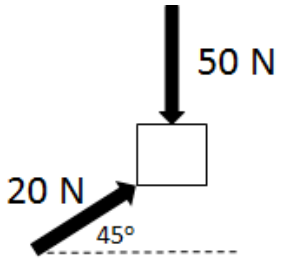
AP Physics C: Mechanics Name: _____

Unit 2 Quiz Class Period: _____

Directions: Show all steps required to arrive at your answer and give answers with the correct units if applicable. **A correct answer with no justification will receive no credit.**

1. Two forces act on an object as shown.

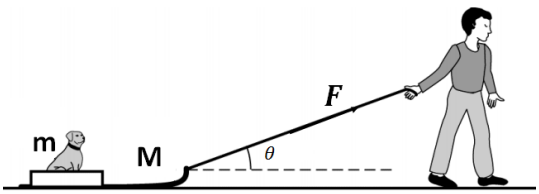
a) If the object has a mass of 5.0 kg, find the acceleration of the object. Give your answer as a vector (remember to include units).



b) Find the magnitude and direction of the equilibrant force (the force needed for the system to be in equilibrium).

2. A sled of mass M is pulled along a rough horizontal surface by a constant applied force of magnitude F that acts at an angle θ to the horizontal, as indicated. A dog of mass m is on the sled. The sled moves at constant velocity.

a) On the figure below, draw and label a free-body diagram showing all the forces on dog/sled system.

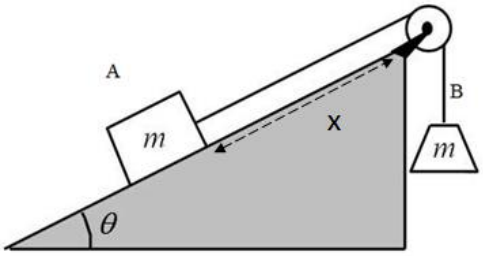


b) Derive an expression for the magnitude of the normal force between the block and ground.

c) Derive an expression for the coefficient of kinetic friction between the block and ground.

d) The dog jumps off the sled. Derive an expression for the acceleration of the sled.

3. Behold the pulley system below in which Block A is on an incline with angle of inclination $\theta = 30^o$. The blocks have equal mass, $m = 10\ kg$.



a) Draw free body diagrams of each block on the diagram below. Clearly label what each force represents.

Block A:

Block B:

b) Determine the minimum coefficient of static friction, μ_s that will keep block A from sliding.

c) At time t = 0, block B is given a nudge downward to start the pulley system in motion. The coefficient of kinetic friction between block A and the incline is $\mu_K = .10$. At time t = 0, block A is a distance of $x = 2.0\ m$ from the top of the incline. Find the time it takes block A to reach the top of the incline.