Name:_____ Period:_____

Which Law? Newton's Laws Review Worksheet – Due *Tuesday, 11/15/11*

Instructions: Each of the items below is best represented by one of Newton's Laws of Motion. Write a 1, 2 or 3 for each of the following to indicate whether it's Newton's 1st Law, Newton's 2nd Law, or Newton's 3rd Law. ***Don't worry if you are unsure – I'll help you with this on Monday when I get back***!

_____1. A climber pulls down on a rope causing his body to lift upward and rise up along the rope.

_____2. Force = Mass x Acceleration

_____3. Two bumper cars collide into each other and each car jolts backwards.

_____4. When you give your friend a lift on your bike you have to pedal harder and faster to keep the same speed (and acceleration) as you had before when you were on your bike alone.

_____5. For every action there is an equal and opposite reaction.

_____6. A smaller cannon ball leaves a cannon much faster than a larger, heavier cannon ball fired from the same cannon.

_____7. When you are standing in a subway train, and the train suddenly stops, your body continues to go forward.

_____8. An object at rest/motion will stay at rest/ motion unless acted on by an outside, unbalanced force.

_____9. It is much easier to carry your backpack when it is empty rather than when it's full of textbooks.

_____10. A boy is going down a slide. As he reaches the bottom, friction causes him to slow down and stop.

_____11. As the wheels of a drag racing car smoke and spin backwards, they eventually begin to grip the race track and push backwards on the road. In turn, the road reacts by pushing the wheels forward.

_____12.When you throw a bowling ball out of a canoe, the bowling ball moves forward and the canoe moves backward.

_____13. A little girl who has been pulling a sled behind her in the snow is crying because when she stopped to tie her shoe, the sled kept moving and hit her in the back of the leg.

_____14. A grocery cart is sitting motionless in the parking lot at Wal-mart. You decide to jump in and your friend pushes you around.

_____15. A basketball sits in the ball cage in the gym. It remains motionless.

Name:_____

Period:_____

Newton's 2nd Law Review – Due *Tuesday, 11/15/11*

Isaac Newton expressed the relationship between force, mass, and acceleration in his second law. This law is so important that it became the basis for much of modern physics. In fact, Newton's contribution to science was so great that the unit for force, the newton (N), was named after him. A newton is defined as the force needed to produce an acceleration of 1 m/s² on a 1 kg object. Therefore, 1 N = 1 kg × 1 m/s². The equation for Newton's second law is given below.

EQUATION: Force = mass × acceleration

$F = m \times a$

If you know two of the values in this equation, you can calculate the third by changing the equation around, as follows:

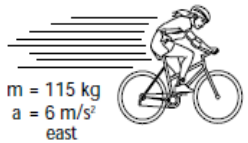
$$\text{acceleration} = \frac{\text{Force}}{\text{mass}} \quad \textit{and} \quad \text{mass} = \frac{\text{Force}}{\text{acceleration}}$$

SAMPLE PROBLEM: A soccer ball accelerates at a rate of 22 m/s² forward when kicked by a player. The soccer ball has a mass of 0.5 kg. How much force was applied to the ball to produce this acceleration?

Force = mass × acceleration
Force = 0.5 kg × 22 m/s²
Force = 11 kg × m/s²
Force = **11 N**

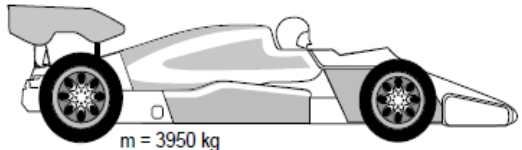
Calculate the force necessary to accelerate the following vehicles at the rate of acceleration shown in the illustration.

a.



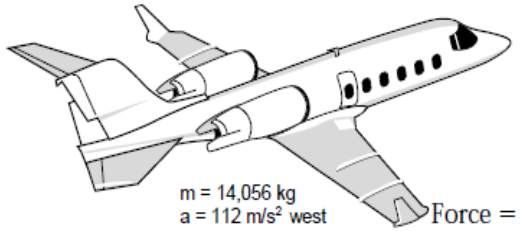
Force = _____

b.



Force = _____

c.



Force = _____

How much force is needed to move a 0.1 kg snowball at a rate of 15 m/s² upward?

_____

_____

A 0.02 N push accelerates a table-tennis ball along a table at 8 m/s² north. What is the mass of the ball?

_____

_____

At lift-off, an astronaut on the space shuttle experiences an acceleration of approximately 35 m/s² upward. What force does an 80 kg astronaut experience during this acceleration?

_____

_____

What is the acceleration of a train with a mass of 3.2×10^9 kg that pushes itself forward with 2.4×10^{10} N of f[illegible]

OMIT!

_____

_____