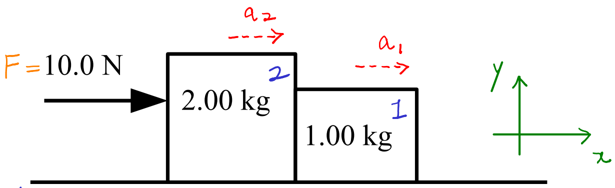
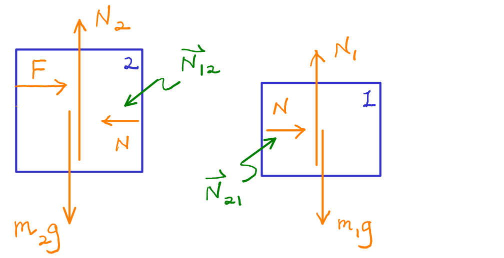
Physics 203 - Section: 06/03/2015 Quiz 2 Name : ……………………………………………………………

For full credit, be sure to show all your work.

1) (1.5 points) A 2.00-kg block is in contact with a 1.00-kg block on a horizontal frictionless surface as shown in the figure. The 2.00-kg block is being pushed by a horizontal 10.0-N force as shown. What is the acceleration of each block? What is the magnitude of the force that the 2.00-kg block exerts on the 1.00-kg block? If the block 2 moves Δx forward, block 1 also moves Δx forward.

So $a_1 = a_2 =: a$.





Writing $\sum \vec{F} = m\vec{a}$ for blocks:

① x: $N = m_1 a$ (i)
y: $N_1 - m_1 g = 0$
(no acceleration in y direction)

② x: $F - N = m_2 a$ (ii)
y: $N_2 - m_2 g = 0$
(no acceleration in y direction)

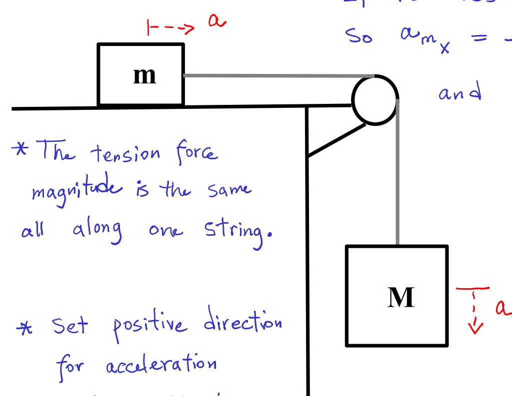
Solving (i), (ii) for a, N:

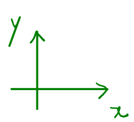
$a = \dfrac{F}{m_1 + m_2} = 3.3\ \dfrac{m}{s^2}$,

$N = \dfrac{m_1}{m_1 + m_2} F = 3.3\ N$.

2) (1.5 points) In the configuration below, m = 2.0kg and M = 3.0kg are connected by a string through a pulley and we assume no friction. If m moves right Δx, M goes down Δx. The length of string is constant.

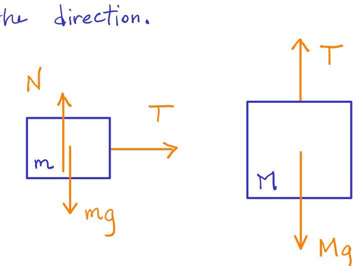
So $a_{m_x} = -a_{M_y}$ or we call this acceleration a and be careful about the direction.





* The tension force magnitude is the same all along one string.

* Set positive direction for acceleration or be meticulous about directions ($a_{M_y} = -a_{m_x}$)



m: x: $T = ma$ (i)
y: $N - mg = 0$

M: $Mg - T = Ma$ (ii)

a) Draw all the forces acting on m and M.

b) Calculate the tension T.

(i) + (ii) : $Mg = (m+M)a \rightarrow a = \dfrac{Mg}{m+M} = 6\ \dfrac{m}{s^2}$,

(i) : $T = \dfrac{mM}{m+M} g = 12\ N$.

T is the same if you swap m and M!