

Kerry's Computer Coaching

All About Bits and Bytes

If you use a computer, then chances are that you have heard the terms bits, bytes, megabytes and gigabytes before. The RAM (random access memory) in your computer system is measured in bytes. The size of your hard drive (also sometimes called the hard disk) is measured in bytes. The files that you use, from Word documents to mp3 songs to mp4 videos to video games to software, programs and other applications, are all measured in bytes. Many of the computer specifications you will see tell you how the computer system works and how efficient it is will be specified in bits and bytes. For example, you may see a laptop for sale that proclaims it has a 32 bit processor with 2 gigabyte of RAM and a 320 gigabyte hard drive.

The easiest way to understand bits is to compare them to something you know: digits. A digit is a single place that can hold numerical values between 0 and 9. Digits are normally combined together in groups to create larger numbers. For example, 7,865 has four digits. It is understood that in the number 7,865, the 5 is filling the "1s place," while the 6 is filling the 10s place, the 8 is filling the 100s place and the 7 is filling the 1,000s place. So you could express things this way if you wanted to be explicit:

$$(7 * 1000) + (8 * 100) + (6 * 10) + (5 * 1) = 7000 + 800 + 60 + 5 = 7865$$

Bits rarely come alone in a computer. They are usually bundled together in collections of 8 bits. An 8 bit collection is called a "byte."

Here is the order:

1 bit = a single digit, either 1 or 0

8 bits = 1 byte, a combination of 1's and 0's

1024 Bytes = 1 KB (kilobyte)

1024 Kilobytes = 1 MB (megabyte)

1024 Megabytes = 1 GB (gigabyte)

Another way to put it in terms of computer memory is:

You are allowed to use a total of 1024 bytes before you use up one KB.

And you can use over 1 MILLION bytes (1024 X 1024) before you use up one MB.

And you can use over 1 BILLION bytes (1024 X 1024 X 1024) before you use up one GB.

Today's computers do not deal in single bits and single bytes. They deal in many thousands and millions of bits and bytes, which is where the prefixes come in. A megabyte is abbreviated to MB and is worth 2^{20} or 1,048,576 bytes. A gigabyte is abbreviated to GB and is worth 1,073,741,824 bytes or 2^{30} . You may have seen a terabyte being advertised lately, as well, in local stores and online. Terabyte drives are big. Abbreviated to TB, a terabyte is worth 1,099,511,627,776 bytes or 2^{40} .

So that's basically it. A bit is a binary digit and can hold a value of zero or one, and a byte is a bundle of 8 bits. Your computer uses this binary language to execute absolutely everything you do while you are using your computer system!