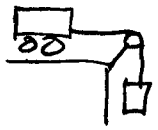
**Quiz 13 – Newton's Second Law – 10-31-03**

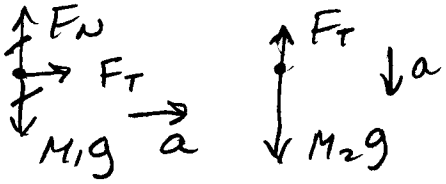
A 1.25 kg ($M_1$) cart sits on a level track. A string runs parallel to the track over a pulley at the end of the track. A 0.225 kg ($M_2$) mass hangs from the string.

(a) Draw a simple picture of the problem.
(b) Draw the FBDs for the problem.
(c) Write the Newton's 2nd law equations and solve for the acceleration without numbers.
(d) After you write the acceleration equation, plug in the numbers and solve numerically for the acceleration.

a)



b)




$\Sigma F = ma$

$F_T = M_1 a$

$M_2 g - F_T = M_2 a$

$M_2 g = M_1 a + M_2 a$

$M_2 g = (M_1 + M_2) a$

c) $\boxed{a = \dfrac{M_2 g}{M_1 + M_2}}$

$$a = \frac{M_2 g}{M_1 + M_2} = \frac{0.225\,kg\,(9.8\,\frac{M}{S^2})}{1.25\,kg + 0.225\,kg}$$

d) $\boxed{a = 1.49\,\frac{M}{S^2}}$

Note! Answers boxed with letter of problem out front. ALL measurements and answers have units.

Two masses, therefore, $M_1$ and $M_2$.

**Quiz 13 – Newton's Second Law – 10-31-03**

$F_g$

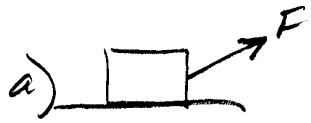
A 75.0 N suitcase is being dragged across the floor by a rope that exerts a force of 20 N and makes a 27° angle with the horizontal.

$F$

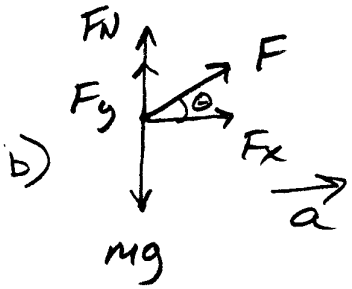
(a) Draw a simple picture of the problem.
(b) Draw the FBD for the problem.
(c) Write the Newton's 2nd law equation and solve for the acceleration without numbers.
(d) After you write the acceleration equation, plug in the numbers and solve numerically for the acceleration.

(Bonus) Solve for the normal force without numbers and then plug in the numbers.

a)




b)




$\Sigma F = ma$

$F_x = ma$

$F\cos\theta = ma$

c) $\boxed{a = \frac{F\cos\theta}{m}}$

$a = \frac{F\cos\theta}{m}$

$= \frac{20N(\cos 27°)}{7.65kg}$

d) $\boxed{a = 2.33 \frac{m}{s^2}}$

$F_g = mg$

$m = \frac{F_g}{g}$

$= \frac{75N}{9.8\frac{m}{s^2}}$

$m = 7.65kg$

$\Sigma F = \cancel{m}^{0}a$

$F_N + F_y - mg = 0$

$F_N + F_{sin\theta} - mg = 0$

$F_N = mg - F_{sin\theta}$

$= 75N - 20N(\sin 27°)$

e) $\boxed{F_N = 65.9N}$

Note: Units on ALL measurements and answers. Answers boxed and letter of problem out front.