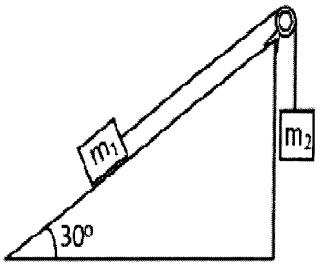
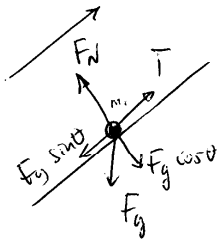
PHYS101.15
QUIZ#5- CHAPTER 5
DATE: 5/4/09

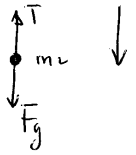
Name: Key Id#:

A block of mass $m_1 = 5.7$ kg on a frictionless 30° inclined plane is connected by a cord over a massless, frictionless pulley to a second block of mass $m_2 = 3.5$ kg hanging vertically as shown in the figure. Find
(a) The tension in the string
(b) The acceleration of mass m_1.



Free body diagram





m_1: $T - m_1 g \sin 30^\circ = m_1 a$ —①

$F_N - m_1 g \cos 30^\circ = 0$

m_2: $m_2 g - T = m_2 a$ —②

② $\Rightarrow T = -m_2 a + m_2 g$

① $\Rightarrow (m_2 g - m_2 a) - m_1 g \sin 30^\circ = m_1 a$

$m_2 g - m_1 g \sin 30^\circ = (m_2 + m_1) a$

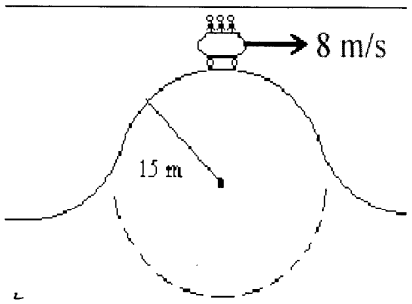
$a = \dfrac{m_2 g - m_1 g \sin 30^\circ}{m_1 + m_2} = \boxed{0.69\ m/s^2}$

② $\Rightarrow T = m_2 g - m_2 a = m_2 (g - a) = \boxed{31.9\ N}$

PHYS101.13
QUIZ#5- CHAPTER6
DATE: 7/4/09

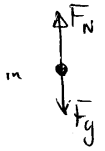
Name: Key Id#:

A roller-coaster car has a mass of 500 kg when fully loaded with passengers. The car passes over a hill of radius 15 m (see the figure). At the top of the hill, the car has a speed of 8 m/s.
(a) What is the acceleration of the car at the top of the hill?
(b) What is the force of the track on the car at the top of the hill?



a) $a = \frac{v^2}{R} = \frac{(8)^2}{15} = 4.3\ m/s^2$

b) Free body diagram



$F_g - F_N = m\frac{v^2}{R} = ma$

$F_N = F_g - ma = mg - ma$

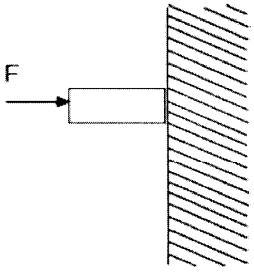
$= m(g-a) = 500 \times (9.8 - 4.3)$

$\boxed{F_N = 2750N}$

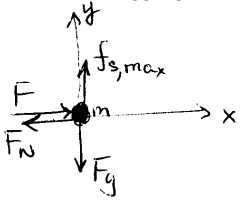
PHYS101.14
QUIZ#4- CHAPTER 6
DATE: 7/4/09

Name: Key Id#:

An 8.0 kg block is pushed against a vertical wall by a horizontal force F as shown in the figure. The coefficients of friction between the block and the wall are $\mu_s = 0.60$ and $\mu_k = 0.30$. Calculate the minimum value for (F) that will prevent the block from slipping.



Free body diagram



$$\sum F_x = F - F_N = 0 \Rightarrow F = F_N$$

$$\sum F_y = f_{s,max} - F_g = 0 \Rightarrow \mu_s F_N = F_g \Rightarrow F_N = \frac{mg}{\mu_s}$$

$$\Rightarrow F = \frac{mg}{\mu_s} = \frac{8 \times 9.8}{0.6} = \boxed{131\ N}$$