The Law of Acceleration

Newton's second law of motion can be formally stated as follows: The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.

Another way to write this would be to use the equation

**Force = Mass X Acceleration** or **F= MA**

The acceleration of an object depends directly upon the net force acting upon the object, and inversely upon the mass of the object. As the force acting upon an object is increased, the acceleration of the object is increased. As the mass of an object is increased, the acceleration of the object is decreased.

For example, one soccer player could kick a 400kg soccer ball and it accelerates at 5 m/s2. His force would be 2000N.

Another soccer player could kick the same 400kg soccer ball, but it accelerates at 10 m/s2. His force would be 4000N.

The ball traveled much faster in the second scenario because the second soccer player applied a much greater force to the soccer ball, which had the same mass.

Which formula(s) is associated with Newton’s second Law?

A. F = MA

B. M = F/A

C. A = F/M

D. All 3 are correct. They are just rearranged differently.

What would be another good title for this passage?

A. The Acceleration of a Ball

B. Newton’s Second Law Explained

C. Laws of Motion

D. Isaac Newton’s 3 Laws of Motion

Why did the soccer ball accelerate faster in the second scenario?

A. The force was increased

B. The mass was increased

C. The force was decreased

D. Both force and mass were increased

What is the net force acting on a 15 kg sled that accelerates at 5m/s2?

A. 45 N

B. 3 N

C. 75 N

D. 30 N

1. Go to <http://www.physicsclassroom.com/Concept->
2. Builders/Newtons-Laws/Balanced-Unbalanced-Forces

There are 12 different situations to analyze and three ability levels. Each situation involves two questions: Is the object speeding up, slowing down, or constant speed motion? and Are the forces balanced or unbalanced? Question-specific help is provided for each of the 12 situations. The built-in score-keeping makes this Concept Builder a perfect candidate for a classroom activity. A handout is provided inside this packet.

1. Go to https://goo.gl/5aDZGk

2. Select 3 different person and cart combinations and write your

equations and answers on the lab sheet.

3. What happens to the acceleration if you apply the same force to a smaller mass?

4. How could you rearrange the formula to solve for force?

5. Write your own word problem to solve for force and then solve it.

(hint: you will need a mass and acceleration)

6. How does this activity relate to Newton’s 2nd Law?

**Go to http://www.physicsclassroom.com/Concept-Builders/Newtons-Laws/Balanced-Unbalanced-Forces**

**Complete** the Concept Builder at the **Apprentice Level** in order. There are different situations to analyze and three ability levels. Each situation involves two questions: Is the object speeding up, slowing down, or constant speed motion? and Are the forces balanced or unbalanced? Question-specific help is provided for each of the situations. The built-in score-keeping makes this Concept Builder a perfect candidate for a classroom activity.