Name:	KEY
Lab Time:	
Date:	
Test Code:	
Problem #:	PROBLEM 22

General Problem Solving Guide

List given information, define variables, sketch picture:

$V_i = 40 m/s$ →

(3)

$M = 0.149 kg$

$\Delta t = 0.031$ second (to stop)

CATCHER'S MITT

$V_f = 0 m/s$

[1D Coordinate System] o⟶ + Direction

Simplify question, list target quantity:

(1/2) Find $F_{AVERAGE} = ?$ Force to stop the ball. Force you feel will be $-F_{AVG}$.

List all related quantitative relationships:

Use Impulse = Change in momentum

(2)

$\vec{F}\Delta t = \Delta\vec{p}$

$\vec{p} = m\vec{v}$

Assume constant force

Outline approach, sketch diagrams if needed (or sketch next to pictures above):

(1/2)

Find $\Delta\vec{p}$

Find $\vec{F}$ by dividing $\Delta\vec{p}$ by Δt

Check.

Obtain a general solution:

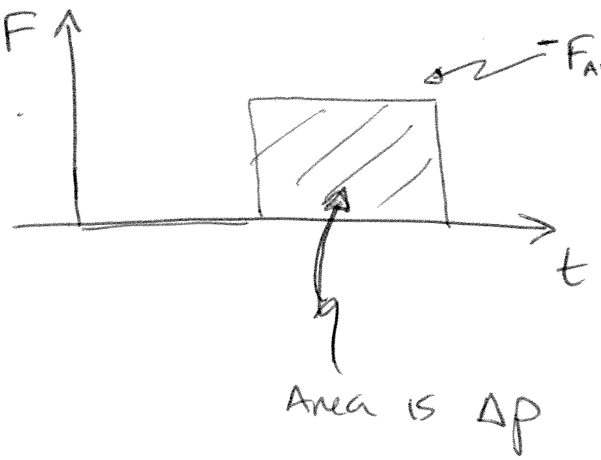
$\Delta\vec{p} = \vec{p}_f - \vec{p}_i$

$V_f = 0\ m/s$

$\Delta\vec{p} = -mv$

$\vec{F}_{AVG} = \frac{\Delta\vec{p}}{\Delta t} = \frac{-mv}{\Delta t}$

Assume Force is constant



A: $V_i = 40.0\ m/s$
$\Delta t = 0.031\ se$

B: $V_i = 44.0\ m/s$
$\Delta t = 0.037\ s$

C: $V_i = 33.0\ m/s$
$\Delta t = 0.025\ s$

Check Units:

(1) $N = \frac{kg\ m/s}{s} = \frac{kg\ m}{s^2}$ ✓

Check Limiting Cases:

(1)
$V\uparrow \quad F\uparrow$ ✓
$\Delta t\downarrow \quad F\uparrow$ ✓
$m\uparrow \quad F\uparrow$ ✓

Obtain a numeric solution:

(i.e. plug in the numbers)

(1)
A: $F_{AVG} = -192\ N$
B: $F_{AVG} = -177\ N$
C: $F_{AVG} = -197\ N$

Force you feel would be opposite (in + direction)

Why is solution reasonable? Explain.

units check

limiting cases check

(1) force is reasonable – you would feel this, but it wouldn't be too large and knock you over.

Direction is correct (against ball's direction of motion)