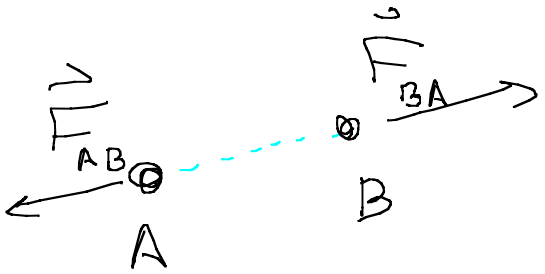
Phys 2110-3 9/27/10

Note Title 9/27/2010

# Dynamics, forces

$$\vec{F}_{net} = m\vec{a}$$ N' 2nd Law



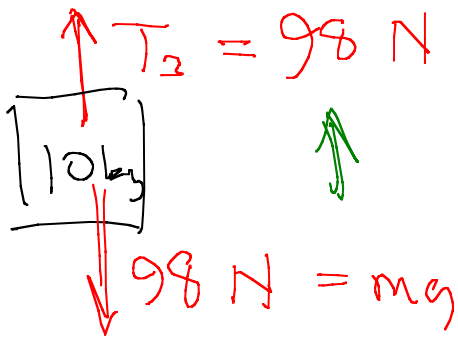

$\vec{F}_{AB} = -\vec{F}_{BA}$ N's 3rd Law

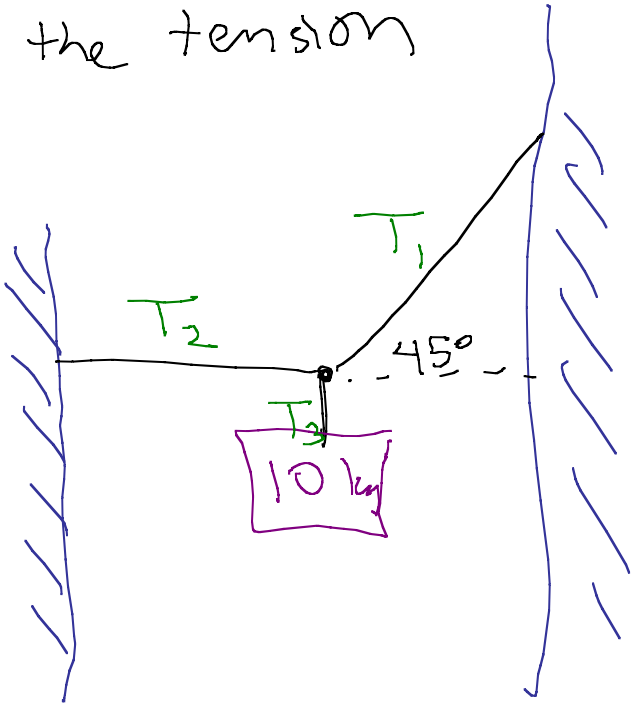
$\vec{p} = m\vec{v}$, momentum

$$\vec{F} = m\vec{a} = m\frac{d\vec{v}}{dt}$$
$$= \frac{d}{dt}(m\vec{v})$$ || (m constant)
$$= \frac{d}{dt}\vec{p}$$

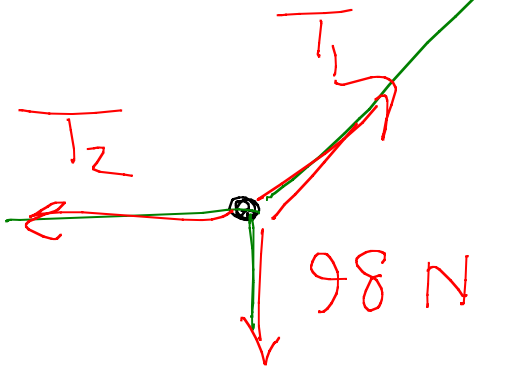
# Solve force problems

5.35 A 10 kg mass is suspended at rest by two strings attached to walls as shown. Find the tension forces in the two strings



