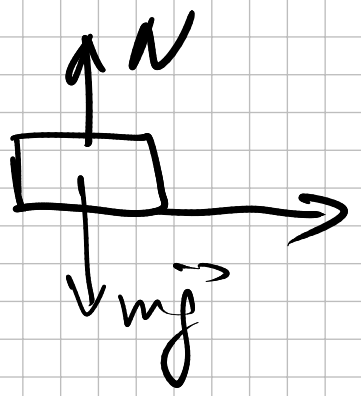


$$F_{fr} = \mu mg$$

$$a = \frac{F_{fr}}{m} = \mu g$$

$\mu \approx 0.7$ dry

≈ 0.4 wet

$v_0 = 25 \text{ mi/h} = 11 \text{ m/s}$

$v_f = 0$

$$d_x = \frac{v_f^2 - v_0^2}{2 a_x} =$$

$$= \frac{0^2 - 11^2}{2\mu g} = -\frac{121}{2 \cdot 10} \frac{1}{\mu} \approx \frac{6 \text{ m}}{\mu}$$

Dry case $d = \frac{6\,m}{0.7} \simeq 8\ldots\ m$

wet case $d = \frac{6\,m}{0.4} \simeq 16\ m$

$$F_{drag} = \frac{1}{2}\,\rho \cdot v^2 \cdot C \cdot A$$

F_{drag}: air resistance; ρ: density; C: drag coef; A: area

$\rho_{air} = 1.2\ \frac{kg}{m^3}$

0.3

$A = 2 \times 2\,m^2 = 4\,m$; $v = 50\ \frac{mi}{h} = 22\ \frac{m}{s}$

$$F_d = \frac{1}{2} \cdot 1.2 \cdot 22^2 \cdot \underbrace{0.3 \cdot 4}_{1.2} = \frac{1}{2}\,1.44 \cdot 22^2$$

$$= \frac{1}{2} 1.44 \cdot (2 \cdot 11)^2 = \frac{1}{2} 1.44 \cdot 4 \cdot 121$$

$$= 360 \text{ N}$$

if $v = 50 \text{ mi/h} \rightarrow 70 \text{ mi/h}$ $\quad F_{drag} \simeq 700 \text{ N}$

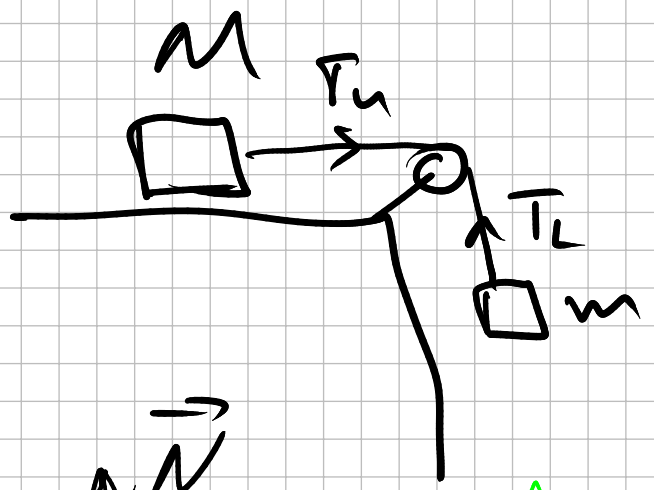
$$F_{friction} = \mu N = \mu mg = 0.01 \cdot 1000 \cdot 10$$

