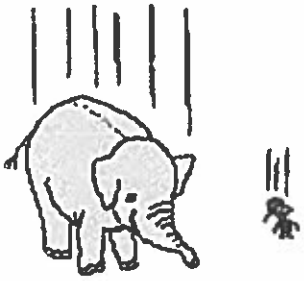
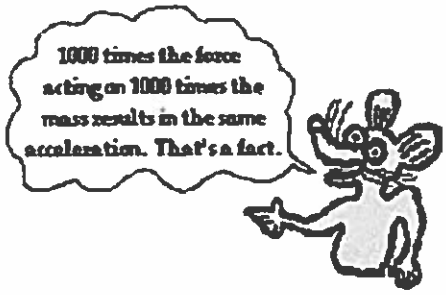
PHYSICS 12

NEWTON'S SECOND LAW





Newton`s First Law says that a nonzero acceleration is a result of a nonzero net force.

Newton`s Second Law explains how the acceleration and net force are related. Newton`s Second Law also explains the relationship between the acceleration of an object and the object`s mass.

$$\frac{F}{m} - \frac{F}{m}$$

Newton`s Second Law

Acceleration of an object is directly proportional to the magnitude of the net force and inversely proportional to the object`s mass. The acceleration is always in the same direction as the direction of the net force.

$$\vec{a} = \frac{\sum \vec{F}}{m}$$

$$\sum \vec{F} = m \cdot \vec{a}$$

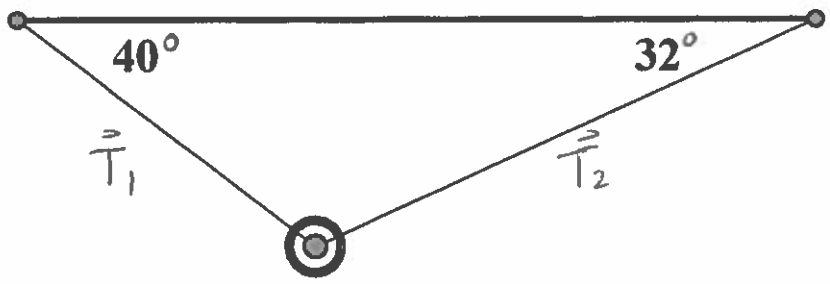
- One Newton is defined as a unit of force necessary for an object with mass 1.0 kg to accelerate by 1.0m/s^2.
- $N = kg \cdot \frac{m}{s^2}$

1. Find the acceleration of an 8.0-kg object that is being pulled with force 120 N 30° above horizontal and pushed with a horizontal force 80 N left. Include a free-body diagram. Assume that the object is moving along a strictly horizontal surface and frictional forces are negligible.

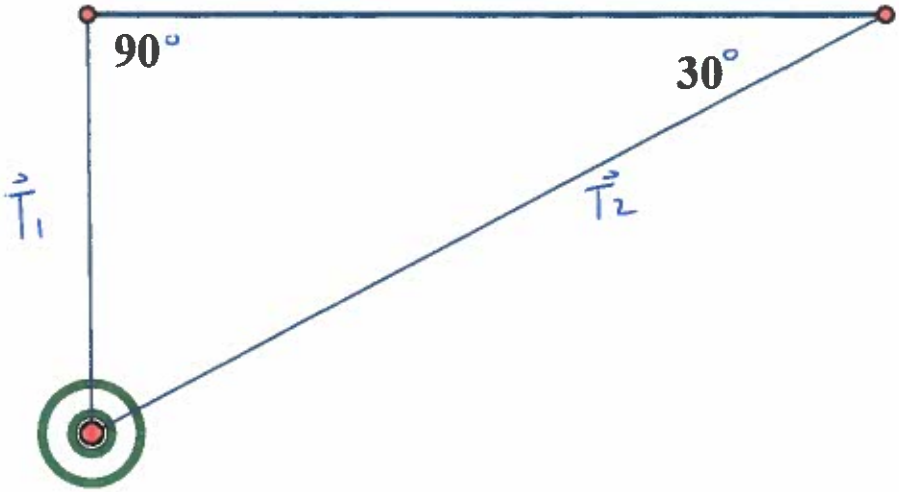
2. Find the magnitude and direction of an acceleration of a 10.0-kg object. The object experiences three pulling forces and a force of gravity. F_1 = 30 N right, F_2= 45 N [Up 28°Left] and F_3 = 85 N [Up 8°right].Include a free body diagram.

3. How much force and what direction needs to be applied to accelerate a 50.0-kg object by 4.0 m/s^2 left if the object is initially moving left at constant velocity along a horizontal surface and the coefficient of kinetic friction is 0.03? **Include a FBD.**

4. Find the magnitude and direction of the force of tension in each of the ropes given that the object tied to the ropes has mass 8.0 kg and is at rest. Include a free-body diagram.



5. Find the magnitude and direction of the force of tension in each of the ropes given that the object tied to the ropes has mass 5.0 kg and is at accelerating 2.0m/s^{2}right. Include a free-body diagram.



6. Find the magnitude and direction of the force of tension in each of the ropes given that the object tied to the ropes has mass 2.0 kg and is at rest. Include a free-body diagram.