

# Newton's Second Law of Motion

To make an object (matter) accelerate, you need to apply a force to it. A force can be defined as a push or a pull that changes the position or motion of matter.

How fast the object accelerates depends on 2 factors:

- 1- How much force is applied to it.
- 2- The mass of the object.

Acceleration is directly proportional to the force you apply. For example, if the force is doubled the acceleration is doubled.

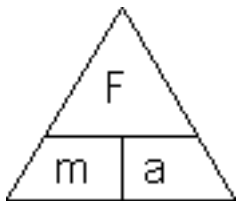
Acceleration is inversely proportional to its mass.

For example, if the mass is doubled the acceleration is halved.

Use the formula

$$a = \frac{f \text{ (force in Newtons)}}{m \text{ (mass in kilograms)}}$$

The triangle formula is:



**Example 1: How much force is needed to accelerate a ball that is .5kg to 15 m/s<sup>2</sup> ?**

$$F=ma \quad F = .5 \text{ kg} \times 15 \text{ m/s}^2, \quad F = 7.5 \text{ Newtons (N)}$$

**Example 2: What is the mass of an object that has a force of 25 N applied to it and it accelerates to 400 m/s<sup>2</sup> ?**

$$m=F/a \quad m = 25 \text{ N} / 400 \text{ m/s}^2, \quad m = .0625 \text{ kg}$$