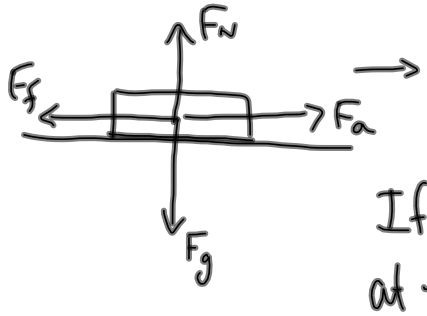
Weight & Friction

Weight => $F_g = mg$

Friction => $F_f = \mu F_N$ * FBD's are important!



If stationary, then $F_a = F_f$ at the instant the object starts to move

If moving,

If $F_a > F_f$, + acc

$F_a = F_f$, velocity constant

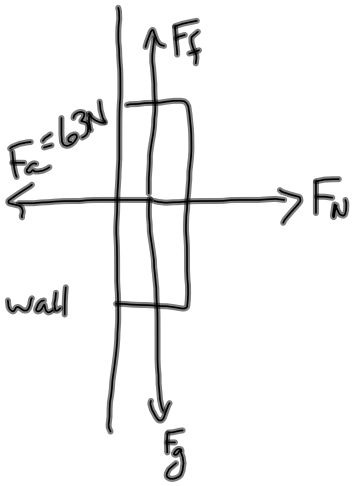
$F_a < F_f$, - acc

PP| 144

8. $\mu = ?$

$m = 2.2kg$

$F_a = 63N$



Horizontally

$F_N = F_a = 63N$

Vertically

$F_f = F_g$

$F_f = mg$

$F_f = (2.2kg)(9.8 m/s^2)$

$F_f = 21.582N$

$F_f = \mu F_N$

$\mu = \frac{F_f}{F_N}$

$\mu = \frac{21.582N}{63N}$

$\mu \doteq 0.34$

Thought Experiments (p153)

Exp	A	B	C	D
1			21	3
2			✓	~~24~~
3	~~10~~	~~2~~	~~5~~	~~17~~

Newton's Laws

Newton's First Law (Law of Inertia)

An object at rest (or in uniform motion) will remain at rest (or in uniform motion) unless acted on by an external force.

Newton's Second Law

Acceleration is directly related to the force acting on an object:

$$a \propto F$$

Acceleration is inversely related to the mass of the object:

$$a \propto \frac{1}{m}$$

Combining proportionalities:

$$a \propto \frac{F}{m}$$

$$F \propto ma$$

$$F = kma$$

Special "k" $= \frac{1\ N}{kg \cdot m/s^2}$

Newton's Second $\rightarrow \vec{F}_{net} = m\vec{a}$

Where $\vec{F}_{net}$ is the unbalanced or net force (N)

m is the mass (kg)

$\vec{a}$ is the acceleration (m/s^2)

MP|162

$m = 7.00 \times 10^2\ kg$

$T = 7.50 \times 10^3\ N$

$\vec{a} = ?$

up +

$T = 7.50 \times 10^3\ N$ (7500 N)

$F_g = (7.00 \times 10^2\ kg)(9.81\ m/s^2)$

$F_g = 6867\ N$

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

$T - F_g = ma$

$7500\ N - 6867\ N = (7.00 \times 10^2\ kg)a$

$633\ N = (7.00 \times 10^2\ kg)a$

$a = +0.90\ m/s^2$

$\vec{a} = 0.90\ m/s^2\ [up]$

elevator is going up and speeding up

OR

going down + slowing down

TODO

1. PP|163
2. Assignment