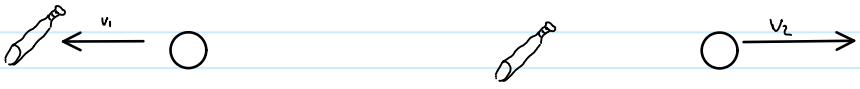
# 20-P-MOM-PT-006

December 31, 2020 3:18 AM

A baseball with a mass of 0.456 kg moves toward a bat at a speed of 34.5 m/s horizontally in the south direction. After the baseball is hit by the bat, it moves horizontally north at a speed of 78.9 . What was the impulse exerted by the bat on the ball?




$m_1v_1 + \int F\,dt = m_1v_2$

$m_1v_1 + I = m_1v_2$

$I = m_1v_2 - m_1v_1$

North is positive: $v_1 = -34.5\ m/s$ $v_2 = 78.9\ m/s$

$m = 0.456\ kg$

$I = 0.456(78.9 - -34.5)$

$\boxed{I = 51.7\ kg \cdot m/s}$

If the time of contact was 0.123s, what is the force exerted by the bat on the ball?

$t = 0.123$

$I = \int F\,dt = Ft$

$F = \frac{I}{t} = \frac{51.7}{0.123}$

$\boxed{F = 420.4\ N\ North}$