Mathematics As A Liberal Art

Math 105 Spring 2024 Fowler 309 MWF 3:00pm- 3:55pm

 http://sites.oxy.edu/ron/math/105/24/

Class 11: Friday February 23

Everything You Ever Wanted To Know About Hex

Hexadecimal Number System

Another number system which is often seen in computer systems is the hexadecimal number system, which uses 16 as a base or **radix**. In this case the digits are 0 through 9 supplemented with A, B, C, D, E, and F.

One issue with hexadecimal numbers is that since they use the same digits as the decimal system plus more, they can be confused for each other unless one uses a subscript to distinguish them, like 42_{hex}.

Some places use a header to indicate a a non-decimal number, like "0x" for hex, e.g. **0x4E** (which is the same thing as 78_{10}). One can also use the header "0b", e.g. **0b1001110** (which is also the same thing as 78_{10}).

Hexadecimal numbers are usually seen in the description of colors, in describing pixel RGB values on screens in terms of how much red, green or blue are in a particular color. These pixel values range from 0 to 255 for each of these three, colors which puts the number of possible colors as 256x256x256 = 16 million colors!

For example, the color pure red is represented by **0xFF0000**, pure green is represented by **0x00FF00** and pure blue is represented by **0x0000FF**.

EXAMPLE

What number in base 10 is equal to $05A3_{hex}$?

How do we convert 637 into its hexadecimal equivalent?

An Algorithm For Converting From A Decimal Number To Hexadecimal Use Repeated Division

1. Take the decimal number and divide it by 16 and note the remainder R_1.
2. Take the quotient result from the previous step noting your remainders (for example R_2 to R_k) and repeat until you get a quotient of zero
3. Your hexadecimal number is your remainders written in reverse order, i.e. $R_k ... R_3 R_2 R_1$

GroupWork

Convert the following numbers from hexadecimal, decimal, quinary or binary.

HEXADECIMAL DECIMAL QUINARY BINARY

$\_\_\_\_\_{}_{hex} = \_\_\_\_\_{}_{10} = \_\_\_\_\_{}_{5} = 1001_2$

$\_\_\_\_\_{}_{hex} = \_\_\_\_\_{}_{10} = 1001_5 = \_\_\_\_\_{}_{2}$

$\_\_\_\_\_{}_{hex} = 1001_{10} = \_\_\_\_\_{}_{5} = \_\_\_\_\_{}_{2}$

$1001_{hex} = \_\_\_\_\_{}_{10} = \_\_\_\_\_{}_{5} = \_\_\_\_\_{}_{2}$