Weight

$\vec{F_g} = m\vec{g}$

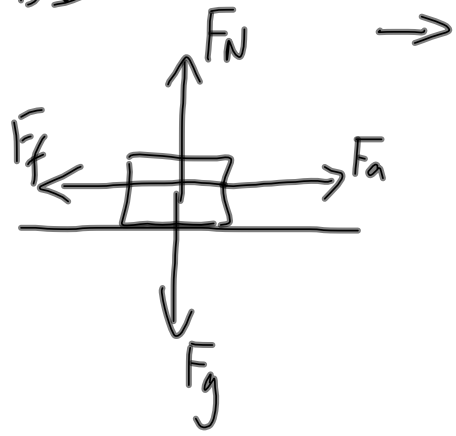
$\left(\vec{g} = 9.81 \text{ m/s}^2 \text{ [down]}\right)$

$\vec{g} = 9.81 \text{ N/kg [down]}$

(near Earth's surface)

Friction

FBD →



If everything is horizontal,

$F_N = F_g$

$F_f = \mu F_N$

If moving at a constant velocity,

$F_a = F_f$ (kinetic)

If you are just starting to move,

$F_a = F_f$ (static)

Newton's Second Law + Kinematics

Recall Newton's Second Law: $\vec{F}_{net} = m\vec{a}$

MP/165

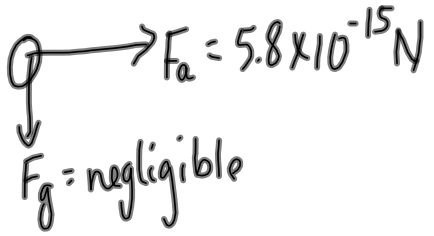
$m = 9.1 \times 10^{-31}\ kg$

$v_1 = 0$

$v_2 = ?$

$\Delta d = 3.5\ mm$

$F_a = 5.8 \times 10^{-15}\ N$



$\vec{F}_{net} = m\vec{a}$

$F_a = ma$

$a = \frac{F_a}{m}$

$a = \frac{5.8 \times 10^{-15}\ N}{9.1 \times 10^{-31}\ kg}$

$a = 6.3736 \times 10^{15}\ m/s^2$

$v_2^2 = v_1^2 + 2a\Delta d$

$v_2^2 = 0^2 + 2(6.3736 \times 10^{15}\ m/s^2)(0.0035\ m)$

$v_2 = 6.7 \times 10^6\ \frac{m}{s}$

MP|166

$\vec{F}_a = 9.50\ N\ [S]$

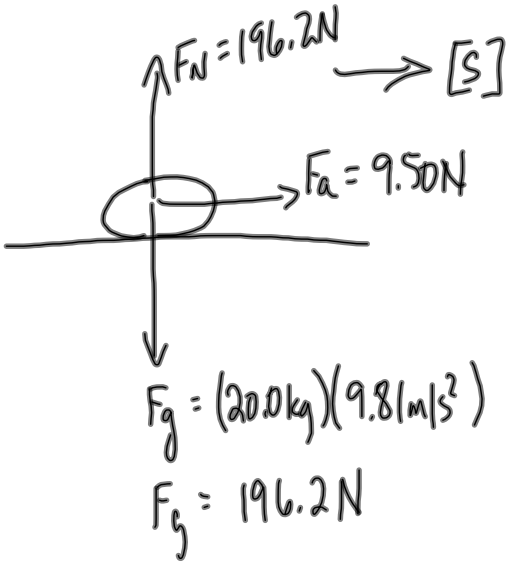
$V_1 = 0$

$\Delta t = 1.86 s$

$m = 20.0 kg$

a) $a = ?$

b) $V_2 = ?$



$\vec{F}_{net} = m\vec{a}$

$\vec{F}_a = m\vec{a}$

$\vec{a} = \frac{\vec{F}_a}{m}$

$\vec{a} = \frac{9.50N\ [S]}{20.0kg}$

$kg \cdot m/s^2$ / kg

$\vec{a} = 0.475\ m/s^2\ [S]$

b) $a = \frac{\Delta V}{\Delta t}$

$\Delta V = a\Delta t$

$V_2 - V_1 = a\Delta t$

$V_2 = \cancel{V_1}^{0} + a\Delta t$

$V_2 = (0.475\ m/s^2\ [S])(1.86 s)$

$V_2 = 0.884\ m/s\ [S]$

TO DO: PP|168