Name: _____

Newton's Laws of Motion Notes

Newton's 1st Law of Motion: Objects in _____, stay in motion and objects at rest stay at _____ unless acted upon by an outside _____.

So what does this mean? Let's apply this law to you sitting in a chair. If no one touches your chair and it stays structurally intact, what will happen?

Now what happens if someone comes along and pulls your chair out from under you?

In either situation, you model Newton's 1st Law of Motion (refer back to the definition). Newton's 1st Law of Motion is also known as The Law of Inertia. Inertia is the tendency of an object to _____ a change in motion. Would you agree that an object with more mass is harder to move? _____ Now if the object is in motion, would it be harder or easier to stop if it had a lot of mass? Consider stepping in front of someone riding a bicycle versus stepping in front of a truck moving at the same speed as the bicycle. Which situation would result in the better outcome and why?

_____ Therefore inertia is related to mass. More mass = more inertia, harder to move, harder to stop if already moving and connected back to _____.

Newton's 2nd Law of Motion: Building upon Newton's 1st Law of Motion, in order to achieve a change in an object's inertia, a force is needed. A _____ is simply a push or a pull. Newton's _____ Law relates an object's mass, force, and _____. Various forms of this equation are shown below:

$F = ma$ $\quad a = \frac{F}{m}$ $\quad m = \frac{F}{a}$

Units for mass are typically kg for _____
Units for acceleration are _____ for meters per second per second
This means the units for force are $kg \cdot m/s^2$ which is also conveniently referred to as a Newton (____).

Assume a cement mixer and a race car are drag racing. Which one has the greater acceleration if the forces acting on both are the same?

Now let's apply Newton's 2nd Law of Motion to confirm our statement.

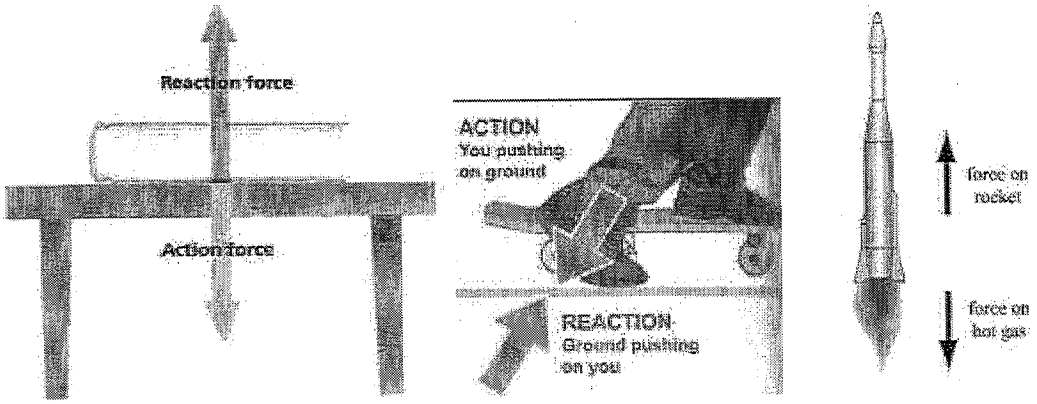
$a = \frac{F}{m}$

So as mass increases, acceleration _____. If mass decreases, acceleration _____. This shows an _____ relationship between mass and acceleration. Mass tends to resist acceleration!

How much force is needed to accelerate a 5 kg ball at 2 m/s^2?

What is the acceleration of a .5 kg rock thrown with a force of 4 N?

Newton's 3rd Law of Motion: For every action, there is an _____ but opposite _____. Forces exist in pairs! Think cause and effect.



When you jump off the ground what are the action and reaction forces?

Why doesn't the Earth accelerate as much as you do when you jump?

Do action and reaction forces cancel each other out? Why or why not?

If a bug hits the windshield of a car, it applies a force to the car and the car applies a force to it. Which object, the car or the bug applies the greater force?