Weight + Friction

Weight (force of gravity)

$\vec{F_g} = m\vec{g}$ where $\vec{F_g}$ is the force of gravity (N)

m is the mass (kg)

$\vec{g}$ is the acceleration due to gravity (m/s^2)

$g = 9.81 m/s^2$

(near the Earth's surface)

units: $1N = 1 kg \cdot \frac{m}{s^2}$

PP|137

4. $m = 1.00 kg$

$\vec{F_g} = 3.25 \times 10^{-2} N$ [down]

$\vec{g} = ?$

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

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

$\vec{g} = \frac{3.25 \times 10^{-2} N \text{ [down]}}{1.00 kg}$

$\vec{g} = 3.25 \times 10^{-2} m/s^2$ [down]

$\frac{N}{kg} = \frac{kg \cdot m/s^2}{kg}$

$= m/s^2$

Friction

$$F_f = \mu F_N$$

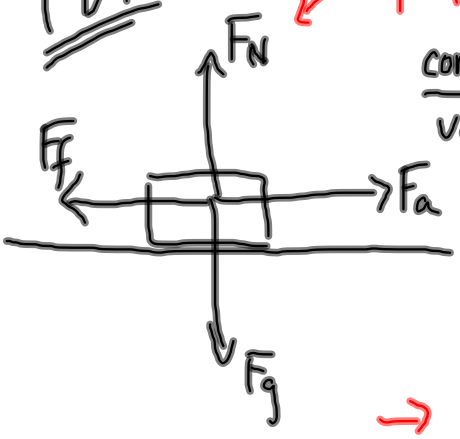
where F_f is the frictional force (N)

μ is the coefficient of friction

F_N is the normal force (N)

FBD

perpendicular to the surface



All the forces must be balanced if there is constant velocity.

$F_a = F_f$ and $F_N = F_g$

↑ ↑

the "sizes" or magnitude.

$\vec{F_a} = -\vec{F_f}$

$\vec{F_a} + \vec{F_f} = 0$

(vectors)

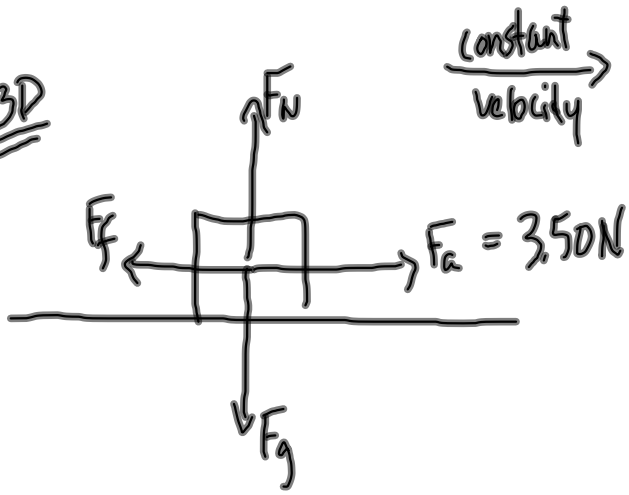
PP 14.4

5. constant velocity.

$m = 600\,g$

$F_a = 3.50\,N$

FBD



a) $F_N = ?$

b) $F_f = ?, \mu = ?$

c) μ_s or μ_k?

a) $F_N = F_g$

$F_N = mg$

$F_N = (0.600\,kg)(9.81\,m/s^2)$

$F_N = 5.886\,N$

$\boxed{F_N \doteq 5.89\,N}$

b) $F_f = F_a$

$\boxed{F_f = 3.50\,N}$

$F_f = \mu F_N$

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

$\mu = \dfrac{3.50\,N}{5.886\,N}$

$\boxed{\mu \doteq 0.595}$

c) μ_k (object is moving)

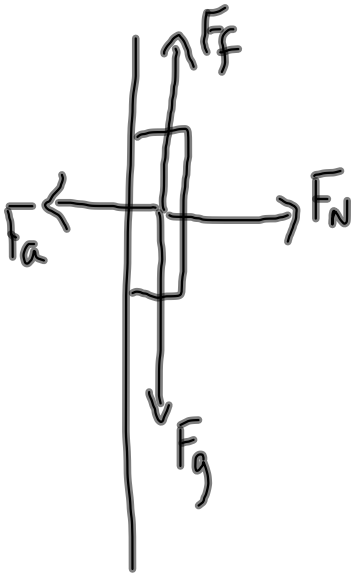
pp 144

8. $m = 2.2\,kg$

$F_a = 63\,N$

$\mu_s = ??$

$g = 9.81\,m/s^2$



If there is no motion and you are pushing just hard enough to prevent slipping:

$F_a = F_N$

$F_g = F_f$

$F_N = F_a$

$F_N = 63\,N$

$F_f = F_g$

$F_f = mg$

$F_f = (2.2\,kg)(9.81\,m/s^2)$

$F_f = 21.582\,N$

$F_f = \mu F_N$

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

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

$\mu = 0.34$

Assignment: (due Thurs)

p 151 | 26-35