

3.1 Newton

3.1.1 Unit

A newton is defined as $1 \text{ kg}\cdot\text{m}/\text{s}^2$ (it is a derived unit which is defined in terms of the SI base units). One newton is therefore the force needed to accelerate one kilogram of mass at the rate of one metre per second squared in the direction of the applied force. The units „metre per second squared“ can be understood as measuring a rate of change in velocity per unit of time, i.e. an increase in velocity by 1 metre per second every second. Visualisation of this is seen on figure 3.1.



Figure 3.1: Visualisation of Newton

In 1946, the Conférence Générale des Poids et Mesures (CGPM) Resolution 2 standardized the unit of force in the MKS system of units to be the amount needed to accelerate 1 kilogram of mass at the rate of 1 metre per second squared. In 1948, the 9th CGPM Resolution 7 adopted the name newton for this force.¹ The MKS system then became the blueprint for today's SI system of units. The newton thus became the standard unit of force in the Système international d'unités (SI), or International System of Units.

The newton is named after *Isaac Newton* (see chapter ??). As with every SI unit named for a person, its symbol starts with an upper case letter (N), but when written in full it follows the rules for capitalisation of a common noun; i.e., „newton“ becomes capitalised at the beginning of a sentence and in titles, but is otherwise in lower case.

In more formal terms, Newton's second law of motion states that the force exerted on an object is directly proportional to the acceleration hence acquired by that object, thus equation (3.1), where m represents the mass of the object undergoing an acceleration a :

$$F = ma \quad (3.1)$$

3.1.2 Isaac Newton

Sir Isaac Newton FRS (25 December 1642 - 20 March 1726/27) was an English mathematician, physicist, astronomer, alchemist, theologian, and author who was described in his time as a natural philosopher. He was a key figure in the Scientific Revolution and the Enlightenment that followed. His pioneering book *Philosophiæ Naturalis Principia Mathematica* (Mathematical Principles of Natural Philosophy), first published in 1687, consolidated many of his previous results and established classical mechanics. Newton also made seminal contributions to optics, and shares credit with German mathematician Gottfried Wilhelm Leibniz for developing infinitesimal calculus.^[5]

¹more here: https://books.google.cz/books?id=YvZNdSdeCnEC&pg=PA17&redir_esc=y#v=onepage&q&f=false