

Template Week 1 – Bits & Bytes

Student number: 586146

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit is the smallest unit of digital information on a computer; it represents a single binary value of either 1 or 0. A byte is a larger unit of digital information made up of 8 bits. Every single data on a computer is made up from bits.

What is a nibble?

A nibble is a fundamental unit of storage. It consists of 4 bits which can represent 16 different values, starting from 0 to 15 in decimal notation.

What relationship does a nibble have with a hexadecimal value?

A nibble can hold one hexadecimal digit, this makes hexadecimal a convenient way to display a nibble.

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

They are simpler to write and read/check than when using binary data.

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

It's a handy way to write bytes using fewer characters.

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

An IPv4 consists of 4 numbers separated by a dot, each number is 8 bits. Therefore if you do the math and multiply 4 by 8 you get 32 bits in total.

Assignment 1.2: Your favourite color

Hexadecimal color code: #9840DB

Assignment 1.3: Manipulating binary data

Color	Color code hexadecimal (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)	9840DB	98 40 DB	DB 40 98

Screenshot modified BMP file in hex editor:

-Untitled- x	4pixels.bmp x	
00000000	42 4D 86 00 00 00 00 00	00 00 7A 00 00 00 6C 00 BMå.....z...l.
00000010	00 00 04 00 00 00 01 00	00 00 01 00 18 00 00 00
00000020	00 00 0C 00 00 00 13 0B	00 00 13 0B 00 00 00 00
00000030	00 00 00 00 00 00 42 47	52 73 00 00 00 00 00 00BGRs.....
00000040	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
00000050	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
00000060	00 00 00 00 00 00 00 00	00 00 02 00 00 00 00 00
00000070	00 00 00 00 00 00 00 00	00 00 00 00 FF 00 FF 00
00000080	FF 00 00 DB 40 98 +	..ëÿ

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.

$$586461 / 2 = 293230 \text{ (1 remainder)}$$

$$293239 / 2 = 146619 \text{ (1 remainder)}$$

$$146619 / 2 = 73309 \text{ (1 remainder)}$$

$$73309 / 2 = 36654 \text{ (1 remainder)}$$

$$36654 / 2 = 18327 \text{ (0 remainder)}$$

$$18327 / 2 = 9163 \text{ (1 remainder)}$$

$$9163 / 2 = 4581 \text{ (1 remainder)}$$

$$4581 / 2 = 2290 \text{ (1 remainder)}$$

$$2290 / 2 = 1145 \text{ (0 remainder)}$$

$$1145 / 2 = 572 \text{ (1 remainder)}$$

$$572 / 2 = 286 \text{ (0 remainder)}$$

$$286 / 2 = 143 \text{ (0 remainder)}$$

$$143 / 2 = 71 \text{ (1 remainder)}$$

$$71 / 2 = 35 \text{ (1 remainder)}$$

$$35 / 2 = 17 \text{ (1 remainder)}$$

$$17 / 2 = 8 \text{ (1 remainder)}$$

$$8 / 2 = 4 \text{ (0 remainder)}$$

$$4 / 2 = 2 \text{ (0 remainder)}$$

$$2 / 2 = 1 \text{ (0 remainder)}$$

$$1 / 2 = 0 \text{ (1 remainder)}$$

Binary: 111101111010011110001

$$586461 / 16 = 36653 \text{ (0.8125 * 16 = D remainder)}$$

$$36653 / 16 = 2290 \text{ (0.8125 * 16 = D remainder)}$$

$$2290 / 16 = 143 \text{ (0.125 * 16 = 2 remainder)}$$

$$143 / 16 = 8 \text{ (0.9375 * 16 = F remainder)}$$

$$8 / 16 = 0 \text{ (0.5 * 16 = 8 remainder)}$$

Hexadecimal = 8F2DD