# Hexadecimal Numbering System Encyclopedia Article

## Hexadecimal Numbering System

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# Contents

Hexadecimal Numbering System Encyclopedia Article.....1

Contents.....2

Hexadecimal Numbering System.....3

# Hexadecimal Numbering System

The hexadecimal numbering system uses the base of 16, rather than ten, as our familiar decimal system does. The system gained popularity during the 1960s surge in computer technology. Hexadecimal numbering uses 16 symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F, where the letters A through F represent the numbers 10 through 15, respectively; however some earlier versions of hexadecimal used instead the latter letters of the alphabet--T, U, V, W, X, Y, and Z. When counting in hexadecimal, a carry-over to the next position is done after reaching the first number past F, comparable to the decimal system where a carry over is done when reaching the number past 9.

Binary arithmetic, which uses the base 2 system and the numbers one and zero, is the standard math employed by computers, because the "on" and "off" states of circuits can function as ones and zeros in a computer. However, representing large numbers in binary form can become confusing. For example, the decimal number *3,915* becomes *111101001011* in binary notation. The hexadecimal system aids computer programmers by allowing them to represent large numbers in a more convenient manner by " compressing" them--for instance, the binary number above equals the hexadecimal number *F4B*.

The base 16 system was chosen to carry out this compression rather than some other base because groups of four binary digits can be converted *directly* into hexadecimal digits. To take the example from above, the binary number is simply divided into groups of four digits, and their hexadecimal equivalents are substituted:

1111 | 0100 | 1011 = F | 4 | B or F4B
In this way, excessively long strings of binary digits can be quickly converted for easier handling.