Weight

Force of Gravity => $\vec{F_g} = m\vec{g}$

where F_g is the weight or force of gravity (N)

m is the mass (kg)

g is the acceleration due to gravity (m/s^2)

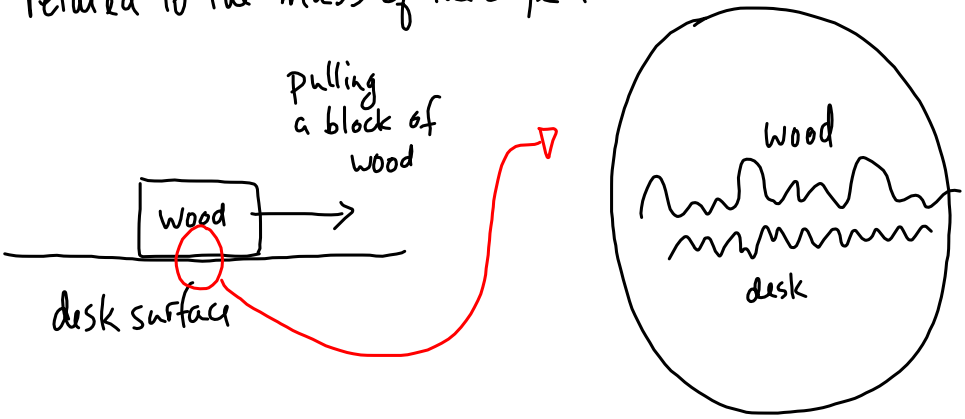
$9.81 m/s^2$ near the Earth's surface.

Friction

Two types: Static Friction -> the frictional force that must be overcome in order to start an object moving.

Kinetic friction -> the frictional force experienced during motion.

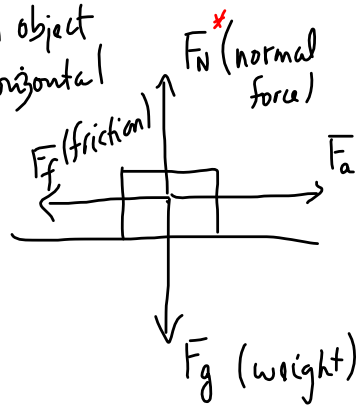
Friction depends on the nature of the surfaces that are in contact with one another. The frictional force is also related to the mass of the object.



Free-Body Diagram (FBD)

Shows all the forces acting on an object.

Pulling an object along a horizontal surface with horizontal force.



* F_N is ALWAYS perpendicular to the surface

$$F_f = \mu F_N$$

where F_f is the frictional force (N)

μ is the coefficient of friction (depends on the surfaces)

F_N is the normal force (N)

IF the surface is horizontal AND F_a is horizontal, $F_N = F_g$

Kinetic

If $F_a > F_f$, then there is + acceleration

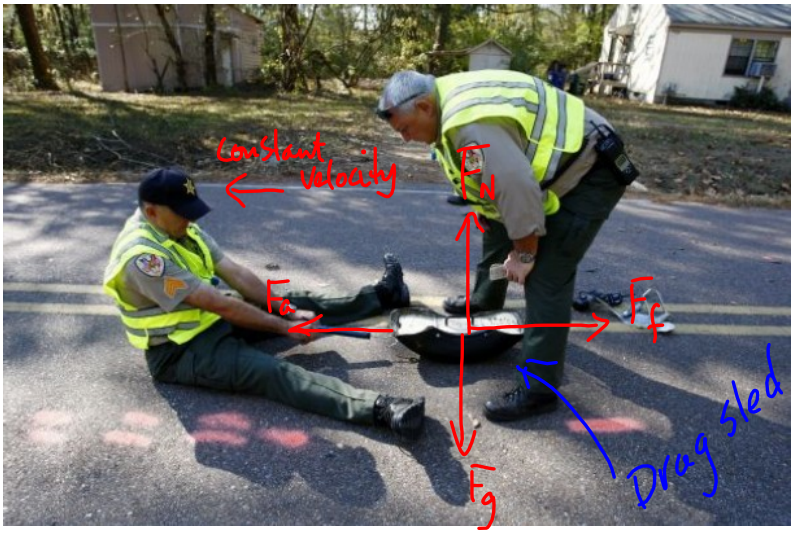
$F_a = F_f$, then there is no acceleration (constant velocity)

$F_a < F_f$, then there is − acceleration.

Static

If $F_a \geq F_f$ then the object just starts to move.

$F_a < F_f$ then the object does not move.



At constant velocity

$F_a = F_f$

If everything is horizontal:

$F_N = F_g$

A value for μ (coefficient of friction) can be found

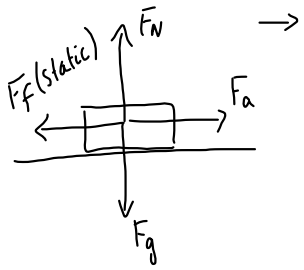
MP|141

$m = 2.00 \times 10^2\ kg$

$\mu_s = 0.70$

(rubber on wet concrete)

$F_f = ??$



$F_f = \mu F_N \quad (F_N = F_g)$

$F_f = \mu F_g \quad (F_g = mg)$

$F_f = \mu mg$

$F_f = (0.70)(2.00 \times 10^2\ kg)(9.81 m/s^2)$

$F_f = 1.4 \times 10^3\ N$

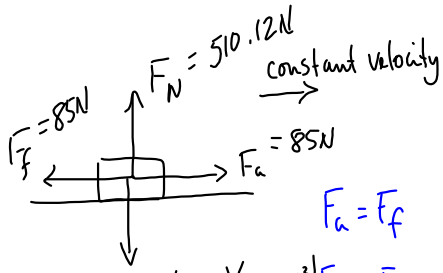
The added mass will result in an increased static frictional force of $1.4 \times 10^3\ N$

MP|143

$F_a = 85N$

$m = 52kg$

$\mu_k = ?$



$F_f = \mu F_N$

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

$\mu = \frac{85N}{510.12N}$

$\mu = 0.17$

TO DO: PP|144