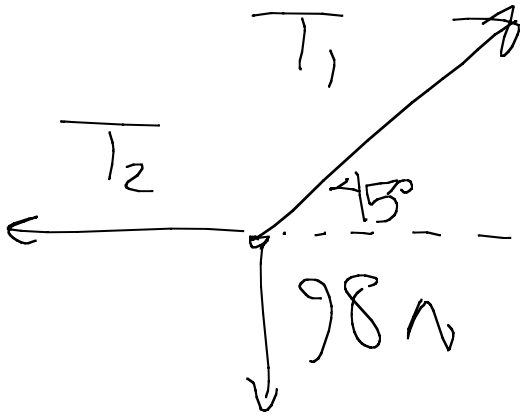

Force here add to zero



$\sum F_x = 0$

$\sum F_y = 0$

(For this case)




$x|\quad T_1 \sin 45° - 98\,N = 0$

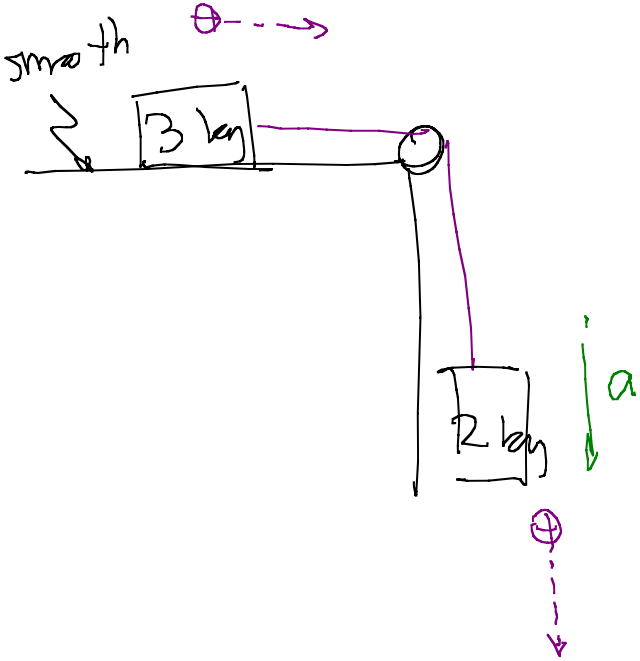
$$T_1 = \frac{98\,N}{\sin 45} = 139\,N$$

$x|\quad -T_2 + T_1 \cos 45° = 0$

$$\Rightarrow \quad T_2 = 98\,N$$

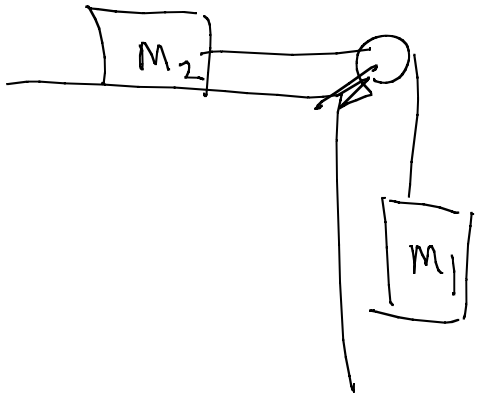
Masses joined by string which runs over ideal pulley; 3 kg mass is on level, smooth surface, 2kg mass is suspended...

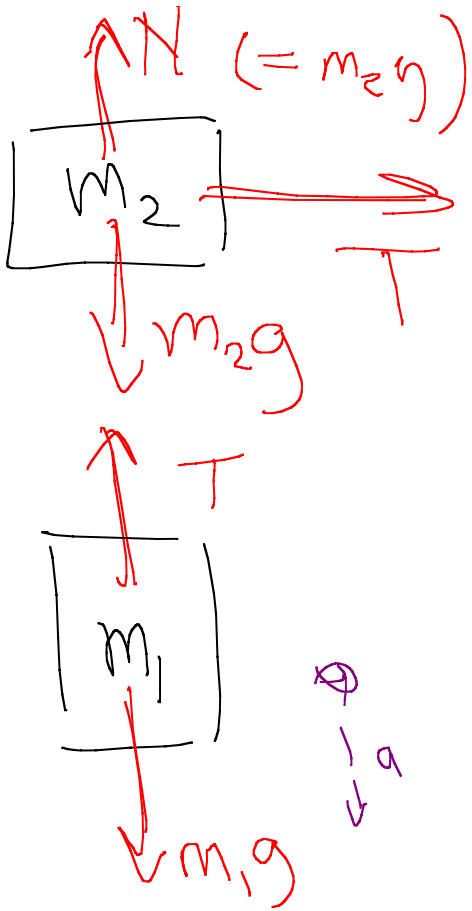
Find acceleration of the masses




Magnitudes of their accel's are the same

Use algebra:






