

Template Week 1 – Bits & Bytes

Student number: 577029

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit is a single place or symbol in a binary number, each bit can either be 0 or 1. A single bit cannot convey much information, it is either off or on. Because of this reason, computers group bits together in sets of eight which is called bytes.

What is a nibble?

A nibble is a 4-bit number or half a byte e.g. 1010 = 10 (decimal)

What relationship does a nibble have with a hexadecimal value?

A nibble that having 4 bits number, that represents one of 16 values of hexadecimal (which is 0 to F. Therefore, every nibble corresponding to one symbol in hexadecimal.

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

It's for readability and to avoid of human errors to read long sequences of 0s and 1s, and its easier to converting from hexadecimal to decimal, because of one nibble belongs to one hex character value.

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

Each hexadecimal character is mapping to 4 bits. Therefore, a byte that consist of 8bits, takes two hexadecimal to represent one byte.

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

IPv4 subnet displayed in decimal which consist of four groups that represent each group is an 8-bit number or an octet. So while four groups consist of an octet, so the total of the subnet address is 32bits.

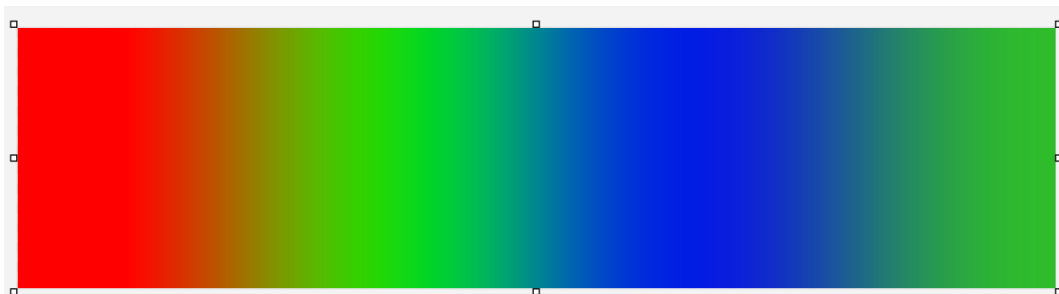
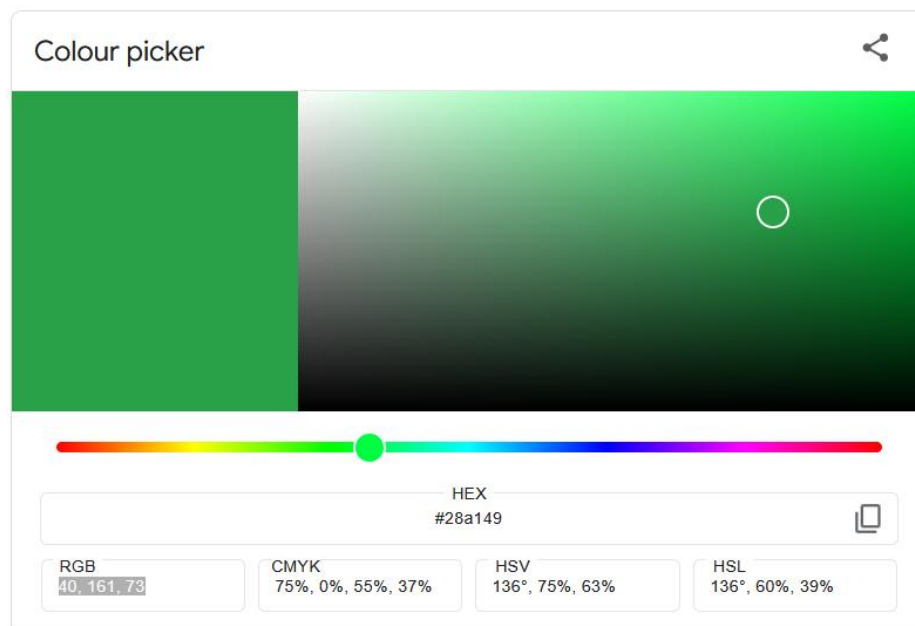
Assignment 1.2: Your favourite color

Hexadecimal color code: #28a149

Assignment 1.3: Manipulating binary data

Color	Color code hexadecimal (RGB)	Big Endian	Little Endian
RED	255 0 0	FF 00 00	FF FF 00
GREEN	0 255 0	00 FF 00	FF 00 FF
BLUE	0 0 255	00 00 FF	FF FF 00
WHITE	255 255 255	FF FF FF	FF FF FF
Favourite (previous assignment)	40 161 73	28 A1 49	49 A1 28

Screenshot modified BMP file in hex editor:



Source: hexed.it

Assignment 1.4: Student number to HEX and Binary

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 to hexadecimal number

$577029 \% 16 = 36064$ remainder 5

$36064 \% 16 = 2254$ remainder 0

$2254 \% 16 = 140$ remainder 14 → E

$140 \% 16 = 8$ remainder 12 → C

$8 \% 16 = 0$ remainder 8

Result : **0x8CE05**

Student number decimal to binary

$577029 \% 2 = 288514$ remainder 1

$288514 \% 2 = 144257$ remainder 0

$144257 \% 2 = 72128$ remainder 1

$72128 \% 2 = 36064$ remainder 0

$36064 \% 2 = 18032$ remainder 0

$18032 \% 2 = 9016$ remainder 0

$9016 \% 2 = 4508$ remainder 0

$4508 \% 2 = 2254$ remainder 0

$2254 \% 2 = 1127$ remainder 0

$1127 \% 2 = 563$ remainder 1

$563 \% 2 = 281$ remainder 1

$281 \% 2 = 140$ remainder 1

$140 \% 2 = 70$ remainder 0

$70 \% 2 = 35$ remainder 0

$35 \% 2 = 17$ remainder 1

$17 \% 2 = 8$ remainder 1

$8 \% 2 = 4$ remainder 0

$4 \% 2 = 2$ remainder 0

$2 \% 2 = 1$ remainder 0

$1 \% 2 = 0$ remainder 1

Result:

1000 1100 1110 0000 0101

1	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	1	0	1
2^{19}	2^{18}	2^{17}	2^{16}	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
524288	0	0	0	32768	16384	0	0	2048	1024	512	0	0	0	0	0	0	8	2	1

$$2^{19} + 2^{15} + 2^{14} + 2^{11} + 2^{10} + 2^9 + 2^2 + 2^1 + 2^0$$

$$524288 + 32768 + 16384 + 2048 + 1024 + 512 + 8 + 2 + 1 = 577029$$

Could also using hexadecimal from binary

8 = 1000

C = 1100

E = 1110

0 = 0000

5 = 0101

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