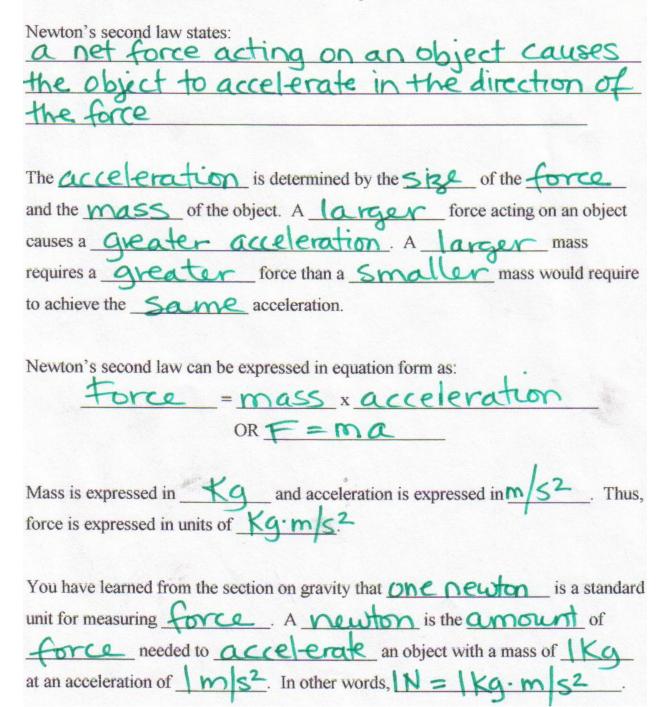
Accelerated Motion

Newton's Second Law

With Newton's first law, you learned that the motion of an object only changes if a net force acts on it, such as the brakes of a car, or a fast moving hockey stick. Newton's second law elaborates on other components of motion and forces.



Force Problems

How much force is needed to accelerate a 70-kg rider and her 200-kg motorcycle at $4m/s^2$?

mass of rider (mr) = 70kg $F = 270kg \cdot 4m/s^2$ mass of motoraple = 200kg $acc = 4 m/s^2 = 270kg \cdot 4m/s^2$

It takes a force of 3000 N to accelerate an empty 1000-kg car at 3m/s2. If a 160-kg wrestler is inside the car, how much force will be required to produce the same acceleration?

 $F = m \cdot a = (1000 \text{kg} + 160 \text{kg})(3 \text{m/s}^2)$ = 3480 N

A 63-kg skater pushed off from a wall with a force of 300 N. What is the skater's acceleration?

$$A = \frac{1}{m}$$
, $= \frac{300 \,\text{N}}{63 \,\text{kg}} = \frac{300 \,\text{Kg} \cdot \text{m/s}^2}{63 \,\text{kg}} = \frac{4.76 \,\text{m/s}^2}{63 \,\text{kg}}$

Falling Objects

It's hard to believe, but if you drop a bowling ball and a marble from a bridge at the same instant, they'd both splash into the water at almost the same instant. This means their <u>accelerations</u> would be about the same. Would you have expected the bowling ball to hit the water first because it has more mass? It's true that the force of <u>avavity</u> would be greater on the bowling ball because of the larger <u>mass</u>. But larger mass also gives the bowling ball more <u>inertia</u>, so more <u>force</u> is needed to change its <u>velocity</u>. The marble has a much smaller mass than the bowling ball, but its <u>inertia</u> is also less.

Near Earth's surface, gravity causes all falling objects to accelerate at 9.8 m/s? Does the number 9.8 seem familiar? It

