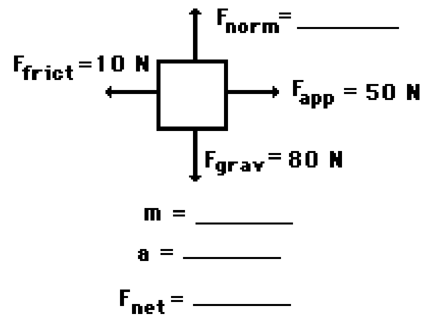
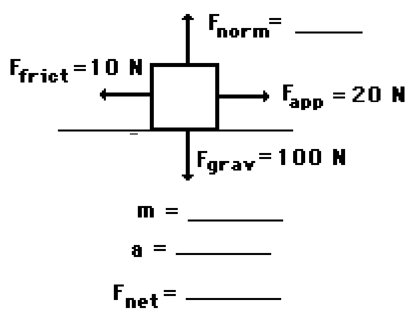
NEWTON'S 2ND LAW PROBLEM W.S.

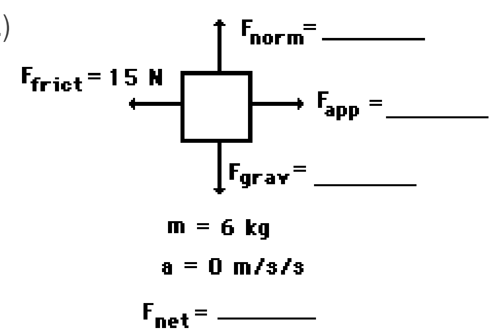
1. An applied force of 50 N is used to accelerate an object to the right across a frictional surface. The object encounters 10 N of friction. Use the diagram to determine the normal force, the net force, the mass, and the acceleration of the object. (Neglect air resistance.)



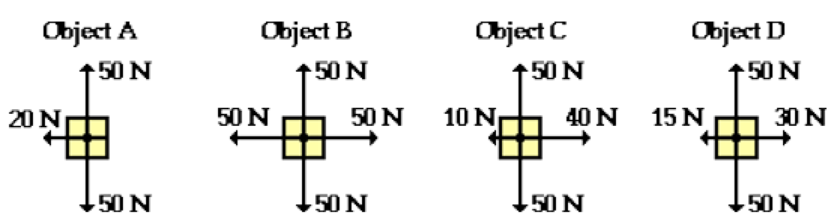
2. An applied force of 20 N is used to accelerate an object to the right across a frictional surface. The object encounters 10 N of friction. Use the diagram to determine the normal force and the net force between the object and the surface, the mass, and the acceleration of the object. (Neglect air resistance.)



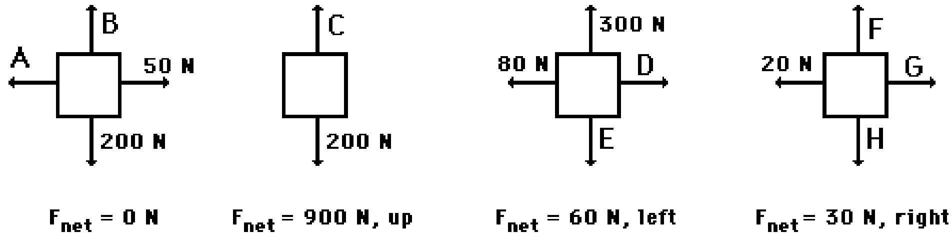
3. A rightward force is applied to a 6-kg object to move it across a rough surface at constant velocity. The object encounters 15 N of frictional force. Use the diagram to determine the gravitational force, normal force, net force, and applied force. (Neglect air resistance.)



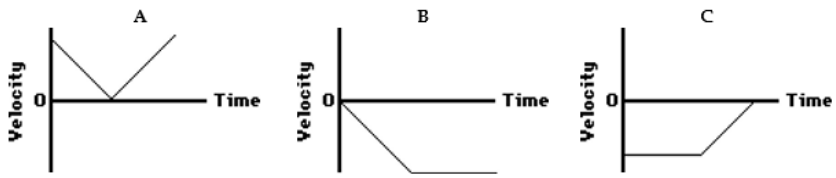
4. These force diagrams depict the magnitudes and directions of the forces acting upon four objects. In each case, the down force is the force of gravity. Rank these objects in order of their acceleration, from largest to smallest:
_______ > _______ > _______ > _______



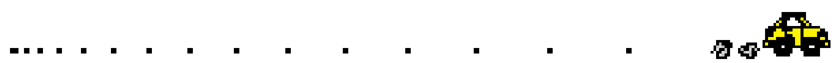
5. Free-body diagrams for four situations are shown below. The net force is known for each situation. However, the magnitudes of a few of the individual forces are not known. Analyze each situation individually and determine the magnitude of the unknown forces.



6. Luke Autbeloe drops a 5.0 kg fat cat (weight = ~50.0 N) off the high dive into the pool below (which on this occasion is filled with water). Upon encountering the water in the pool, the cat encounters a 50.0 N upward restraining force. Which one of the velocity-time graph best describes the motion of the cat? ________ Accompany your answer with a description of the cat's motion.



The direction of the net force is in the same direction as the acceleration. Thus, if the direction of the acceleration is known, then the direction of the net force is also known. Consider the two oil drop diagrams below for an acceleration of a car. From the diagram, determine the direction of the net force that is acting upon the car.

7. ____________ 

8. ____________ 

9. Suppose that a sled is accelerating at a rate of 2 m/s^2. If the net force is tripled and the mass is doubled, then what is the new acceleration of the sled?

10. Suppose that a sled is accelerating at a rate of 2 m/s^2. If the net force is tripled and the mass is halved, then what is the new acceleration of the sled?

11. In a physics lab, Kate and Rob use a hanging mass and pulley system to exert a 2.45 N rightward force on a 0.500-kg cart to accelerate it across a low-friction track. If the total resistance force to the motion of the cart is 0.72 N, then what is the cart's acceleration? Draw a force body diagram too.

12. In a Physics lab, Ernesto and Amanda apply a 34.5 N rightward force to a 4.52-kg cart to accelerate it across a horizontal surface at a rate of 1.28 m/s/s. Determine the friction force acting upon the cart.

13. The maximum force that a grocery bag can withstand without ripping is 250 N. Suppose that the bag is filled with 20 kg of groceries and lifted with an acceleration of 5.0 m/s^2. Do the groceries stay in the bag? **Make a quantitative force diagram. Write a net force equation for the axis along which forces are not balanced.**