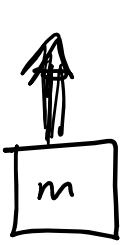
Thurs Feb 22, 2024

Physics 11 - Dynamics Notes – Chapters 2 and 3

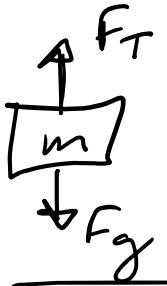
Force of tension

- "elevator problems"
or - crate lifted by a rope

sketch



fbd



$$\Sigma F = \boxed{m\vec{a} = F_T - F_g}$$

eg. $F_g = 12N$

$F_T = 15N$

$m = 1,22kg$

$$\vec{a} = \frac{F_T - F_g}{m} = \frac{(15-12)N}{1.22kg}$$

$$\vec{a} = 2.46 N/kg$$

$$\boxed{\vec{a} = 2.46 m/s^2}$$

---

or if $\vec{a} = 0$ (box at rest or const. speed)

$$m\vec{a} = F_T - F_g$$

$$\boxed{F_T = F_g = 12N}$$

or if $\vec{a} = 1.00\,m/s^2$ [down]

$\vec{a} = -1.00\,m/s^2$

$F_T = ?$

$m\vec{a} = F_T - F_g$

$F_T = ma + F_g = (1.22kg)(-1m/s^2) + 12N$

$F_T = 10.78\,N$

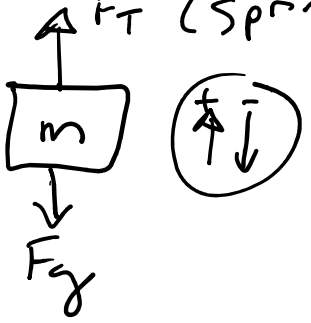
$\boxed{F_T = 10.8N}$

Force of gravity (aka = weight)

near Earth $\boxed{F_g = mg}$

g = gravitational field strength

lab:

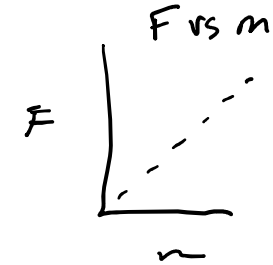


$\vec{a} = 0$

$\therefore \Sigma F = \boxed{m\vec{a} = F_T - F_g}$

$\therefore F_T = F_g$

(spring scale)



$\Sigma\vec{F} = m\vec{a}$

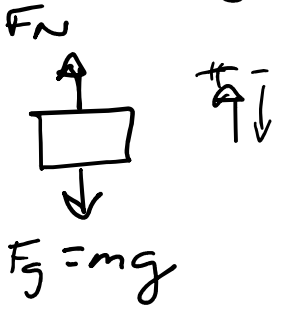
$(N) = (kg)(m/s^2)$

$g = \text{slope} = \frac{F}{m} = 9.8N/kg$

$$g = 9.8\frac{N}{kg} = 9.8\frac{\cancel{kg}\cdot m/s^2}{\cancel{kg}} = 9.8\ m/s^2$$

Mass = amount of matter in an object

- gravitational mass



$$\sum \vec{F} = m\vec{a} = F_N - mg$$

if $\vec{a} = 0$ then $0 = F_N - mg$

$\therefore F_N = mg$

Scale reading (apparent weight)

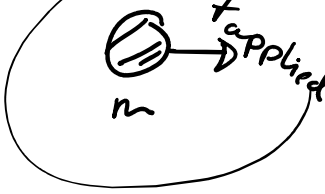
$$m = \frac{F_N}{g} = \frac{F_N}{9.8\ N/kg}$$

---

inertial mass

$$\sum \vec{F} = m\vec{a}$$

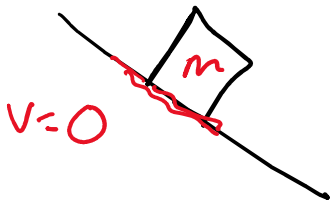
$$m = \frac{F_{applied}}{\vec{a}}$$



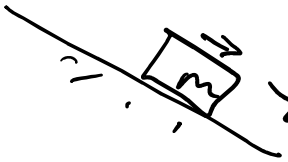
$\therefore F_N = 0$?

$\therefore$?? mass ??

Frictional force: force between surfaces of 2 objects



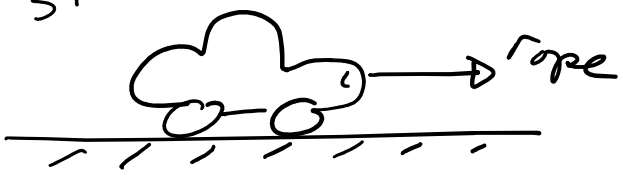
if the objects are stationary relative to each other friction is static



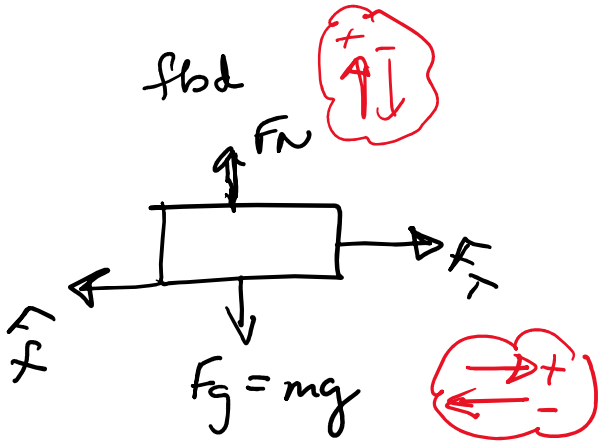
if the object is sliding across the surface friction is kinetic

problem #6 booklet

6. sketch



fbd



$$\Sigma F = ma = F_T - F_f$$

(a) $a = ?$

$F_f = 950N$

$F_T = 1500N$

$m = 700kg$

$$a = \frac{F_T - F_f}{m}$$

$$a = \frac{1500N - 950N}{700kg} = 0.785 N/kg$$

$$\vec{a} = 0.785 m/s^2$$

(b) $F_T = 750N$

$$a = \frac{(750 - 950)N}{700kg} = -0.286 m/s^2$$