

# AP Physics - Newton's Laws - Day 2

Note Title

9/19/2007

## Newton's 2nd Law

- Acceleration is directly proportional to net force  $\Sigma F$ .
- Acceleration is inversely proportional to mass  $m$ .

$$\left. \begin{array}{l} a \propto \Sigma F \\ a \propto \frac{1}{m} \end{array} \right\} a \propto \frac{\Sigma F}{m} \rightarrow a = \frac{\Sigma F}{m}$$

or, more commonly

$$\boxed{\Sigma \vec{F} = m\vec{a}}$$

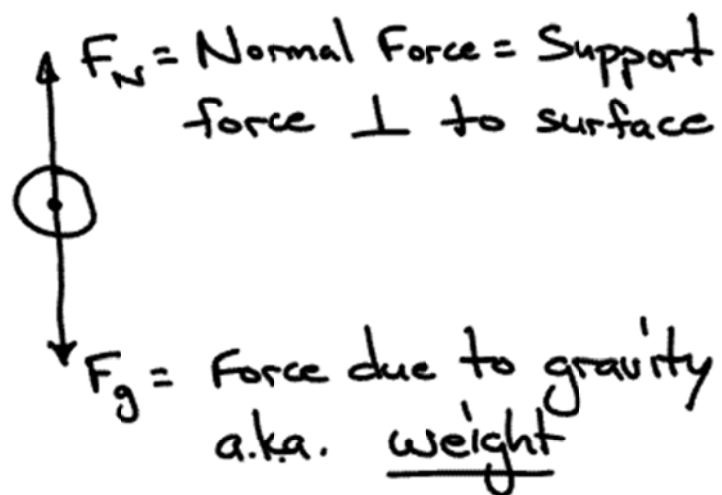
→ If a net force exists on an object in a certain direction, the object will accelerate in that direction.

# Free Body Diagrams (FBD)

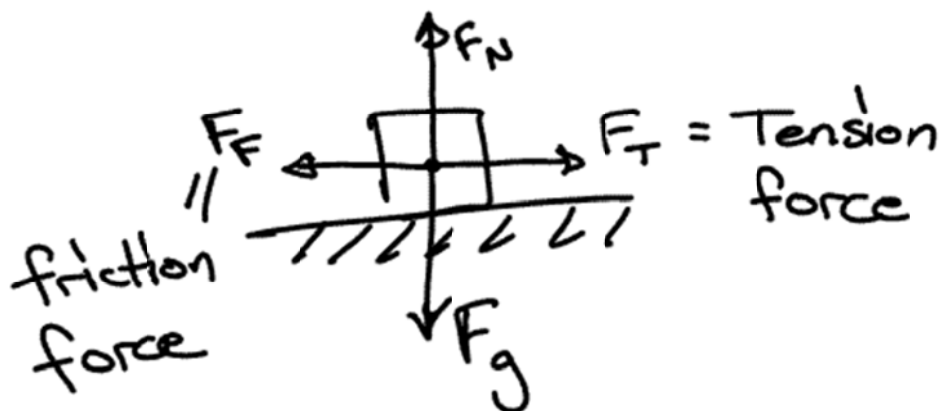
- Consider only the forces acting on a particular body.

→ From the point of view of a ball at rest on a table:

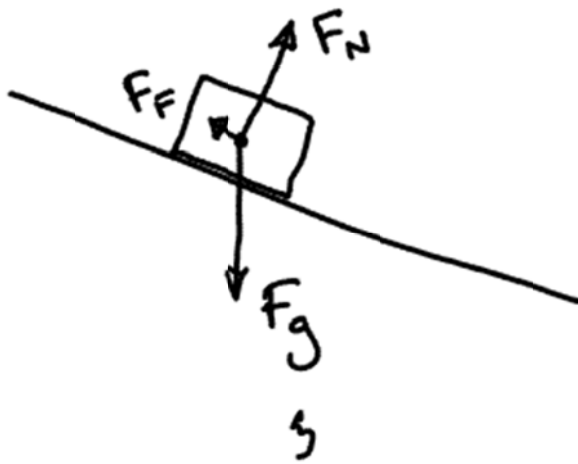
 the FBD looks like...



A box being pulled along a surface:



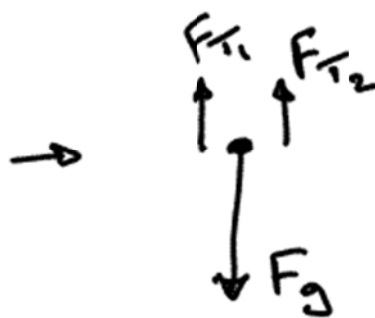
A box standing still (with zero acceleration)  
on a ramp:



note that since  
 $a=0 \rightarrow \Sigma F=0$   
 $\rightarrow \vec{F}_g + \vec{F}_N + \vec{F}_f = 0$

$\therefore$  If you add the  
three force vectors,  
they all balance in  
both the  $x$  and  $y$   
directions.

A gymnast on the rings:



$$F_{T1} + F_{T2} + F_g = 0$$