

## Newton's Second Law of Motion

[MUSIC PLAYING] Now let's look at Newton's second law of motion. This law describes what happens to a moving object when a force is applied to it. This batter will strike the pitched ball, and change the ball's direction. Oops, I mean he will try to strike the ball and change its direction. Well, if he does make contact with the ball, the force of his swing and the bat that he is holding will accelerate the ball in a different direction.

There, the ball is hit. It travels in the direction in which the force is applied. If the batter hits it straight on, the ball will change direction and travel in the direction of the swing. How much it accelerates depends on the strength of the force, and the mass of the ball. Mass is not the same as an object's weight. Weight is a measure of gravitational pull, and it changes as an object it's farther from the Earth.

Mass doesn't change. It is a measure of an object's inertia. The greater the mass, the harder it is to get the object to start or stop moving. As we add more mass to this cart, the amount of force required to get the cart going increases. Newton found that the higher the mass of an object, the greater the force must be to change the object's motion.

That's why we don't play softball with a shot-put. There would never be a home run, and bean balls would be lethal. So the second law of motion says that the change of motion of an object depends on the size of the force, and the mass of the object. The greater the force, the greater the resulting acceleration. The greater the mass, the smaller the resulting acceleration.

It is harder to stop a train than it is to stop a car, even when the car is moving faster. That's because the train has a greater mass than the car, and will require a greater force to slow it down. We say the train has greater momentum.

Momentum is the strength of an object's motion. The more mass an object has the greater its momentum. Momentum is determined by multiplying the mass of a moving object by its speed. The faster an object travels, the greater its momentum.

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