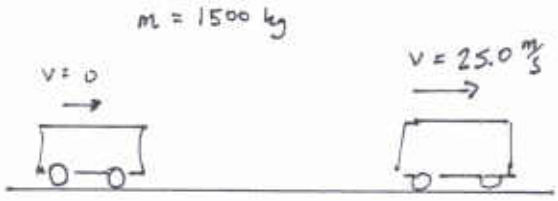
Name_____

Phys 2010, Section 2
Quiz #2 — Fall 2003

1. A 1500 kg car drives in a straight line and goes from $0\frac{m}{s}$ to $25.0\frac{m}{s}$ in 10.0 s (uniformly).



a) What is the car's acceleration?

Use $a = \frac{v - v_0}{t}$ Then:

$a = \frac{(25.0\ m/s - 0)}{10.0\ s} = \boxed{2.50\ m/s^2}$

b) What is the net force which acts on the car?

Use $F_{net,x} = ma_x$ Then:

$F_{net} = (1500\ kg)(2.50\ m/s^2) = \boxed{3.75 \times 10^3\ N}$

2. An object has a weight of 200 lb (on Earth).

a) What is its weight in newtons? (1 lb = 4.448 N.)

Convert units:

$W = (200\ lb)\left(\frac{4.448\ N}{1\ lb}\right) = \boxed{890\ N}$

b) What is its mass?

Use $W_{earth} = mg_{earth}$. Then:

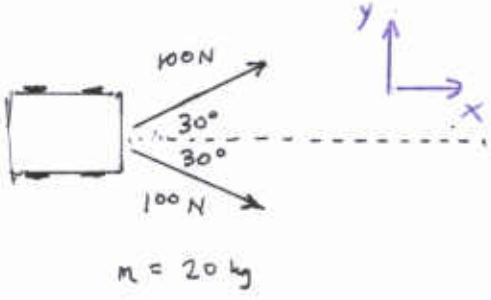
$m = W_{earth}/g_{earth} = 890\ N / 9.80\ m/s^2 = \boxed{90.8\ kg}$

c) What is its weight on Mars, where the gravitational acceleration is $3.71\frac{m}{s^2}$?

Use $W_{mars} = mg_{mars}$. Then:

$W_{mars} = (90.8\ kg)(3.71\ m/s^2) = \boxed{337\ N}$

3. As seen from above, two forces of magnitude 100 N pull on a 20 kg cart as shown.



a) What is magnitude of the total force on the cart?

Add the two force vectors; the sum of the y components is zero. The sum of the x components is:

$F_{net,x} = 100\,N \cos 30° + 100\,N \cos 30° = \boxed{173\,N}$

b) What is the magnitude of the acceleration of the cart?

The acceleration is then all in the x direction, with

$a_x = F_{net,x}/m = (173\,N)/(20\,kg) = 8.66\ m/s^2$

→ Magnitude of the acceleration is $\boxed{8.66\ m/s^2}$

You must show all your work and include the right units with your answers!

$1\text{ in} = 2.54\text{ cm}$ $\quad 1\text{ m} = 3.281\text{ ft}$ $\quad 1\text{ mi} = 5280\text{ ft}$ $\quad 1\text{ yd} = 36\text{ in}$ $\quad g = 9.80\frac{\text{m}}{\text{s}^2}$ on Earth!

$$A_x = A\cos\theta \qquad A_y = A\sin\theta \qquad A = \sqrt{A_x^2 + A_y^2} \qquad \tan\theta = \frac{A_y}{A_x}$$

$$v_x = v_{0x} + a_x t \qquad x = v_{0x}t + \tfrac{1}{2}a_x t^2 \qquad v_x^2 = v_{0x}^2 + 2a_x x \qquad x = \tfrac{1}{2}(v_{0x} + v_x)t$$

$$v_y = v_{0y} + a_y t \qquad y = v_{0y}t + \tfrac{1}{2}a_y t^2 \qquad v_y^2 = v_{0y}^2 + 2a_y y \qquad y = \tfrac{1}{2}(v_{0y} + v_y)t$$

$$\mathbf{F}_{\text{net}} = m\mathbf{a} \qquad 1\text{ lb} = 4.448\text{ N}$$