Dynamics Review #1

1) A 970 kg car starts from rest on a horizontal roadway and accelerates eastward for 5.00 s until it reaches a speed of 25 m/s. What is the average force exerted on the car during this time?

2) If you use a horizontal force of 30.0 N to slide a 12.0 kg wooden crate across a floor at a constant velocity, what is the coefficient of kinetic friction between the crate and the floor?

3) A 4500 kg helicopter accelerates upward at 2.0 m/s^2. What lift force is exerted by the air on the propellers?

4) The maximum force a grocery sack can withstand and not rip is 250 N. If 20.0 kg of groceries are lifted from the floor to the table with an acceleration of 5.0 m/s^2, will the sack hold?

5) A boy exerts a 36 N horizontal force as he pulls a 5.5 kg sled across a cement sidewalk at a constant speed.
   a) What does the sled weigh?
   b) What is the coefficient of kinetic friction between the sidewalk and the metal sled runners? Ignore air resistance.

6) A force of 40.0 N accelerates a 5.0 kg block at 6.0 m/s^2. along a horizontal surface.
   a) How large is the frictional force?
   b) What is the coefficient of friction?

7) A 225 kg crate is pushed horizontally with a force of 710 N. If the coefficient of friction is 0.20, calculate the acceleration of the crate.

8) A sled of mass 50.0 kg is pulled along flat snow-covered ground. The static friction coefficient is 0.30, and the kinetic friction coefficient is 0.10.
   a) What force will be needed to start the sled moving?
   b) Once moving, what total force must be applied to the sled to accelerate it at 3.0 m/s^2.

9) A 873 kg dragster, starting from rest, attains a speed of 26.3 m/s in 0.59 s.
   a) Find the average acceleration of the dragster during this time interval.
   b) What is the magnitude of the average net force on the dragster during this time?

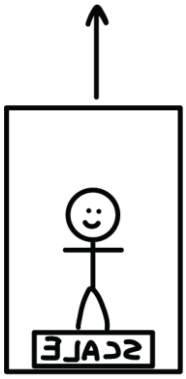
10) A 5.0 g bullet leaves the muzzle of a rifle with a speed of 320 m/s. What force (assumed constant) is exerted on the bullet while it is travelling down the 0.82 m long barrel of the rifle?

11) A 62 kg man stands in an elevator. Determine the man's apparent weight for the following scenarios. (Apparent weight is the normal force)
   a) The elevator is moving upward at a constant speed of 2.2 m/s.
   b) The elevator is accelerating upwards at 1.8 m/s^2.
   c) The elevator is accelerating downwards at 2.5 m/s^2.

12) A 4.8 kg suitcase is sliding across a horizontal floor of an elevator. The coefficient of kinetic friction between the suitcase and the floor is 0.28.
   a) If the elevator is moving upward at a constant speed of 1.6 m/s, find the kinetic frictional force acting on the suitcase.
   b) If the elevator is accelerating upwards at 1.6 m/s^2, find the kinetic frictional force acting on the suitcase.
   c) If the elevator is accelerating downwards at 1.6 m/s^2, find the kinetic frictional force acting on the suitcase.

13) A Pokémon trainer pushes a bag of Pokéballs with a force of 115 N across a horizontal surface. The coefficient of friction between the bag and the surfaces 0.70. The bag accelerates at 4.7 m/s^2. What is the mass of the bag?

14) A 70 kg person is standing on a scale in an elevator.
   a) What will the scale read if he is at rest?
   b) The elevator accelerates upwards at 0.70 m/s^2. What will a scale read?
   c) After reaching a speed of 1.0 m/s. The elevator travels at a constant velocity for 12 s. What is his apparent weight during this time?
   d) After moving upwards at 1.0 m/s for 12 s, the elevator slows down to a stop over 2.5 s. What is his apparent weight?



15) Golem uses strength to move a 100 kg boulder. The force he is able to apply is 900 N. Psyduck tries to help but instead pushes downwards with a force of 150 N. If the boulder accelerates at a rate of 6.8 m/s^2, determine the coefficient of friction between the boulder and the ground.

16) An elevator moving downwards at 1.4 m/s slows to a stop over a distance of 3.0 m. A 65 kg person in the elevator stands on a scale which shows force in Newtons.
   a) What does the scale read?
   b) Compared to when the elevator is at rest, is the scale reading greater, lower or the same? Use principles of physics to explain your answer.