min) bullets with momentum $P_1 = mA\Delta t v$ bounced back with $P_2 = -mA\Delta t v$.
So

$$|P_2 - P_1| = |F\Delta t| \Rightarrow 2mAv\Delta t = F\Delta t \Rightarrow F = 2mAv = 5\ N$$

4. The combined system has total momentum $P = (W+w)v_1$
If the man runs with a velocity v^{rel} relative to the car, then the car's velocity V_c satisfies

$$\begin{cases} WV_c + wV_m = P = (W+w)v_1 \\ -v^{rel} = v_m - v_c \end{cases} \Rightarrow V_c = \frac{(W+w)V_1 + wV^{rel}}{w+W}$$

v_m is the man's velocity relative to the

↑ minus sign comes from the fact that he runs to the left