

Computer Basics: Computer Data Processing

Overview

Computers process data (information) by converting the input (words, sounds, images, graphics) into a form that can be manipulated by the microprocessor. It is not necessary to understand exactly how this works in order to operate a computer, but it is important to understand two things that determine the quality of a computer system and are used as a basis of comparison in most computer ads:

- Byte size
- Clock speed

The byte size and the clock speed both determine how quickly a microprocessor can process data. However, the ability of the microprocessor to process a large amount of data in a short amount of time is also influenced by other hardware components.

Bits and bytes

A bit is short for *binary digit*, the smallest unit of data on a computer. A single bit can hold only one of two values: 0 or 1. More meaningful data is obtained by combining bits to make larger units called bytes. A byte is short for *binary term*, a unit of storage capable of holding the data for a single character, such as the letter “A.” A byte is composed of 8 bits.

Bits and bytes are a unit of measurement

Bits and bytes are used to measure size of a file such as a report, the size of a storage device such as a hard drive, as well as the size of a connection between two computer components. Bytes are also used as a unit of measurement for a connection to the Internet.

When text data is input into a computer, the computer converts the letters into bytes. For example, the phrase “Four score and seven years ago” becomes a string of 1s and 0s that looks something like this:

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1000110110111111101011110010100000111001111000111
1011111...
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Because the phrase “Four score and seven years ago” contains 30 characters, saving the phrase as a text file creates a file that is 30 bytes in size.

File sizes

A page of text created in Word contains about 26,000 bytes.

The file that contains the data for the graphic below is around 72,000 bytes in size:



The file that contains the data for this picture is around 90,000 bytes in size:



Lots of bytes

When you start talking about lots of bytes, you use **prefixes** like kilo-, mega- and giga-, as in kilobyte, megabyte, and gigabyte (also shortened to KB, MB and GB). The following table shows the actual number of bytes that each of these prefixes represent:

Name	Short Name	Size
kilobyte	KB	1,024 bytes
megabyte	MB	1,048,576 bytes
gigabyte	GB	1,073,741,824 bytes

You can see in this chart that a kilobyte is about a thousand bytes, a megabyte is about a million bytes, and a gigabyte is about a billion bytes.

Why bits and bytes matter

Data processing:

When someone says, “This computer has a 1.3GHz processor,” what he or she means is that the processor (in a general way) can process over a billion instructions in a second. An instruction is an order that a program gives the processor like “add” or “delete.” Because the processor is processing information in the form of bytes, the amount of data that the processor can process at one time is one measure of a computer’s speed.

Data storage:

When someone says, “This computer has a 2 gigabyte hard drive,” what he or she means is that the hard drive can store 2 gigabytes, or approximately 2 billion bytes—enough space to store the text data for a book that has 1,600,000 pages. The larger the number of bytes that a hard disk can store, the more information it can contain.

Data transfer:

Bits are used to measure how quickly data can be moved from one computer component to another. Again, the larger number of bits that can be passed between two components in a given amount of time determines how quickly a computer can process or display the data. One area where this is important is Internet access. A good dial-up connection to the Internet is able to transfer data at a speed of around 53,000 bits per second. On the other hand, a fair DSL (digital subscription line) connection can transfer data at 2,000,000 bits per second. This increase in speed is especially noticeable when downloading large video or audio files.