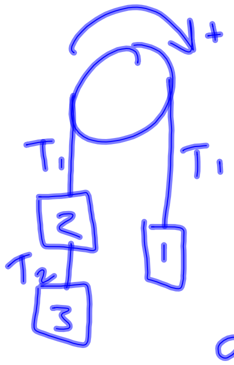
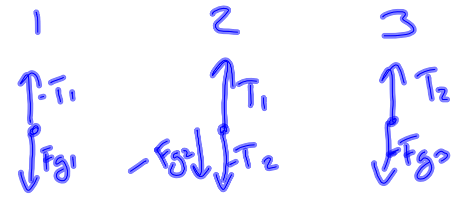
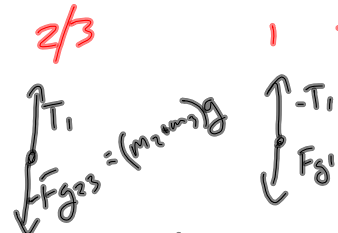




$a_1 = a_2 = a_3 = a$

$a = \frac{\Sigma F_1}{m_1}$ $a = \frac{\Sigma F_2}{m_2}$ $a = \frac{\Sigma F_3}{m_3}$

$a = \frac{(-T_1) + F_{g1}}{m_1}$ $a = \frac{T_1 + (-T_2) + (-F_{g2})}{m_2}$ $a = \frac{T_2 + (-F_{g3})}{m_3}$

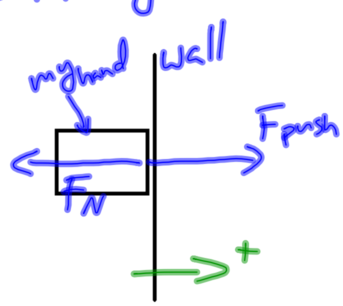


$a = \frac{T_1 + (-F_{g23})}{m_2 + m_3}$ $a = \frac{(-T_1) + F_{g1}}{m_1}$

Normal Force

the force produced by a solid object, that prevents acceleration INTO the object

Keeps solid objects from moving through each other



$a_x = 0$

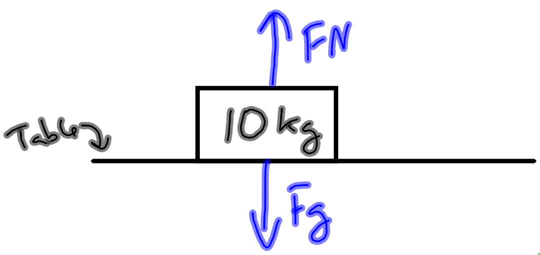
$a_x = \frac{\Sigma F_x}{m} = 0$

$\Rightarrow \Sigma F_x = 0$

$F_{push} + (-F_N) = 0$

$F_{push} = F_N$ equal but opposite

Object on a table



$a_y = 0$

$a_y = \frac{\Sigma F_y}{m} = 0$

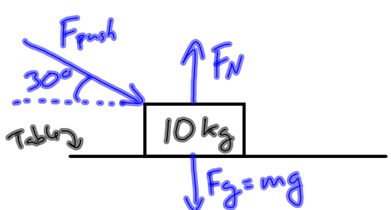
$\Sigma F_y = 0$

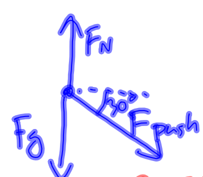
$F_g = (-9.8\,m/s^2)(10\,kg)$ ($g \cdot m$)

$F_g + F_N = 0$

$F_g = -F_N$

What if I also push on the object @ an angle?





Look in the y direction

$\Sigma F_y = 0$

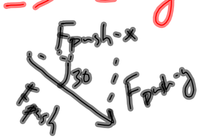
$F_g + F_N + F_{push\text{-}y} = 0$

$F_g + F_{push\text{-}y} = -F_N$

$a_y = 0$

$a_y = \frac{\Sigma F_y}{m} = 0$

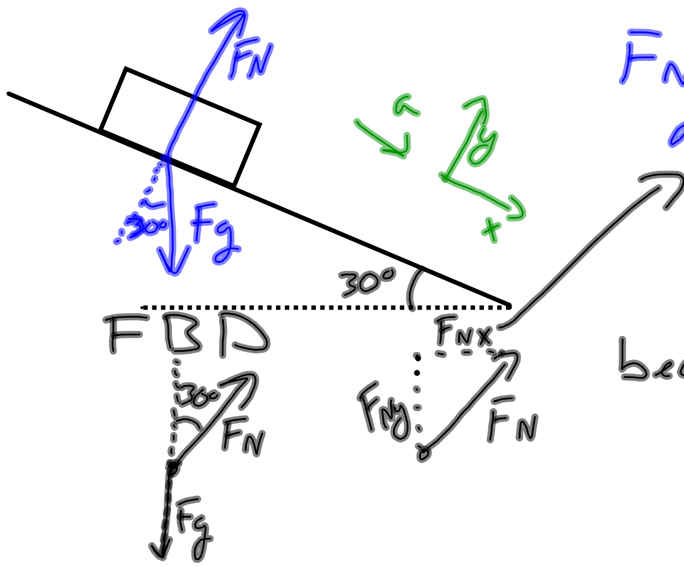
$\Rightarrow \Sigma F_y = 0$



Normal force, must be larger then the force of gravity in order to compensate for the added force downward.

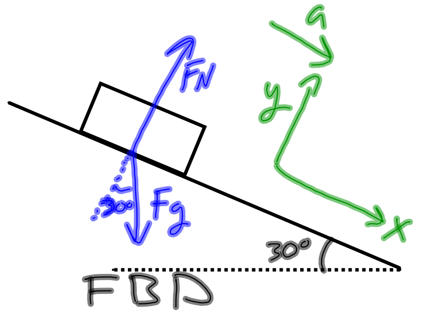
Normal forces can only act perpendicular to the surface.

Ramps



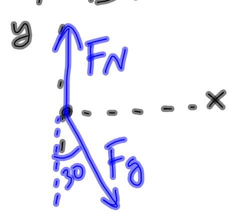
F_N allows it to accelerate to the right

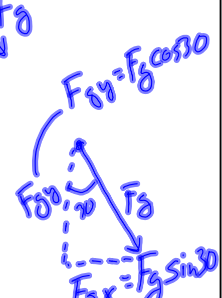
$F_g \neq F_{Ny}$ because $\Sigma F_y = 0$



Setting the axis to match the acceleration

FBD





Y-direction is now perpendicular to the ramp

$a_y = 0 = \frac{\Sigma F_y}{m}$

$\Sigma F_y = 0$

$F_N + F_{gy} = 0$

$F_N = -F_{gy}$

$F_N = -F_g \cos 30°$

X - direction

$F_{N_x} = 0$

$F_{g_x} = F_g \sin(30)$

$a_x = \frac{\Sigma F_x}{m}$

$a_x = \frac{F_g \sin(30)}{m}$

What direction is that?

Along the ramp