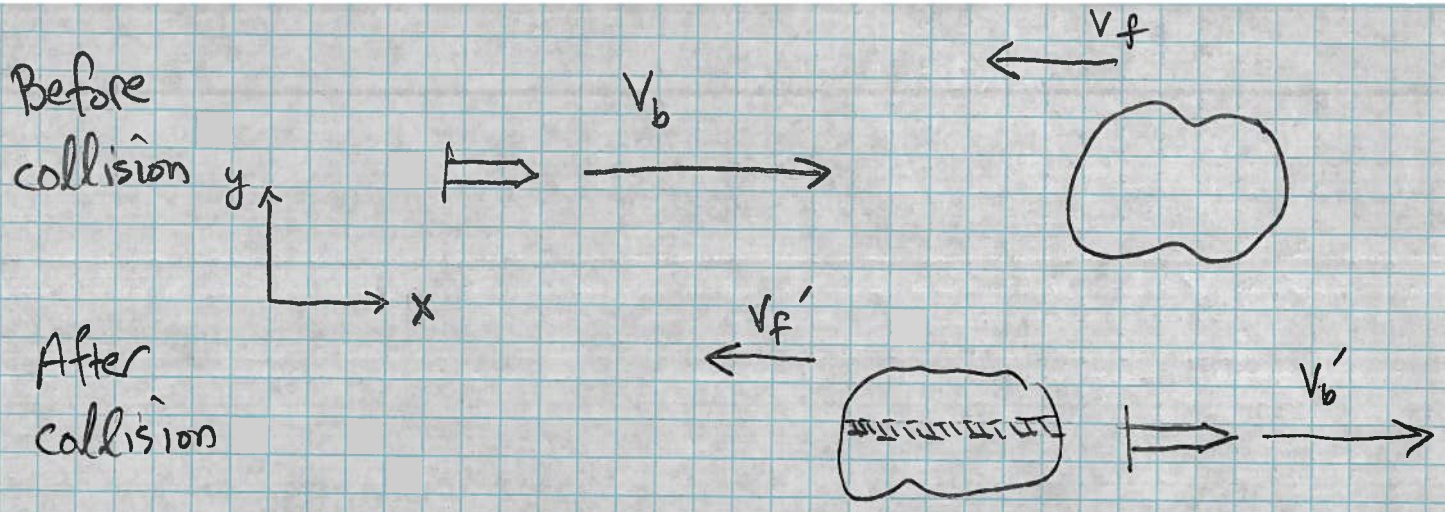

COBRA agent 59 throws a durian fruit of mass $M = 0.5\,kg$ at GI Joe with initial velocity $V_f = -25\ m/s\ \hat{\imath}$. Joe fires a bullet of mass $m = 4\,g$ at velocity $\vec{V}_b = 940\ m/s\ \hat{\imath}$. The bullet passes through the fruit, exiting with a new velocity $\vec{V}_b' = 600\ \frac{m}{s}\ \hat{\imath}$.

What is the new velocity of the durian, after the collision?

Use momentum:

$$M\vec{V}_b + m\vec{V}_f = M\vec{V}_b' + m\vec{V}_f'$$

$$(0.004\,kg)(940\ \tfrac{m}{s}) + (0.5\,kg)(-25\ m/s) = (0.004\,kg)(600\ \tfrac{m}{s}) + (0.5\,kg)\,V_f'$$

$$(3.76 - 12.5)\ kg\cdot m/s = (2.4 + 0.5\,v_f')\ kg\cdot m/s$$

$$-8.74\ kg\cdot m/s = 2.4\ kg\cdot m/s + 0.5\,V_f'\ \tfrac{kg\cdot m}{s}$$

$$-11.14\ kg\cdot m/s = 0.5\,kg\cdot V_f'$$

$$V_f = -22.28\ m/s\ \hat{\imath}$$

So fruit is still coming at Joe, at speed $2.72\ \frac{m}{s}$ slower than initial speed.

If each bullet Joe fires slows the fruit by the same amount, $\Delta v_f = 2.72$ m/s, then it will take roughly

$$N = \frac{25 \text{ m/s}}{2.72 \text{ m/s/bullet}} \simeq 9 \text{ bullets}$$

Actually, it requires 10 bullets to stop the durian completely.

Does Joe have time to fire 10 bullets? At the initial speed, the durian would take a short time to travel the $D = 40$ m between agent 59 and our hero.

$$t \sim \frac{40 \text{ m}}{25 \text{ m/s}} \sim 1.6 \text{ s}$$

Each bullet slows the fruit, so maybe Joe has 2.5-3 seconds to fire 10 bullets. The M16 rifle can fire only about 1 round/sec in semi-automatic mode, but about 10 rounds/sec in automatic mode. Let's hope GI Joe can do that!

He's still in danger, even if the fruit stops, because the flesh of a durian fruit smells very bad — and Joe's bullets have scattered pulp all over the place.