AP Physics C
Review 5 Newton's Laws

1. A can of paint with a mass of 6 kg hangs from a rope.

    a. If the can is pulled up to the rooftop with a constant velocity, what is the tension in the rope?

    b. If the can is to be pulled up to a rooftop with an acceleration of 1.5 m/s^2, what must the tension of the rope be?

    c. If the can is let down with an acceleration of 1.0 m/s^2 want is the tension on the rope?

2. What is the normal force of a crate that has a mass of 150 kg if

    a. it is on a level ground?

    b. It is pulled by a rope that makes an angle of 15° up with a force of 100 N?

    c. it is sitting on an incline of 25°?

    d. it is sliding down an incline of 40°?

3. A crate of mass 20 kg is sliding across a wooden floor. The coefficient of kinetic friction between the crate and the floor is 0.3.

    a. Determine the strength of the frictional force acting on the crate.

    b. If the crate is being pulled by a force of 90 N, (parallel to the floor) find the acceleration.

4. A 10 kg mass hangs over the edge of a table and is connected by a light string to a 2 kg mass on a tabletop that has a coefficient of friction of 0.5.

    a. Compute the acceleration of the blocks.

    b. Find the TENSION in the string.

5. A block slides down an inclined plane that makes an angle of 33° with the horizontal. If the coefficient of kinetic friction is 0.35, find the acceleration of the block.

6. What is the maximum speed an 8.3 kg mass can be whirled horizontally in a circle 80 cm in radius if the string has a breaking strength of 1500 N?

7. A roller coaster car enters the circular loop portion of the ride. At the top of the circle (where people in the car are upside down), the speed of the car is 25 m/s. If the diameter of the loop is 50 m and the total mass of the car (plus passengers) is 1200 kg, find the magnitude of the normal force exerted by the track of the car.

8. A curved section of a highway has a radius of curvature of r. The coefficient of friction between standard automobile tires and the surface of the highway is μ_s.

    a. Draw and label all the forces acting on a car of mass m traveling along this part of the highway.

    b. Compute the maximum speed with which the car of mass m could make it around the turn without skidding in terms of μ_s r, g, and m.

    City engineers are planning on banking this curved section of the highway at an angle of θ to the horizontal.

    c. Draw and label all the forces acting on the car of mass m traveling along this banked turn. Do not include friction.

    d. The engineers want to be sure that a car of mass m traveling at a constant speed v (the posted speed limit) could make it safely around the banked turn even if the road were covered with ice (that is, essentially frictionless). Compute this banking angle θ in terms of r, v, g, and m.