Examples Involving Newton's Laws and Friction

1.   A 10.0 kg block is sitting on a table.
    (A)   If a 49 N force is required to overcome friction and start the block moving, calculate the coefficient of static friction.

    (B)   Once the block is moving, it only requires a 39 N force to maintain a constant speed. What is the coefficient of kinetic friction?

2.   A 110 kg crate is moving on a surface with a coefficient of kinetic friction of 0.600.
    (A)   What force is necessary to maintain a constant speed?

(B)   What force is necessary to produce an acceleration of 1.5 m/s^2?

3.   An applied force of 360 N accelerates a 75 kg object across the floor at a rate of 2.5 m/s^2. Find the coefficient of kinetic friction.

4.   If your bathroom scale indicates that your weight is 720 N, what will be the reading on the scales if you stand on it in an elevator that briefly accelerates upward at 1.4 m/s^2?

5.   A yacht is towing 2 speed boats that have broken down. The mass of the larger boat is 1200 kg, while the smaller one has a mass of 850 kg. The tension in the cable to the first speed boat is 550 N. The opposing forces are 250 N on the larger speed boat and 150 N on the smaller one.

(A)   What is the acceleration of the boats?

(B)   How long will it take the yacht to reach a speed of 12 km/h?

(C)   What is the tension in the cable between the two speed boats?

6.   A 60.0 N force acts on a combination of 2 boxes that are next to each other on a frictionless surface. Find the force of A on B.

7.   A 300.0 kg crate is pulled by a worker who exerts a force of 400.0 N at an angle of 35° with the horizontal. The coefficient of kinetic friction is 0.10. Determine the acceleration of the crate.

8.   A carpenter uses a force of 8.5 N applied along a handle, which is attached to a sanding block, to slide the block up the wall at a constant speed. The angle between the handle and the wall is 30.0° and the mass of the block is 0.50 kg. What must be the coefficient of friction between the block and the wall?

9.   An off-shore-oil-worker decides to move a piece of equipment the hard way. The mass of the equipment is 240 kg and the coefficient of kinetic friction is 0.56. What force does he have to apply along the rope so that the piece of equipment will accelerate at 1.5 m/s^2?