Template Week 1 – Bits & Bytes

Student number: 569091

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

Bit: A bit (binary digit) is the smallest unit of data in computing and can have a value of either 0 or 1 (false/true or off/on).

Byte: A byte is a collection of 8 bits. It's the standard unit used to represent a single character in memory (such as a letter, number, or symbol) in most computing systems.

What is a nibble?

A nibble is half a byte, a byte is 8 bits so that means a nibble is 4 bits.

What relationship does a nibble have with a hexadecimal value?

A nibble is a group of 4 bits, capable of representing 2^4 = 16 distinct values, ranging from 0 to 15 in decimal. Each hexadecimal digit (0-F) also represents exactly 16 values.

Why is it wise to display binary data as hexadecimal values?

Readability: Binary numbers are long and difficult for humans to read. Hexadecimal numbers shorten the representation.

Compactness: Hexadecimal reduces the length of binary strings by grouping every 4 binary bits into one hex digit, making complex binary sequences easier to manage

What kind of relationship does a byte have with a hexadecimal value?

In hexadecimal, a byte is represented as two hex digits. Each hexadecimal digit covers a nibble (4 bits), so two hex digits combine to represent a byte (8 bits). For example, the binary byte 1111 1111 is represented as FF in hexadecimal.

Summary:

A byte contains 8 bits, wich can be represented by 2 hexadecimal digits. Because each hexadecimal digit represents 4 bits (a nibble)

An IPv4 subnet is 32-bit, show with a calculation why this is the case.

An IPv4 address is 32 bits because it has 4 octets, each 8 bits. 4 x 8 = 32. The subnet mask also 32 bits following the same structure.

Assignment 1.2: Your favourite colour

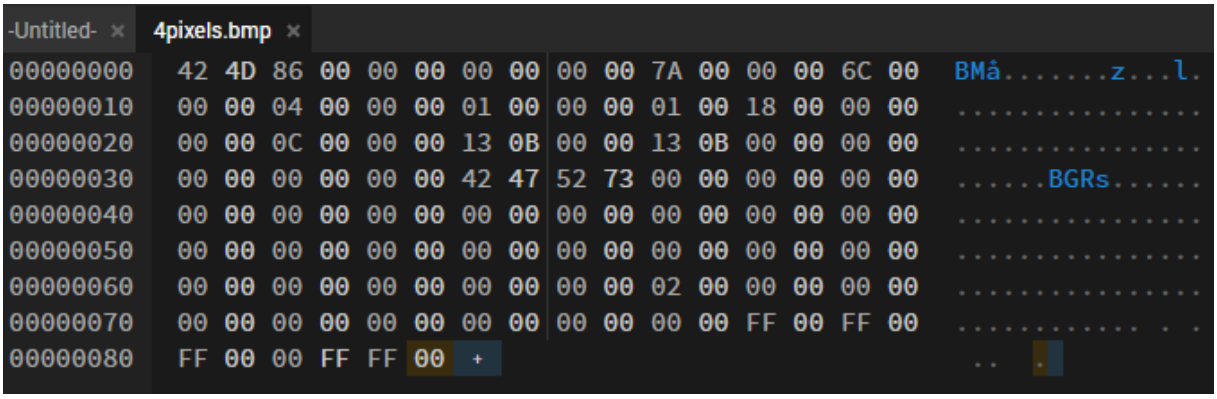
Hexadecimal color code of my favourite color: HEX #00ffff

Screenshot from paint with the image resized to 40x10 and fully zoomed in:

Assignment 1.3: Manipulating binary data

Colour	Colour code hexadecimaal (RGB)	Big Endian	Little Endian
RED	#ff0000	FF 00 00	00 00 FF
GREEN	#00ff00	00 FF 00	00 FF 00
BLUE	#0000ff	00 00 FF	FF 00 00
WHITE	#ffffff	FF FF FF	FF FF FF
Favourite (previous assignment)	#00ffff	00 FF FF	FF FF 00

Screenshot modified BMP file in hex editor:



Bonus point assignment – week 1

Convert your student number to a hexadecimal number and a binary number.

Explain in detail that the calculation is correct. Use the PowerPoint slides of week 1.

Student number: 569091

Number	Divided by 2 (rounded)	remainder
569091		
284545,5	284545	1
142272,5	142272	1
71136	71136	0
35568	35568	0
17784	17784	0
8892	8892	0
4446	4446	0
2223	2223	0
1.111,5	1.111	1
555,5	555	1
277,5	277	1
138,5	138	1
69	69	0
34,5	34	1
17	17	0
8.5	8	1
4	4	0
2	2	0
1	1	0
.5	0	1

Left to right: 10001010111100000011

Right to left: 11000000111101010001

1100.0000.1111.0101.0001

0001 = 1

0101 = 5

1111 = 6

0000 = 0

1100 = C

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