# Combining Dynamics + Kinematics

The link between a dynamics problem + kinematics problem is the acceleration.

Kinematics

Newton's Second Law:

$\vec{F}_{net} = m\vec{a}$ → $V_1, V_2, \Delta d, \Delta t, a$

Dynamics =>

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$V_1 = 0$

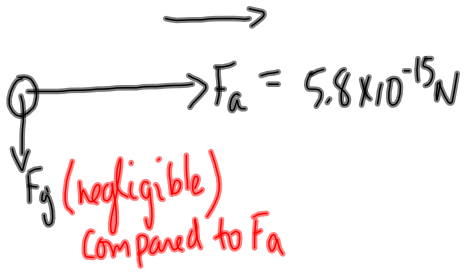
$V_2 = ?$ ← need to know acc

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

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

$\Delta d = 3.5\ mm$ $(3.5 \times 10^{-3}\ m)$

Draw a FBD:




$V_2^2 = \cancel{V_1^2}^{0} + 2a\Delta d$

$V_2^2 = 2a\Delta d$

$V_2^2 = 2\left(6.4 \times 10^{15} \frac{m}{s^2}\right)\left(3.5 \times 10^{-3} m\right)$

$V_2 = 6.7 \times 10^{6} \frac{m}{s}$

Using Newton's Second Law:

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

$F_a = ma$

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

$a = \frac{5.8 \times 10^{-15}\ \cancel{N}}{9.1 \times 10^{-31}\ \cancel{kg}}$ $\cancel{kg} \cdot m/s^2$

$a = 6.4 \times 10^{15} \frac{m}{s^2}$

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

$m = 20.0kg$

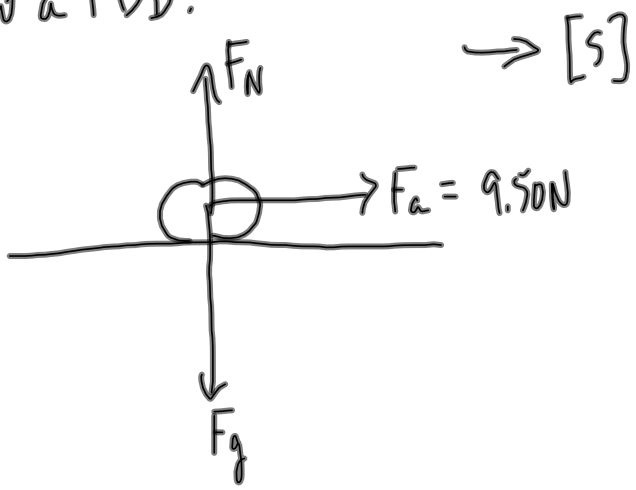
$V_1 = 0$

$\Delta t = 1.86s$

a) $a = ?$

b) $V_2 = ?$

Draw a FBD:




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

$F_a = ma$

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

$a = \frac{9.50\,N}{20.0kg}$

$a = 0.475\,m/s^2$

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

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

$\vec{a} = \frac{\vec{V}_2 - \vec{V}_1}{\Delta t}$ ($\vec{V}_1 = 0$)

$\vec{V}_2 = \vec{a}\,\Delta t$

$\vec{V}_2 = (0.475\frac{m}{s^2}[S])(1.86s)$

$\vec{V}_2 \doteq 0.884\frac{m}{s}[S]$

TO DO: PP|168