Friction

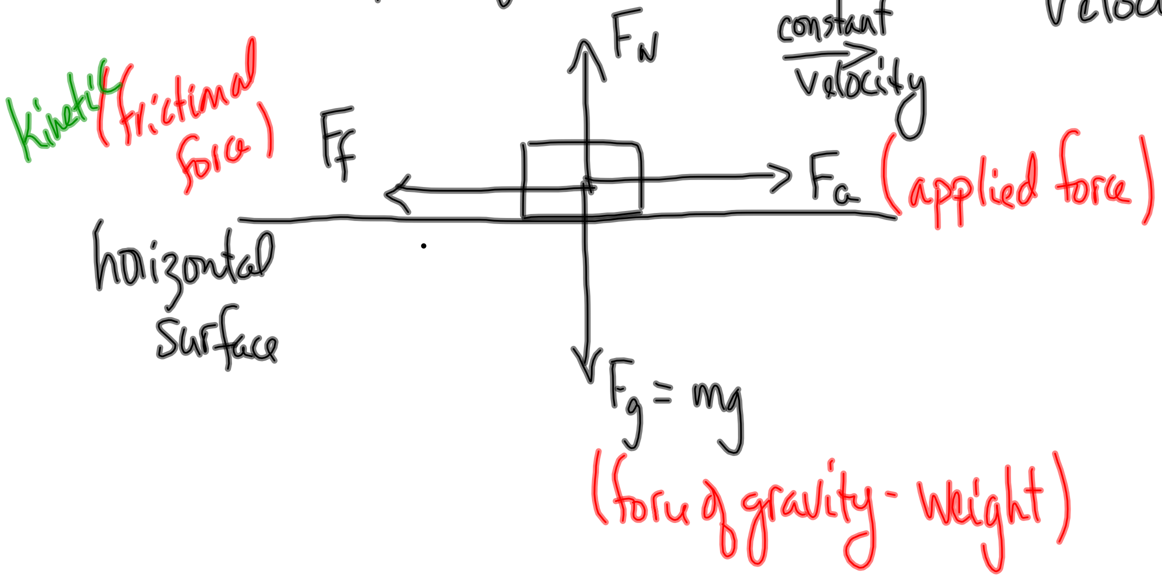
static - the frictional force when the object is not moving

Kinetic - the frictional force when the object is moving

$$F_f = \mu F_N$$

Draw a FBD (Free Body Diagram):

Consider pulling an object along at a constant velocity:



If the surface is horizontal and F_a is horizontal, then $F_N = F_g$.

If there is constant velocity, then $F_a = F_f$

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

If $F_a < F_f$ then there is - acceleration

Thought Experiments (p153)

	A	B	C	D
1		3	11	2
2		1	③	14
3	~~4~~	~~4~~	~~8~~	⑦

Come back to this → 1

← $F_g + F_{air}$

inertia. + F_g

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

Newton said that acceleration depends on the mass of the object and the force acting on the object.

$$\left.\begin{array}{l} a \propto F \\ a \propto \frac{1}{m} \end{array}\right\} \quad a \propto \frac{F}{m}$$

$$F \propto ma$$

"Special k"

$$F = \boxed{k}ma$$

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

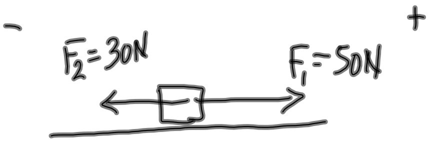
k just converts the unit

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

Newton's Second Law

where F_{net} is the unbalanced force (N)
m is the mass (kg)
a is the acceleration (m/s^2)

Consider these FBDs:

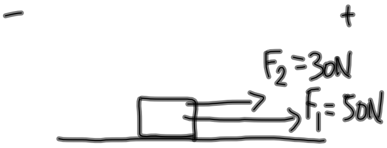


$F_{net} = F_1 - F_2$

$F_{net} = 50N - 30N$

$F_{net} = 20N$

$\boxed{\vec{F}_{net} = 20N\ [R]}$

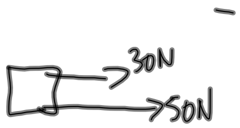


$F_{net} = F_1 + F_2$

$F_{net} = 50N + 30N$

$F_{net} = 80N$

$\vec{F}_{net} = 80N\ [R]$



$F_{net} = -50_N + (-30N$

$= \circled{-}80N$

right

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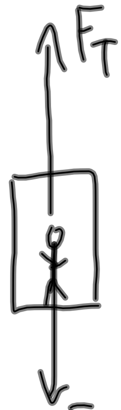
+

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



$m = 7.00 \times 10^2 kg$

$F_T = 7.50 \times 10^3 N$

$a = ?$

$F_g = mg$

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

$F_g = 6867 N$

up +

DOWN -

\-

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

$F_T - F_g = ma$

$7.50 \times 10^3 N - 6867 N = (7.00 \times 10^2 kg) a$

$F_{net} \rightarrow \boxed{633 N} = (7.00 \times 10^2 kg) a$

$a = \frac{633 N}{7.00 \times 10^2 kg}$ $\frac{\cancel{kg}\, \boxed{m/s^2}}{\cancel{kg}}$

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$\boxed{a \doteq 0.90 m/s^2}$

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

going up + speeding up

going down + slowing down.