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 Earth's surface)

$1N = 1 kg \cdot m/s^2$

Friction

$F_f = \mu F_N$ where F_f is the frictional force (N)

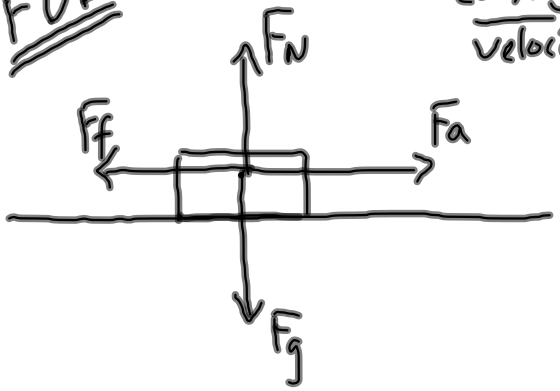
F_N is the normal force (N)

μ is the coefficient of friction

(* depends on surfaces - determined experimentally)

Consider an object being pulled along at constant velocity:

FBD



constant velocity $\Rightarrow$ all forces balanced.

$F_a = F_f$ $(\vec{F}_a = -\vec{F}_f)$

$F_N = F_g$ $(\vec{F}_N = -\vec{F}_g)$

magnitude/sig

vectors

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6. $m = 125\,kg$

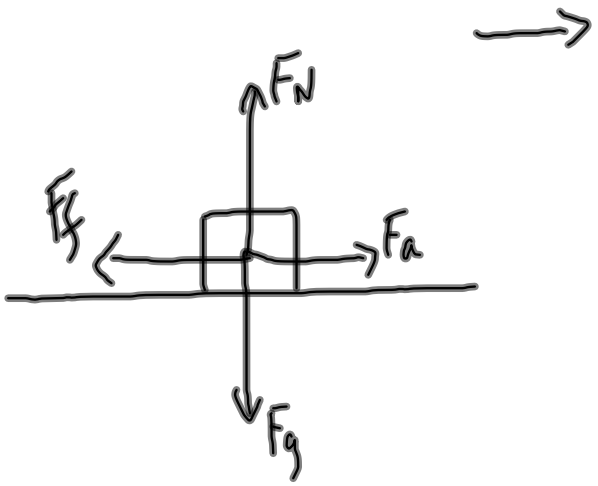
$g = 9.81\,m/s^2$

$\mu_s = 0.430$

a) $F_N = ?$

b) $F_a = ??$

c) $F_a = ??$ (if $\frac{1}{2}$ mass)



a) $F_N = F_g$

$F_N = mg$

$F_N = (125\,kg)(9.81\,m/s^2)$

$F_N = 1226.25\,N$

$F_N \doteq 1.23 \times 10^3\,N$

b) $F_a = F_f$ (at the instant the crate begins to move)

$F_a = \mu F_N$

$F_a = (0.430)(1226.25\,N)$

$F_a \doteq 527\,N$

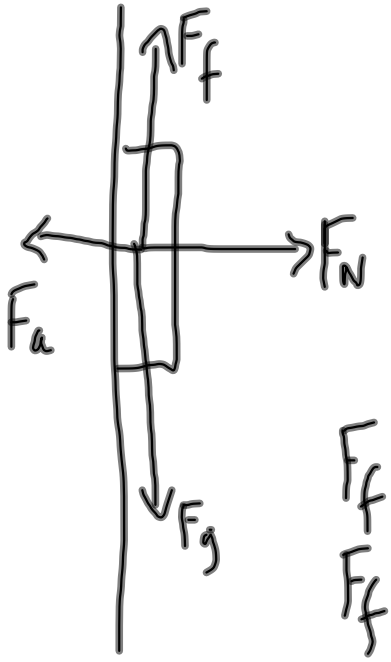
8.

$m = 2.2\,kg$

$F_a = 63\,N$

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

$\mu_s = ?$



$F_f = F_g$

$F_a = F_N$

$F_f = F_g$

$F_f = mg$

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

$F_f = 21.582\,N$

$F_f = \mu F_N$

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

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

$\mu \doteq 0.34$

$F_N = F_a$

$F_N = 63\,N$

Assignment (due Thurs)

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