Forces in 1D & Newton's Second Law

1. A force is applied to a 50 kg object and results in a constant acceleration of 3.6 m/s^2 on a flat floor. The coefficient of kinetic friction is 0.15.
    a. Calculate the magnitude of the force of friction. (73.6 N)
    b. Calculate the net force. (180 N)
    c. Calculate the applied force. (106.4 N)

2. The net force on a box is 125 N and results in an acceleration of 10.5 m/s^2 along the ground. However, to keep that box moving an applied force of 175 N is required.
    a. Calculate the mass of the box. (12 kg)
    b. Calculate the normal force on the box. (117 N)
    c. Calculate the force of friction acting on the box. (–50 N)
    d. Calculate the coefficient of kinetic friction between the box and the ground. (0.43)

3. A 2 kg ball is dropped straight down. The ball's acceleration is measured to be, –7.6 m/s^2.
    a. Calculate the force of gravity on the ball. (–19.6 N)
    b. Calculate the net force on the ball. (–15.2 N)
    c. Calculate the force of air friction on the ball. (4.4 N)

4. A 13 kg mass starts from 3.1 m/s and is accelerated to 18.6 m/s in 4.5 seconds from an unknown applied force. The coefficient of kinetic friction is 0.24.
    a. Calculate the acceleration of the mass. (3.4 m/s^2)
    b. Calculate the net force on the mass. (45 N)
    c. Calculate the magnitude of the force of kinetic friction on the mass. (31 N)
    d. Calculate the applied force. (76 N)

5. The applied force on a 53 kg mass at rest is 400 N and the coefficient of kinetic friction is 0.29.
    a. Calculate the magnitude of the force of friction. (151 N)
    b. Calculate the net force on the mass. (249 N)
    c. Calculate the acceleration of mass. (4.7 m/s^2)
    d. Calculate the velocity of the mass after 14.5 seconds of constant acceleration. (68.2 m/s)

6. A car is driving against a strong head wind when the driver hits the breaks and locks the tires. The head wind has a force of –2500 N. The car's mass is 250 kg and was initially traveling 35 m/s. The acceleration of the car ends up being, –16.7 m/s^2. Assume that the only other force is static friction between the tires and the road.
    a. Calculate the coefficient of static friction between the tires and the road. (0.68)
    b. Calculate the distance required to stop. (37 m)

7. A large box is pushed along a flat floor. The coefficient of kinetic friction is 0.18. The box has a mass of 75 kg and has a constant acceleration of 2.5 m/s^2.
    a. Calculate the applied force acting on the box. (320 N)
    b. Suppose the box is pushed to a floor that has a coefficient of kinetic friction of 0.36. Calculate the new acceleration if the applied force remains the same. (0.75 m/s^2)