Newton’s Laws

1. Use Newton’s first law to explain why
   1. steel barriers usually separate the cab of a truck from the load,
   2. trucks carrying tall loads navigate corners slowly, and
   3. Customers who order take-out drinks are provided with lids.
2. What happens to the acceleration of an object if
   1. the mass and net force both decrease by a factor of 4?
   2. the mass and net force both increase by a factor of 4?
   3. the mass increases by a factor of 4, but the net force decreases by the same factor?
   4. the mass decreases by a factor of 4, and the net force is zero?
3. The net force acting on a 6.0-kg grocery cart is 12 N [left]. Calculate the acceleration of the cart. [2.0 m/s2 [left]]
4. A net force of 34 N [forward] acts on a curling stone causing it to accelerate at 1.8 m/s2 [forward] on a frictionless icy surface. Calculate the mass of the curling stone. [19 kg]
5. Two athletes on a team, A and B, are practicing to compete in a canoe race. Athlete A has a mass of 70 kg, B a mass of 75 kg, and the canoe a mass of 20 kg. Athlete A can exert an average force of 400 N [forward] and B an average force of 420 N [forward] on the canoe using the paddles. During paddling, the magnitude of the water resistance on the canoe is 380 N. Calculate the initial acceleration of the canoe. [2.7 m/s2 [forward]]
6. A person and an elevator have a combined mass of 6.00 x 102 kg. The elevator cable exerts a force of 6.50 x 103 N [up] on the elevator. Find the acceleration of the person. [1.02 m/s2 [up]]
7. The person in the question above rides the same elevator when the elevator cable exerts a force of 5.20 x 103 N [up] on the elevator. Find the acceleration of the person. [1.14 m/s2 [down]]
8. A 55-kg female bungee jumper fastens one end of the cord (made of elastic material) to her ankle and the other end to a bridge. Then she jumps off the bridge. As the cord is stretching, it exerts an elastic force directed up on her. Calculate her acceleration at the instant the cord exerts an elastic force of 825 N [up] on her. [5.2 m/s2 [up]]
9. A 4.0-kg oak block on a horizontal, rough oak surface is attached by a light string that passes over a light, frictionless pulley to a hanging 2.0-kg object. The magnitude of the force of friction on the 4.0-kg block is 11.8 N. Calculate the acceleration of the system. [1.3 m/s2 [toward pulley], 1.3 m/s2 [down]]