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Newton's Three Laws of Motion

By Sharon Fabian

Isaac Newton was born in 1643. His family was wealthy, so in some ways he had advantages over other kids his age, but in other ways he was disadvantaged. Isaac's father had died before Isaac was born, and he was raised by his grandmother and other relatives. At first he probably was not encouraged to learn much in school. He didn't pay attention in school and was described as lazy. It was only after an uncle encouraged him to prepare to go on to college that he began to take an interest in school and to develop his talents. One of the skills he developed while still in school was making model machines, including clocks and windmills. In college he began studying the latest theories in math. Soon he was coming up with theories of his own, and today Sir Isaac Newton is well known for his three laws of motion as well as for other scientific breakthroughs.

Here are Sir Isaac Newton's three laws of motion.

Law 1 - An object moving in a straight line will continue moving in a straight line unless acted on by an outside force. Also, an object at rest will stay at rest unless acted on by an outside force. The word for this is inertia.

Law 2 - Force will cause a change in the motion of an object. The change in motion depends on the amount of force and the mass of the object. There is a formula for this: $F = ma$ (force equals mass times acceleration).

Law 3 - For each action, there is an equal and opposite reaction.

These three laws will make more sense, and be a lot more interesting, if you do some experiments to demonstrate each law. Maybe Sir Isaac did some similar experiments when he was testing out his theories.

To demonstrate the first law, you might want to try the old trick of pulling the tablecloth out from under the dishes on the table. If you do it just right, you will remove the tablecloth without causing the dishes to crash to the floor. Then again, maybe you wouldn't

want to try that one, even though Newton's first law says that objects at rest, like the dishes, will stay at rest.

Another way to demonstrate inertia is to show what can happen when you don't wear your seat belt. A safe way to demonstrate this is with a small toy truck, a clay figure, a ramp, and a brick. Place the little clay figure in the toy truck. Place the brick just a short distance past the end of the ramp. The toy truck can roll down the ramp until it hits the brick. When it hits the brick, the truck will stop suddenly, but the clay figure will keep moving forward and fly out of the truck because of inertia.

For the second law, there are many demonstrations that you can do. Anything that involves using a force to move an object would demonstrate Newton's second law. You might want to try an experiment in which you change the amount of force that you use or change the mass of the objects that you try to move. For example, you could set up a little seesaw, made from a ruler balanced on a pencil. Try objects of different weights at the one end and drop something on the other end to see which object moves the farthest. Or, try dropping the objects from different heights.

The third law is fun to demonstrate. One way is with a basketball and roller skates. Two kids, each wearing roller skates, stand facing each other and throw a basketball back and forth. As each kid pushes the basketball forward, he will roll backwards on his skates. That is the equal and opposite reaction described in the third law. You can also build a balloon racer to demonstrate the third law. Tie a string between two chairs, pretty far apart. Put an empty pen case or a section of a straw on the string so that it can slide along the string. Now blow up a balloon but don't tie it. Carefully tape the balloon to the pen case or straw, then let go. The action of the air shooting out of the balloon causes a reaction of the balloon racing across the string towards the opposite end.

If you don't feel like doing experiments, you can always observe Newton's laws of motion in another location, an amusement park. Roller coasters, merry-go-rounds, and bumper cars all follow Newton's three laws of motion and are part of the science of force and motion.

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Newton's Three Laws of Motion

Questions

- _____ 1. Sir Isaac Newton's only discovery was the three laws of motion.
- A. true
 - B. false
- _____ 2. According to the first law, an object that is sitting still will stay that way unless acted on by an outside force.
- A. true
 - B. false
- _____ 3. The formula $F = ma$ means "force equals motion times acceleration."
- A. false
 - B. true
- _____ 4. The third law says that some actions will produce an equal and opposite reaction.
- A. false
 - B. true
- _____ 5. Sir Isaac Newton probably never conducted any experiments.
- A. false
 - B. true
- _____ 6. One word that sums up the first law is:
- A. force
 - B. motion
 - C. acceleration
 - D. inertia

7. Bumper cars are an example of Newton's third law. Explain.

8. Which law might require you to do some math calculations?

A roller coaster is a good example of more than one of Newton's laws of motion. Explain.
