Physics 3A: Basic Physics I
Quiz #4a : Solutions

Name: SolutionsXXXXXXXXXXXXXXXX___
Student ID #:_________________________
Discussion Section:____________________
Date:________________________________
Signature:____________________________

\[ \sum \vec{F} = 0 \quad \vec{F}_{12} = -\vec{F}_{21} \quad \vec{F}_g = mg \quad \sum \vec{F} = ma \quad \frac{m_1}{m_2} = \frac{a_2}{a_1} \]

(circle the letter of your answer)

1. (2 pts) A 500 lb. block is resting on the floor. There is a rope tied to it and to show your overwhelming strength you start to pull up straight up on the rope. What happens to the normal force on the block?

a.) since the normal force only depends on the gravitational force, it doesn't change
b.) the normal force increases since your force is upward
c.) the normal force decreases since your force is upward
d.) there is not enough information to tell
e.) none of the above

2. (2 pts) A large father and his small son face each other on frictionless ice. They put their hands together and push each other so they move away from each other. Who exerts a larger force and who experiences the larger acceleration.

a.) The father exerts a larger force and experiences a larger acceleration.
b.) The son exerts a larger force and experiences a larger acceleration.
c.) They both exert the same force and experience the same acceleration.
d.) They both exert the same force but the son experiences a larger acceleration.
e.) They both exert the same force but the father experiences a larger acceleration.

3. (6 pts) A 12.5 kg object placed on a frictionless, horizontal table is connected to a cable that passes over a pulley and then is fastened to a hanging 7.55 kg object. Find the acceleration of the two objects (see diagram) (use back of sheet as well, circle your final answer and show all work)
Concept: Newton's 2\textsuperscript{nd} law

Draw force diagram & apply Newton's 2\textsuperscript{nd} in component form:

a.) Free body diagrams:

For 12.5 kg mass:

\[ \sum F_x = T = m_1a_1x \]
\[ \sum F_y = N - m_1g = m_1a_1y \]
\[ N = m_1g \]

Rope does not stretch, so:
\[ a_1x = a \]
\[ a_2y = -a \]

For 7.55 kg mass:

\[ \sum F_x = 0 = m_2a_2x = 0 \]
\[ \sum F_y = T - m_2g = m_2a_2y \]

\[ T = m_1a \]
\[ T - m_2g = m_2(-a) \]
\[ m_1a - m_2g = -m_2a \]
\[ (m_1 + m_2)a = m_2g \]

\[ a = \frac{m_2g}{(m_1 + m_2)} = \frac{(7.55)(9.8)}{(12.5 + 7.55)} = 3.690 = 3.69 \text{ m/s}^2 \]