AP Physics 1
## Newton's Laws and Free Body Diagrams
Assessment

Name:_____   Period:_____

Ok pholks, phinally the chance to show your phine physics phinese. Phinish the phollowing phun problems.

1) Two fishermen are pulling a boat through the water, as shown. Each exerts a force of 600 N directed at a 30º angle relative to the forward motion of the boat. If the boat moves with a constant velocity, find the resistive force, F, of the water on the boat.
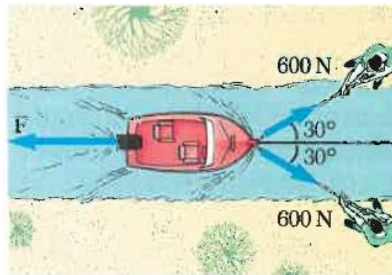
2) Phil Phisikson leaves his physics book on top of a drafting table that is inclined at a 35º angle. The free body diagram below shows the forces acting on the book. Find the net force on the book. Hint: remember to always choose a coordinate system in which as many forces as possible lie on the x- and y-axes.

$F_{table\text{-}on\text{-}book} = 18$ N

$F_{friction} = 11$ N

$F_{gravity\text{-}on\text{-}book} = 22$ N
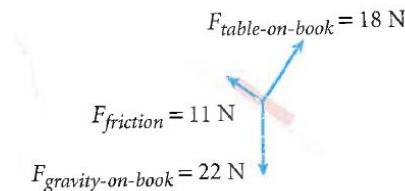
3) The photograph below shows a person pulling a sled. Draw a free body diagram for the sled. The forces acting on the sled are: 60 N by the string, 130 N by Earth, and 90 N normal force.

4) Draw a free body diagram of a football being kicked at the time of impact.

5) Consider the free body diagram below. Label each vector with a description of the force, including the object exerting the force and the object on which the force is acting.

(a)
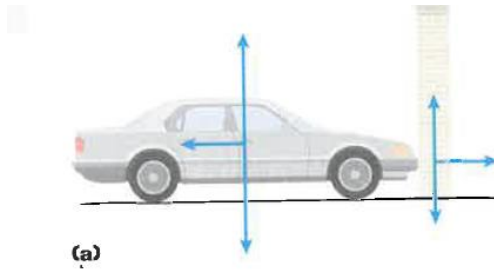
6) A child holds a sled at rest on a frictionless, snow-covered hill, as shown below. If the sled weighs 100 N, find the force the child must exert on the rope and the force the hill exerts on the sled.

40°
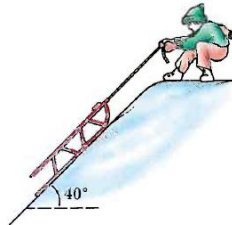
7) An airplane of mass 1.5×10^4 kg tows a glider of mass 0.5×10^4 kg. If the propellers on the airplane produce a forward force of 7.5×10^4 N, what is the tension in the connecting cable if air resistance is ignored? Hint: Sketch the system first and consider the two objects separately.

8) Two objects of masses 10 kg and 5 kg are connected by a light string (meaning its mass may be ignored) that passes over a frictionless pulley, as shown below. The 5 kg object lies on a smooth incline of angle $\theta = 40°$. Find the acceleration of the two objects and the tension in the string.

5 kg

10 kg

40°
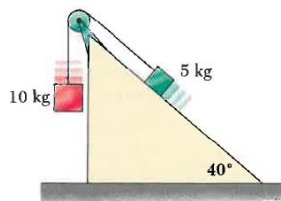
9) Two objects are connected by a light string that passes over a frictionless pulley, as shown. The coefficient of kinetic friction between the 4 kg object and the surface is 0.30. Find the acceleration of the two objects and the tension in the string.

4 kg

7 kg