N's 2nd law

$$T = m_2 a$$

$$m_1 g - T = m_1 a$$

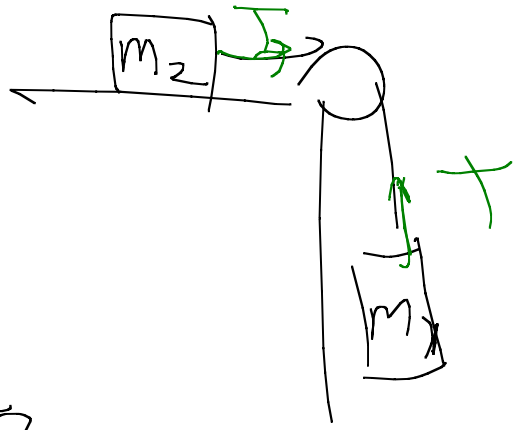
Sub. 1st eqn into 2nd one

$$m_1 g - m_2 a = m_1 a$$

$$m_1 g = m_2 a + m_1 a$$

$$m_1 g = a(m_1 + m_2)$$

$$a = \frac{m_1 g}{(m_1 + m_2)}$$



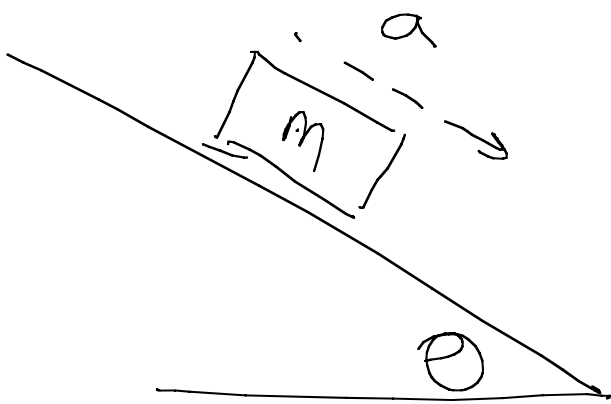

$$= \frac{2\ \text{kg}}{5\ \text{kg}} \left(9.8 \frac{\text{m}}{\text{s}^2}\right) = 3.92 \frac{\text{m}}{\text{s}^2}$$

