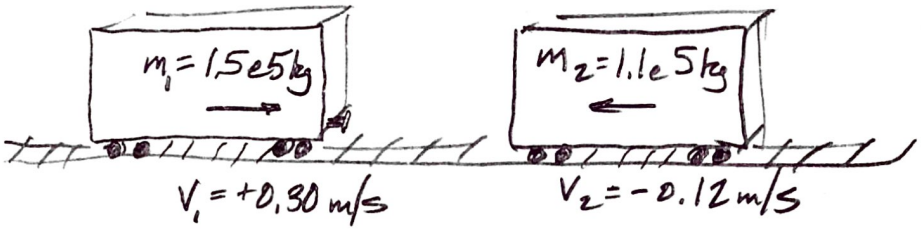
9.35



$V_{Final} = ?$ after latching?

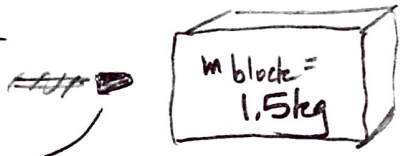
Perfectly inelastic collision:

$$m_1 V_1 + m_2 V_2 = (m_1 + m_2) V'$$

$$(1.5e5)(0.3) + (1.1e5)(-0.12) = (1.5e5 + 1.1e5) V'$$

$$V' = \boxed{+0.122\ m/s} \rightarrow$$

9.37



bullet embeds in block, so perfectly inelastic collision.

$m_{bullet} = 0.200\,kg$
$V_{bull} = 400\,m/s$

a) V' immediately after collision = ?

$m_{bull} V_{bull} + m_{block} V_{block} = (m_{bull} + m_{block}) V_{block\&bull}$

$(0.2)(400) + 0 = (0.2+1.5) V'$

$V' = \boxed{47.1\ m/s} \rightarrow$

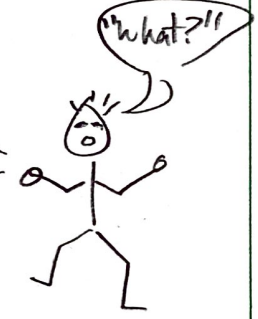
b) Impulse by block on the bullet?

Impulse $J = \int F\,dt$, but that's just ΔP, so

ΔP_{bullet}? $P_f - P_i = m(V_f - V_i)$

$= (0.200)(47.1 - 400)$

$= \boxed{-70.6\ kg\,m/s}$



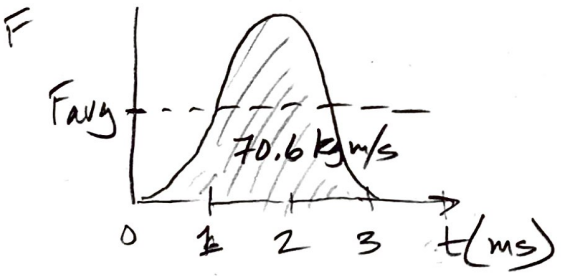
c) Impulse from bullet on block?

$= \Delta P$ of block

$= m(V_f - V_i) = 1.5(47.1 - 0)$

$= \boxed{70.6\ kg\,m/s}$

d) If bullet changed speed over $3.0\,ms = 3e{-}3\,s$, what was average Force?

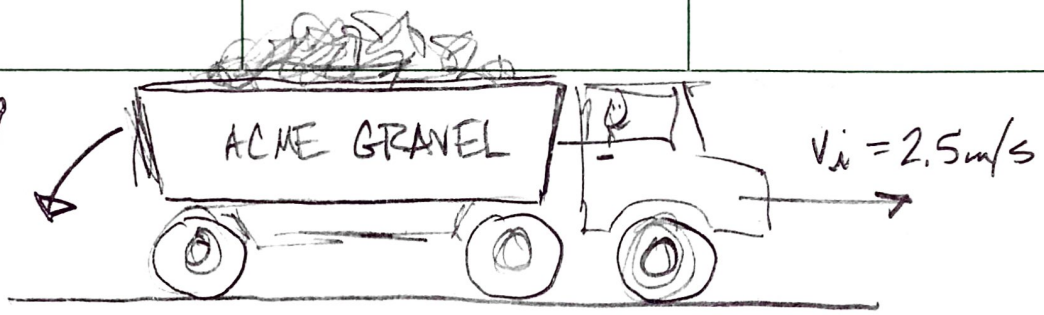


$J = F \cdot t$

$70.6\ kg\frac{m}{s} = F_{avg}(3e{-}3\,s)$

$F_{avg} = \boxed{2.36e4\,N}$

9.39



$m_{truck} = 5000 kg$

$m_{gravel} = 1000 kg$

Initially, truck & gravel moving together

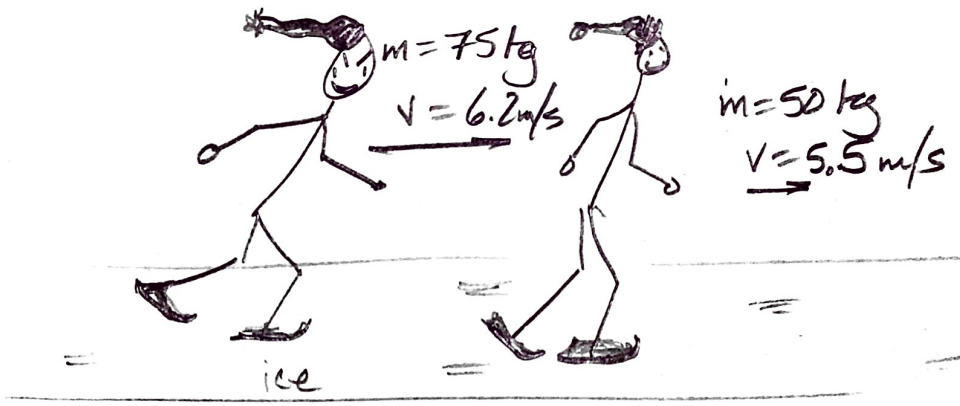
$$(m_{truck} + m_{gravel}) V_i = m_{truck} V_{truck} + m_{gravel} V_{gravel}$$

$$(5000 + 1000)\ 2.5 m/s = 5000\ V_{truck} + (1000)(0)$$

$$15000 = 5000\ V_{truck} + 0$$

$$V_{truck} = \boxed{3.0 m/s}$$

9.41



inelastic collision, so

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v'$$

$$(75)(6.2) + (50)(5.5) = (75+50) v'$$

$$v' = \boxed{5.92 \text{ m/s}}$$