PROBLEM SOLVING WITH NEWTON'S LAWS **Name** ________________________

1) The net force on a 5.0kg bowling ball is 20.0N. What is the acceleration of the bowling ball?

2) A baseball is hit by a bat, with a force of $1.0\text{x}10^3$N, and accelerates at $4.0\text{x}10^3$m/s^2. What is the ball's mass?

3) What net force is needed to accelerate a $3.0\text{x}10^4$kg spacecraft at 2.5m/s^2?

4) An 873kg dragster, starting from rest, attains a speed of 26.3m/s in 0.590s.
   A) What was the acceleration of the dragster?

   B) What was the net force needed to accelerate the dragster?

   C) Assume that the driver has a mass of 68.0kg. What horizontal force does the seat exert on him?

5) How much ***total force*** is needed to accelerate a 2.0kg block of wood at 4.0m/s^2 along a rough table, against a force of friction of 10.N?

6) A 0.50kg cart, initially at rest, accelerates at 3.0m/s^2 over a distance of 10.m.

    A) What net force is acting on the cart?

    B) How fast is the cart moving at the end of the track?

    C) How long did it take the cart to travel the 10.m down the track?

7) A fully loaded Saturn V rocket has a mass of 2.92x10^{6}kg. It's engines have a thrust upward of 3.34x10^{7}N.

    a. What is the downward force, caused by gravity, on the rocket at blastoff?

    b. What is the net force on the rocket at blastoff?

    c. What is the acceleration of the rocket as it leaves the launch pad?

d. As the rocket travels upwards, the engine thrust remains constant, but the ***mass*** of the rocket decreases. Why?

e. Does the acceleration of the rocket increase, decrease, or remain the same as the engines continue to fire? Explain your answer using Newton's laws.

8) A force of 36N gives a mass (m_1) an acceleration of 4.0m/s^2. The same force gives another mass (m_2) an acceleration of 12m/s^2. What acceleration will this same force give if $m_1$and m_2 are fastened together?

9) A man, with a mass of 1.0x10^{2}kg, slides across a frozen lake with an initial speed of 5.5m/s. Friction slows him, and after 4.3s he comes to a stop.

   a. What was his acceleration?

   b. What was the net force, caused by friction, that caused him to stop?

   c. How far did he slide across the lake?

10) Two toboggans are connected by a rope. The first toboggan has a mass of 60.kg and the second has a mass of 40.kg. The two toboggans are pulled by a rope connected to the front of the first toboggan. The force exerted by the rope is 250N. Ignore any friction forces here.

   a. What is the acceleration of the two toboggans together?

   b. What is the tension, force, in the rope connecting the toboggans?

11) If your weight, the gravitational pull on your body, is the action force, what is the reaction force?

12) A friend thinks that since when a bullet fires there is an equal but opposite force backward, it would seem that these forces are balanced, and would cancel out. It is then impossible for a gun to fire a bullet. How would you enlighten your confused friend?

13) An 80.0kg man is riding in a car that was moving at 25.0m/s until it strikes a large tree and comes to rest after it travels for 0.800m. What was the force that the man experienced?