Suppose $m_2 \to 0$ $\quad a \to g$

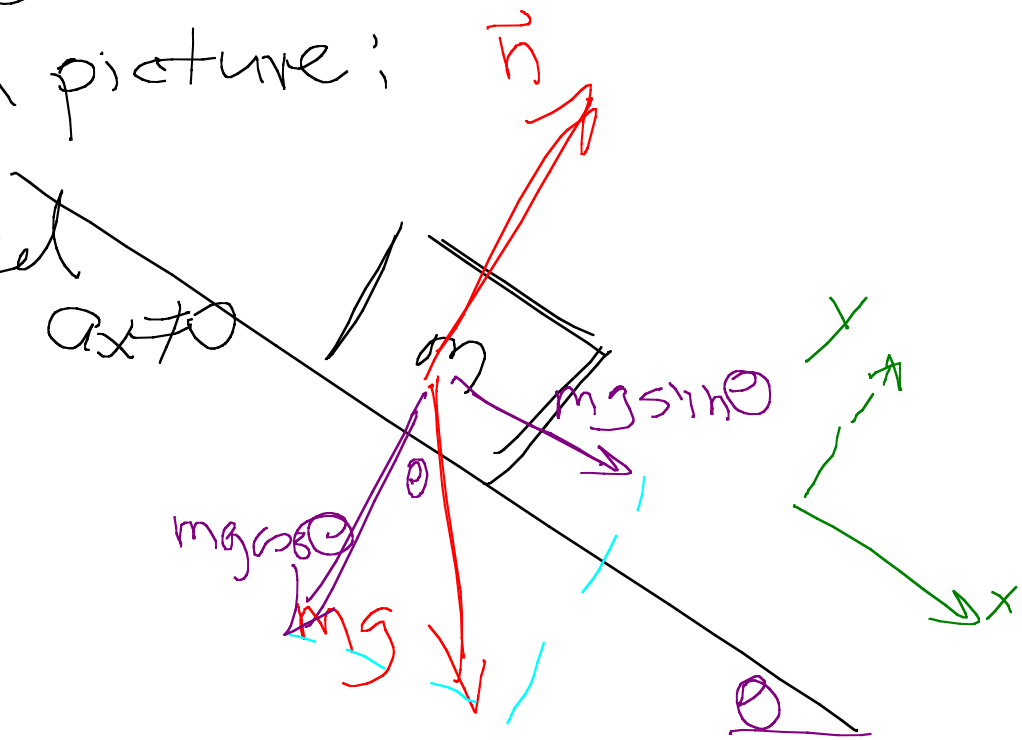
$m_1 \to 0$ $\quad a \to 0$

$$T = m_2 a = \frac{m_1 m_2 g}{(m_1 + m_2)}$$

Mass slides down a frictionless inclined plane. (Angle $\theta$). Find accel of mass.




Draw damn picture;




y-forces cancel

$a_y = 0$ $a_x \neq 0$

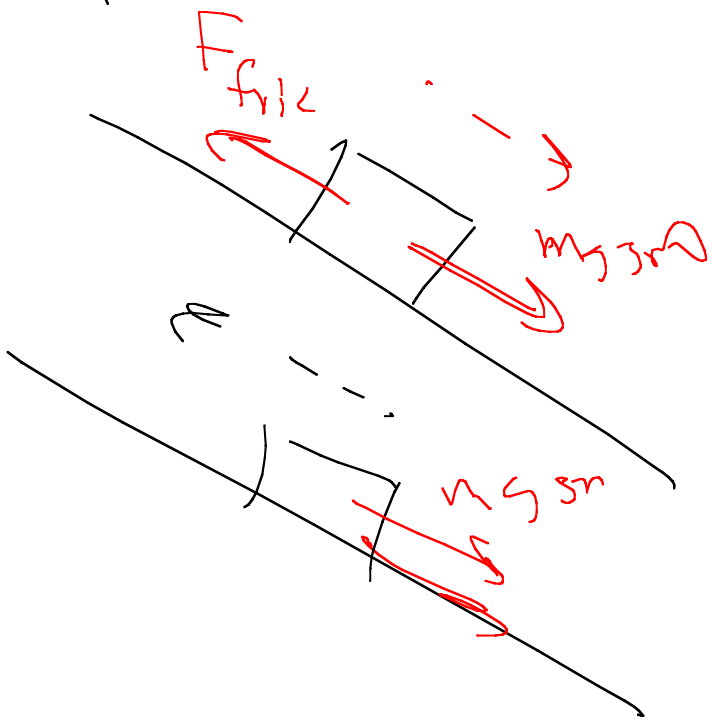
$n = mg\cos\theta$

$$F_x = mg\sin\theta = ma_x$$

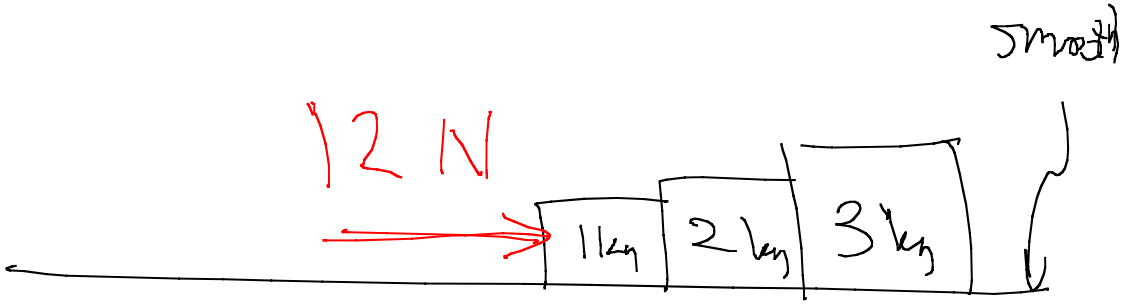
$g_x$

$$a_x = g\sin\theta$$

Accel down slope of $g\sin\theta$.

