

## Topic Page: [Balances \(Weighing instruments\)](#)

Definition: **balance** from *The Hutchinson Unabridged Encyclopedia with Atlas and Weather Guide*

Apparatus for weighing or measuring mass. The various types include the **beam balance**, consisting of a centrally pivoted lever with pans hanging from each end, and the **spring balance**, in which the object to be weighed stretches (or compresses) a vertical coil spring fitted with a pointer that indicates the weight on a scale. Kitchen and bathroom scales are balances.

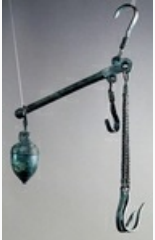


Image from:

[Steelyard balance with bronze hook for hanging goods to weigh and acorn counterweight decorated with stripes at top, artifact uncovered in Pompeii, Campania, Italy, Roman Civilization, 1st century in Bridgeman Images: DeAgostini Library](#)

Summary Article: **balance**

From *The Columbia Encyclopedia*

instrument used in laboratories and pharmacies to measure the mass or weight of a body. A balance functions by measuring the force of gravity that the earth exerts on an object, i.e., its weight. Since the mass of an object is directly proportional to its weight, a balance can also be used to measure mass.

### Types of Balances

#### *The Equal-Arm Balance*

The simplest type of balance, the equal-arm, or beam, balance, is an application of a lever. A uniform bar, the beam, is suspended at its exact center on a knife-edge set at right angles to it. The point of support is called the fulcrum. Two pans of equal weight are suspended from the beam, one at each end, at points equidistant from the fulcrum. Since the center of gravity of a uniform bar is at its midpoint, the beam supporting the pans will be in equilibrium, i.e., will balance on the knife-edge. A long pointer attached at right angles to the beam at the fulcrum indicates zero on a scale when the beam is at rest parallel to a level surface. It shows also the extent of swing of the beam on one side or the other, acting somewhat as a pendulum, when the beam is coming to rest. The object to be weighed is placed on one pan, and standard weights are added to the other until the balance of the beam is

established again. The unknown weight can then be determined by adding up the standard weights in the pan.

The platform balance is a form of equal-arm balance in which two flat platforms are attached to the top side of the beam, one at each end. Such a balance has a rider, or weight, mounted on a bar that has a calibrated scale, is parallel to the beam, and connects the supports of the two platforms. This rider is moved along the bar, its edge marking decimal fractions of the unit weight.

#### *The Unequal-Arm Balance*

On the unequal-arm balance the beam is suspended at a point a very short distance from one of its ends. The object to be weighed is placed on this end, and a small known weight is moved out along the longer arm until balance is obtained. The unknown weight is then determined by using a formula involving the known weight and the distance of each weight from the fulcrum. One example of this type of balance is the steelyard, an ancient device still used in underdeveloped nations because of its portability and low cost; since the difference in length of the arms can multiply the effect of the smaller

weight by a factor of 100 or more, a small steelyard hung from a tree can be used, for example, to weigh a side of beef.

### *The Spring Balance*

A spring balance consists of a coiled spring fixed to a support at one end, with a hook at the other to which the body to be weighed is applied. Within the spring's limit of elasticity, the distance through which it is stretched is directly proportional to the weight of the applied body. A pointer and graduated scale attached to the spring convert this distance into a weight reading.

### **Accuracy of Balances**

Although extremely accurate results can be obtained in measuring the weights of minute objects, it is physically impossible to construct any balance perfect enough to yield absolutely accurate determinations. For example, the analytical balance, a type of equal-arm balance, is used for delicate weighing in quantitative chemical analysis and in preparing pharmaceutical prescriptions; it must be kept in a glass case, since its accuracy is easily affected by dust and moisture. A spring balance does not retain its accuracy permanently, for no matter how carefully it is handled, the spring very gradually uncoils even though its limit of elasticity has not been exceeded.

For ordinary purposes the errors are so small that they are considered insignificant, but in chemical analysis it has been necessary to develop methods by which they can be further minimized. A so-called torsion balance, which depends on the twisting of a wire or thread, is employed for weighing, but the term is commonly used to indicate a device for measuring minute electrical and magnetic forces.

See scale.

#### **APA**

Chicago

Harvard

MLA

---

balance. (2018). In P. Lagasse, & Columbia University, *The Columbia encyclopedia* (8th ed.). New York, NY: Columbia University Press. Retrieved from <https://search.credoreference.com/content/topic/balance>

---



*The Columbia Encyclopedia*, © Columbia University Press 2018



*The Columbia Encyclopedia*, © Columbia University Press 2018

## APA

balance. (2018). In P. Lagasse, & Columbia University, *The Columbia encyclopedia* (8th ed.). New York, NY: Columbia University Press. Retrieved from <https://search.credoreference.com/content/topic/balance>

## Chicago

"balance." In *The Columbia Encyclopedia*, by Paul Lagasse, and Columbia University. 8th ed. Columbia University Press, 2018. <https://search.credoreference.com/content/topic/balance>

## Harvard

balance. (2018). In P. Lagasse & Columbia University, *The Columbia encyclopedia*. (8th ed.). [Online]. New York: Columbia University Press. Available from: <https://search.credoreference.com/content/topic/balance> [Accessed 18 November 2019].

## MLA

"balance." *The Columbia Encyclopedia*, Paul Lagasse, and Columbia University, Columbia University Press, 8th edition, 2018. *Credo Reference*, <https://search.credoreference.com/content/topic/balance>. Accessed 18 Nov. 2019.