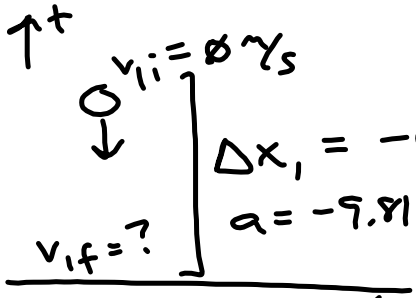
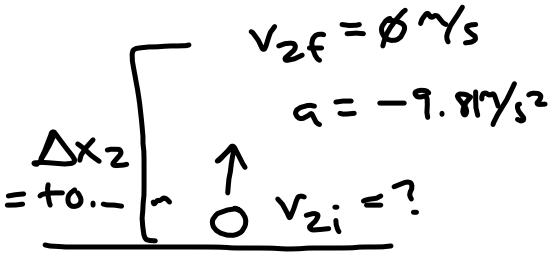
Tennis Ball Impulse Lab

- Two measurements:
  - Force Sensor (somewhere in the 25N – 45N range)
  - Motion sensor + calculations



$$v_f^2 = v_i^2 + 2a\Delta x_1$$

$$v_{1f} = -\sqrt{2a\Delta x_1}$$



$$v_{2f}^2 = v_{2i}^2 + 2a\Delta x_2$$

$$v_{2i} = +\sqrt{-2a\Delta x_2}$$

$$F = \frac{m\,\Delta v}{\Delta t} = \frac{m(v_{2i} - v_{1f})}{\Delta t}$$

↖ from motion detector/photogate

Conservation of Momentum

- If two objects intract, momentum can be conserved.
- Types of collisions:
  - Perfectly Elastic
    - → momentum conserved
    - → energy conserved
  - Inelastic
    - → momentum NOT conserved
    - → energy NOT conserved
  - Perfectly Inelastic
    - → momuntum conserved
    - → energy NOT conserved

- Collisions:
  - Hit-and-Bounce
  - Hit-and-Stick
  - Explosion

Is $\bar{p}$ conserved? Use mathematics to show if it is/is not

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H/B $\quad \bar{p}_{1i} + \bar{p}_{2i} = \bar{p}_{1f} + \bar{p}_{2f}$

H/S $\quad \bar{p}_{1i} + \bar{p}_{2i} = m_{Total}\,\bar{v}_f$

E $\quad m_{Total}\,\bar{v}_i = \bar{p}_{1f} + \bar{p}_{2f}$