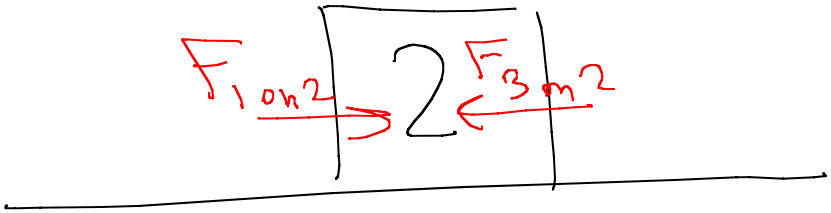


4.45



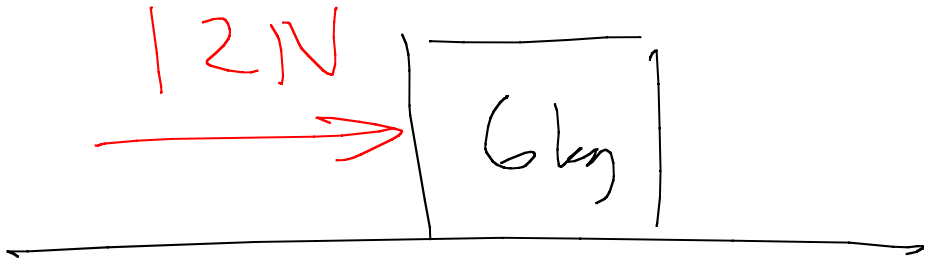

Blocks... lined up on table

12 N force applied to leftmost block. What force does middle block exert on right-most block?



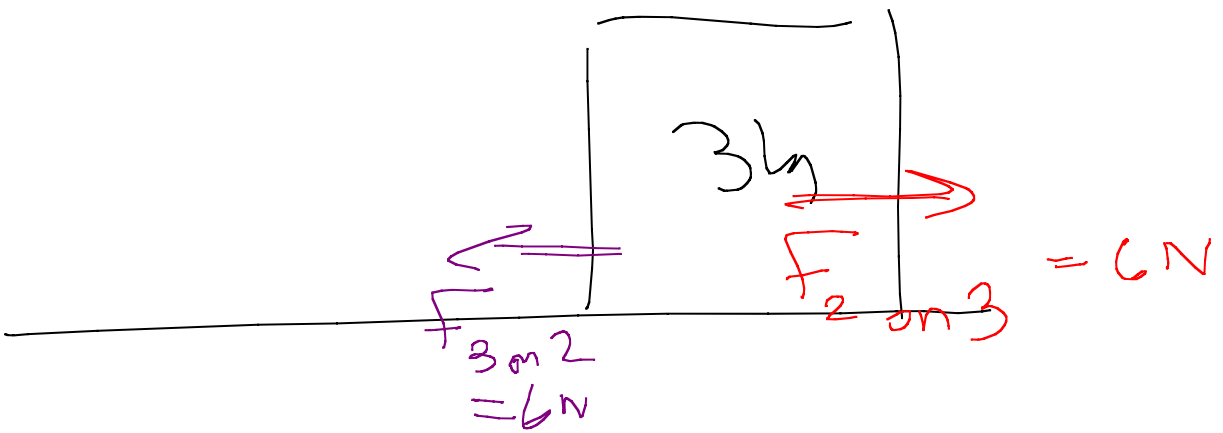
Solve in a simpler way

Treat masses as one masses (1 eqn)




$a = 2\ m/s^2$

accel of 2 of them




$$F_{2\text{ on }3} = ma = (3kg)(2\ m/s^2)$$
$$= 6N$$