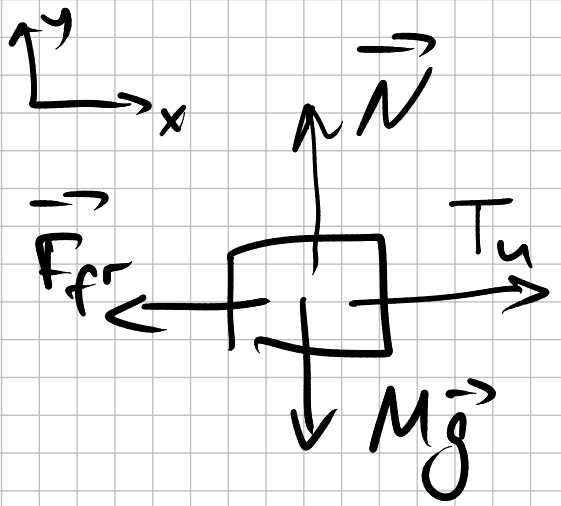
$$\simeq 100 \text{ N}$$

$\mu_{rolling} \simeq 0.01$

Tricky Friction

$a - ?$



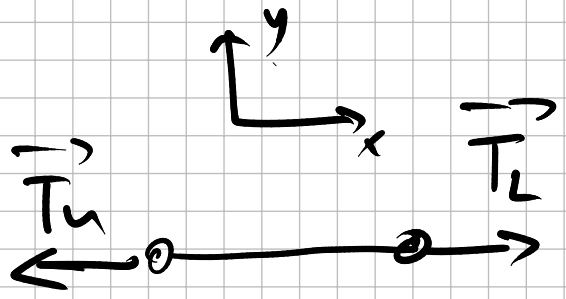


$$\vec{F}_{fr} + \vec{N} + \vec{T} + M\vec{g} = M\vec{a}$$

y: $N - Mg = M \cdot 0$

x: $T - F_{fr} = Ma_x$

$F_{fr} = \mu N = \mu Mg$

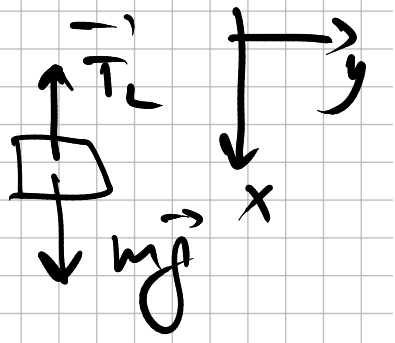


$m_{rope} a_x = T_L - T_M$

$0 = T_L - T_M$

$T_L = T_M = T$

$a_x \equiv a$



y: $0 = ma_y$

x: $mg - T = ma_x$

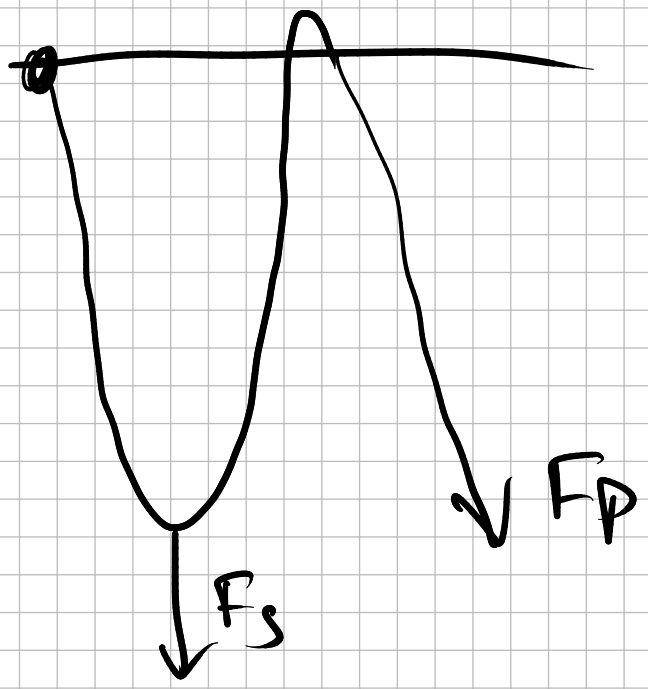
$T - \mu Mg = Ma$

$T = m(g-a)$

$m(g-a) - \mu Mg = Ma$

$$a = \frac{m - \mu M}{m + M} g$$

must be ≥ 0


F_p
F_s