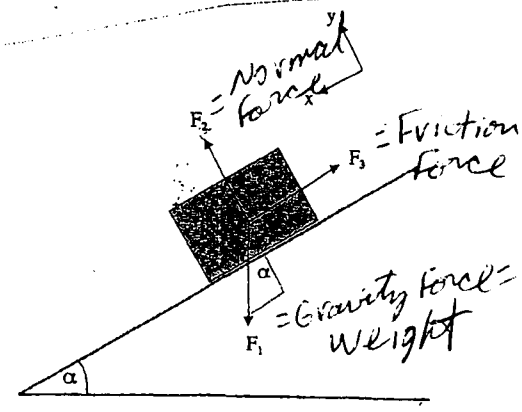


General Physics Week : FORCES!

ALL WORK NEATLY (given information, equation(s), algebra, substitution, and unit analysis for full credit. Don't forget significant figures. The first step for Forces problems is to draw a free body diagram. Use additional sheets as necessary in order to show all work neatly! Box the final answer. Correct in red pen during class.

1. If the block to the right is sliding down the inclined plane, label each of the forces and explain what each is.



2. If we increase the angle in the diagram shown, what will happen to the normal force? What will happen to the force of gravity? The components of the force of gravity?

The Normal force will decrease.  
The force of gravity will stay the same.  
The components: x component will increase, y component will decrease.

3. The law of inertia states that no force is required to maintain motion. Why, then, do you have to keep pedaling your bicycle to maintain motion?

Friction on the tires will cause your bicycle to slow down so, the pedaling force is equal and opposite the friction force in cases of constant speed.

4. If forces of 15.0 N and 10.0 N act in opposite directions on a 5.00 kg object, what is the acceleration of the object? If the object was initially at rest when the forces were applied, how far has the object traveled after 5.0 seconds?

Draw FBD  $F_{net} = 15.0\text{ N} - 10.0\text{ N} = 5.0\text{ N}$   
 $\vec{a} = \frac{\vec{F}}{m} = \frac{5.0\text{ kg} \frac{\text{m}}{\text{s}^2}}{5.00\text{ kg}} = 1. \frac{\text{m}}{\text{s}^2}$   
 $x = x_0 + v_0 t + \frac{1}{2} a t^2$   
 $x = \frac{1}{2} \cdot 1 \frac{\text{m}}{\text{s}^2} \cdot (5.0\text{ s})^2$   
 $x = 12.5\text{ m}$

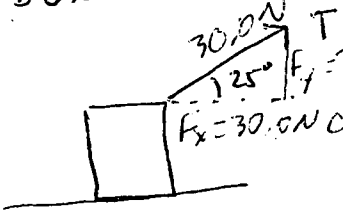
5. In what direction does the force due to drag point? How does this relate to summing forces and terminal velocity?  
Drag or friction always points opposite the direction of motion. This causes forces to balance and terminal velocity to be achieved.

6. A child pulls a 30 N red wagon with a force of 15 N. What is the magnitude of the force that the wagon exerts on the child? Why?  
The wagon exerts an equal, but opposite force on the child of 15 N. This is due to Newton's

You're happiest while you're making the greatest contribution. -Robert F. Kennedy  
3rd Law, for every action, there is an equal and opposite reaction.

c.) How far will the football travel ~~with zero velocity~~?

A box has a force of 30.0 N applied at 25°. If the box has a mass of 20.0 kg, and the surface is frictionless,



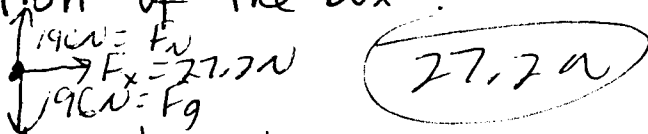
a.) What is the normal force?

~~$F_f = \mu \cdot F_N$     $F_f = 0$ , so  $0 = \mu \cdot F_N \therefore F_N = 0 = 0$~~

b.) What is the net horizontal force

and acceleration of the box?

Net force



if pulling at 0° angle.

c.) How far will the box travel in 2.0 s?

$$X = X_0 + V_0 t + \frac{1}{2} a t^2$$

Find  $\vec{a}$

$$\vec{a} = \frac{F}{m} = \frac{27.2 \text{ kg} \cdot \text{m} / \text{s}^2}{20.0 \text{ kg}} = 1.36 \frac{\text{m}}{\text{s}^2}$$

$$X = \frac{1}{2} \cdot 1.36 \frac{\text{m}}{\text{s}^2} (2.0 \text{ s})^2 = 2.7 \text{ m}$$

$\vec{F}_g$   
 $F_N = 196 \text{ N} - F_f = 196 \text{ N} - 12.7 \text{ N} = 183.3 \text{ N}$