## Forces and Motion Review

## Newton's Laws of Motion

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Newton's 1st Law - "Law of Inertia" an object at rest remains at rest, and an object in motion remains in
motion at a constant speed and in a straight direction unless acted upon by another force.
Inertia- is the tendency of an object to remain at rest or in constant motion unless a force acts on it.
Newton's 2nd Law - the acceleration of an object depends on the mass of the object and the size of the net force applied

- acceleration = force/ mass or $\mathrm{F}=\mathrm{M}^{*} \mathrm{~A}$
- the direction of acceleration depends on the direction of the forces applied to the object

Newton's 3rd Law - "Law of action and reaction" when a force is applied to an object, the object exerts an equal force in the opposite direction (for every action there is an equal and opposite reaction)
Momentum - a measure of the force needed to stop a moving object

- depends on the object's mass and velocity
- total momentum before collision = total momentum after

Position: the location of an object
Reference Point: any object that is not moving and can be used to describe the position of another object
Distance: the length of a line between two points
Direction: the path that a moving object follows
Motion: a change in an object moves in a certain amount of time; Distance/ Time
Force: a push or pull on an object

- objects move in the direction of the applied force.
- a force can change the direction of an object's motion and the speed.
- the greater the mass, the less the motion.
- objects that weigh less can move faster

Mass: how much matter makes up an object
Matter: anything that has mass and takes up space
Gravity: a force that pulls all objects toward each other.

- the more mass an object has the greater pull of gravity but it also has more inertia which is why a less massive object falls at the same rate
- the closer two objects the stronger the pull of gravity.

Friction: a force that acts against motion

- cause objects to move slower and eventually stop moving

Speed: a measure of how far an object moves in a certain amount of time; Speed = distance $\div$ time Velocity: speed and direction
Acceleration: any change in speed or direction (velocity)
Inertia: an objects resistance to changes in its state of motion
Balanced Force: forces balance or cancel each other out - NO ACCELERATION.
An object that is stopped or moving at a constant speed is balanced.
Unbalanced Force: forces on an object are not fully cancelled - object accelerates (velocity change)
Action/reaction: when one object applies a force to a second object it is the action, the reaction is force that pushes back. Rocket engine pushes gases out pushing against the rocket - reaction is the gases going out the nozzle of the rocket.
Gravity - the force of any to objects with mass - all object have gravity

- The larger the mass, the greater the gravitational force
- The closer the objects to one another the greater the force

Weight: force of gravity on an object - different at different elevations and different planets etc.

Forces and Motion Review

DISTANCE vs. Time Graphs

| Object is stopped | Constant Speed | Acceleration | Dotted line is faster |
| :---: | :---: | :---: | :---: |
|  |  |  |  |

SPEED vs. Time Graphs:


Graph Summary


THIS JUST IN! INCREDIBLE I KEEPS OBJECTS MOVING OR RESTING (DOING WHAT THEY WERE $\qquad$ )!


The amount of inertia is determined or caused by the m $\qquad$ of an object. Objects with more mass have more inertia because they are harder to s $\qquad$ (if in motion) or harder to put into motion (if already at rest).
Answer these questions on a separate sheet of paper:

1. What is inertia? Inertia is a property of motion that says that
2. Do resting objects have inertia?
3. Do moving objects have inertia?
4. What measurement determines how much inertia an object has?
5. If no force acts on an object in motion, what will that object do?
6. If no forces act on an object that is still, or at rest, what will that object do?
7. Explain what this cartoon has to do with inertia:
(hint: when you read the text bubble, justify means to use evidence for your argument)

| What happens when you <br> "slide" on the floor with shoes <br> on? | What happens when you "slide" <br> on the dirt road or on a carpet? |
| :--- | :--- |
| What happens when you <br> "slide" on the floor with socks <br> on? | Do rough sur faces have more <br> friction or less friction? |
| On surfaces with more friction, <br> do objects move faster or <br> slower? | What could you do to a smooth <br> surface if you needed to <br> increase friction/ decrease <br> speed(give specific examples): |

What could you do to DECREASE friction when it became a problem (ex- an object is too heavy to move on a rough surface,
 door hinges are squeaky because they have too much friction/are too dry, your car or bike is going too fast)

1. Would a ball move faster over a large piece of sandpaper or on a mirror? Why?
2. Susan was playing hockey on a frozen lake. She hit the hockey puck with as much force as she could, but it soon stopped on the ice. If inertia is true, it seems that the hockey puck should be able to slide forever. Why did the hockey puck stop?
3. A box is sliding down a ramp. Friction between the box and the ramp will:
A) increase the box's speed
C) increase the box's mass
B) decrease the box's speed
D) decrease the box's mass
