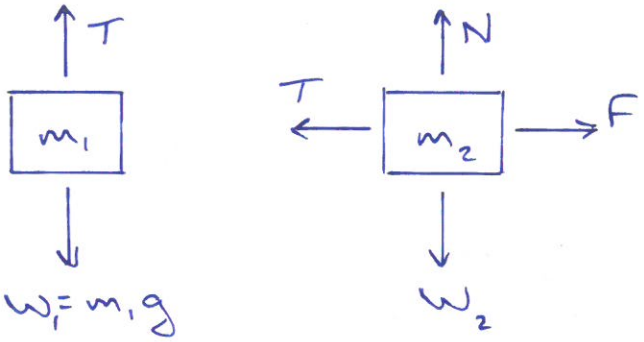
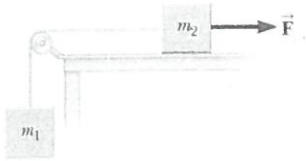
Name: SOLUTIONS Student #: _____ /10

PHYS 1150: Quiz #6

/7 **Problem 1:** In the system shown below, a horizontal force $F = 30.0\,\text{N}$ acts on an 8.00 kg object, which sits on a frictionless horizontal surface. The object is connected (via a massless cord over a massless, frictionless pulley) to a 2.00 kg that hangs vertically as shown.

/3 (a) Draw a free-body diagram for each object, clearly labelling all the forces.





/4 (b) Calculate the magnitude of the acceleration of the system, and the tension in the cord.

using $F=ma$... (take a positive in dir'n of $\vec{F}$)

for m_1: $T - w_1 = m_1 a \Rightarrow T - (2)(9.8) = 2a$

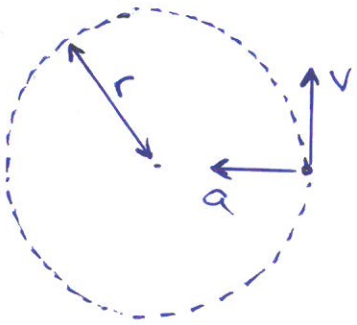
for m_2: $F - T = m_2 a \Rightarrow 30 - T = 8a$

add eqns: $10.4 = 10a$

$\therefore\ a = \frac{10.4}{10} = \boxed{1.04\ \text{m/s}^2}$

$T = 2a + 19.6 = 2(1.04) + 19.6 \Rightarrow \boxed{T = 21.7\ \text{N}}$

/3 **Problem 2:** A tire with radius 0.600 m rotates at a constant rate of 300 rev/min. Fin the speed and acceleration of a small stone lodged in the tread at the outer edge of the tire.



$\omega = 2\pi f = 2\pi \frac{300}{60} = 10\pi\ [\text{rad/s}]$

$a = \omega^2 r = (10\pi)^2(0.6) = \boxed{592\ \text{m/s}^2\ \text{(toward center)}}$

$v = \omega r = (10\pi)(0.6) = \boxed{18.8\ \text{m/s}}$