Computer

Computer is an electronic machine. A computer is a general purpose device that can be [programmed](https://en.wikipedia.org/wiki/Computer_program) to carry out a set of [arithmetic](https://en.wikipedia.org/wiki/Arithmetic) or [logical](https://en.wikipedia.org/wiki/Boolean_algebra) operations automatically. Since a sequence of operations can be readily changed, the computer can solve more than one kind of problem.

Conventionally, a computer consists of at least one [processing element](https://en.wikipedia.org/wiki/Processing_element), typically a [central processing unit](https://en.wikipedia.org/wiki/Central_processing_unit) (CPU), and some form of [memory](https://en.wikipedia.org/wiki/Memory_(computers)). The processing element carries out arithmetic and logic operations, and a sequencing and control unit can change the order of operations in response to stored [information](https://en.wikipedia.org/wiki/Data). [Peripheral devices](https://en.wikipedia.org/wiki/Peripheral) allow information to be retrieved from an external source, and the result of operations saved and retrieved.

The [Antikythera mechanism](https://en.wikipedia.org/wiki/Antikythera_mechanism) is believed to be the earliest mechanical analog computer, according to [Derek J. de Solla Price](https://en.wikipedia.org/wiki/Derek_J._de_Solla_Price). It was designed to calculate astronomical positions. It was discovered in 1901 in the [Antikythera wreck](https://en.wikipedia.org/wiki/Antikythera_wreck) off the Greek island of [Antikythera](https://en.wikipedia.org/wiki/Antikythera), between [Kythera](https://en.wikipedia.org/wiki/Kythera) and [Crete](https://en.wikipedia.org/wiki/Crete), and has been dated to*circa* 100 BC. Devices of a level of complexity comparable to that of the Antikythera mechanism would not reappear until a thousand years later.

[Charles Babbage](https://en.wikipedia.org/wiki/Charles_Babbage), an English mechanical engineer and [polymath](https://en.wikipedia.org/wiki/Polymath), originated the concept of a programmable computer. Considered the [father of the computer](https://en.wikipedia.org/wiki/Computer_pioneer) he conceptualized and invented the first [mechanical computer](https://en.wikipedia.org/wiki/Mechanical_computer) in the early 19th century.

During the first half of the 20th century, many scientific [computing](https://en.wikipedia.org/wiki/Computing) needs were met by increasingly sophisticated [analog computers](https://en.wikipedia.org/wiki/Analog_computer), which used a direct mechanical or electrical model of the problem as a basis for [computation](https://en.wikipedia.org/wiki/Computation). However, these were not programmable and generally lacked the versatility and accuracy of modern digital computers.

Digital Computer

Early digital computers were electromechanical; electric switches drove mechanical relays to perform the calculation. These devices had a low operating speed and were eventually superseded by much faster all-electric computers, originally using [vacuum tubes](https://en.wikipedia.org/wiki/Vacuum_tube). The [Z2](https://en.wikipedia.org/wiki/Z2_(computer)), created by German engineer [Konrad Zeus](https://en.wikipedia.org/wiki/Konrad_Zuse) in 1939, was one of the earliest examples of an electromechanical relay computer. 1941, Zeus followed his earlier machine up with the [Z3](https://en.wikipedia.org/wiki/Z3_(computer)), the world's first working [electromechanical](https://en.wikipedia.org/wiki/Electromechanical) [programmable](https://en.wikipedia.org/wiki/Computer_programming), fully automatic digital computer. The Z3 was built with 2000[relays](https://en.wikipedia.org/wiki/Relay), implementing a 22 [bit](https://en.wikipedia.org/wiki/Bit) [word length](https://en.wikipedia.org/wiki/Word_(data_type)) that operated at a [clock frequency](https://en.wikipedia.org/wiki/Clock_frequency) of about 5–10 [Hz](https://en.wikipedia.org/wiki/Hertz). Program code was supplied on punched [film](https://en.wikipedia.org/wiki/Celluloid) while data could be stored in 64 words of memory or supplied from the keyboard. It was quite similar to modern machines in some respects, pioneering numerous advances such as [floating point numbers](https://en.wikipedia.org/wiki/Floating_point_number). Replacement of the hard-to-implement decimal system (used in [Charles Babbage](https://en.wikipedia.org/wiki/Charles_Babbage)'s earlier design) by the simpler [binary](https://en.wikipedia.org/wiki/Binary_numeral_system) system meant that Zeus’s machines were easier to build and potentially more reliable, given the technologies available at that time. The Z3 was [Turing complete](https://en.wikipedia.org/wiki/Turing_complete).

Modern computers

The concept and principle of the modern computer was proposed by [Alan Turing](https://en.wikipedia.org/wiki/Alan_Turing), in his seminal 1936 paper, On Computable Numbers. Turing proposed a simple device that he called Universal Computing machine that is later known as a [Universal Turing machine](https://en.wikipedia.org/wiki/Universal_Turing_machine). He proved that such machine is capable of computing anything that is computable by executing instructions (program) stored on tape, allowing the machine to be programmable.

The fundamental concept of Turing's design is [stored program](https://en.wikipedia.org/wiki/Stored_program), where all instruction for computing is stored in the memory.

[Von Neumann](https://en.wikipedia.org/wiki/John_von_Neumann) acknowledged that the central concept of the modern computer was due to this paper. Turing machines are to this day a central object of study in [theory of computation](https://en.wikipedia.org/wiki/Theory_of_computation). Except for the limitations imposed by their finite memory stores, modern computers are said to be [Turing-complete](https://en.wikipedia.org/wiki/Turing-complete), which is to say, they have [algorithm](https://en.wikipedia.org/wiki/Algorithm) execution capability equivalent to a [universal Turing machine](https://en.wikipedia.org/wiki/Universal_Turing_machine).