

Template Week 1 – Bits & Bytes

Student number: 568209

Use chatcpt for better English (writing parts)

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

Bits are the smallest unit of data in a computer and i can have only two values: 0 or 1. this is the foundation of all digital information.

Bytes are also a group of 8 bits. Each byte represents 8 bit and can have 256 different values from 0 to 255 in decimal. Furthermore, many systems use a byte to store one character, like the letter 'A' which is 65 in decimal or 01000001 in binary. This answer comes from dividing number of 65 into 2 till quotient is 0.

What is a nibble?

Nibble is a group of 4 bits, and it is half of Byte. So, 1 byte = 2 nibbles.

What relationship does a nibble have with a hexadecimal value?

1 nibble = 1 Hexadecimal digit. This means the 4bits in a nibble can be directly represented by a single hexadecimal digit. For example, the 4-bit binary 1010 equals to A in Hexadecimal.

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

Because we can read and understand better Hexadecimal more than binary. Especially when we dealing with large amounts of binary data. For example, 8-bits (like 10101101) would require 8 digits in binary , but only 2 digits in Hexadecimal (AD).

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

1 byte = 2 Hexadecimal digits. This means that every byte (8 bits) can be represented by two hexadecimal digits.

For instance, the byte 11111111 (binary) is equal to FF (Hexadecimal).

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

Because IPv4 addresses are represented using 32 bits. They are split into 4 octets, each containing 8 bits. 8 bits (times) 4 octets = 32 bits.

Assignment 1.2: Your favourite colour

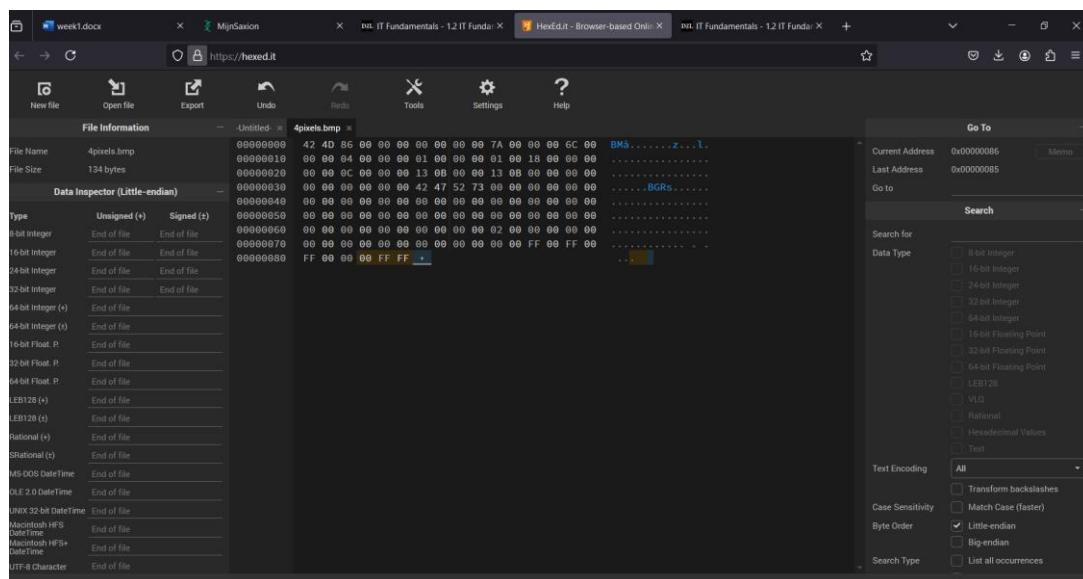
Hexadecimal colour code:

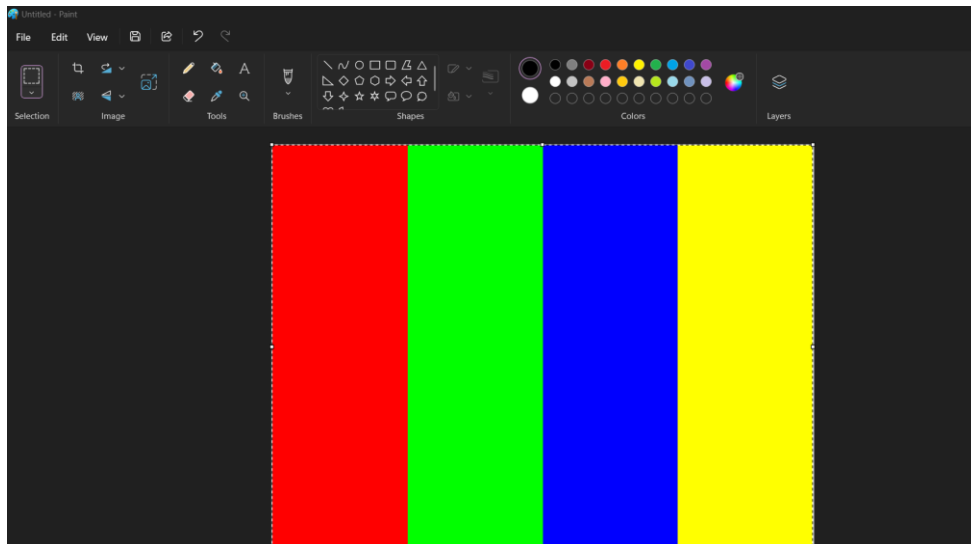
YELLOW => FF0000

Assignment 1.3: Manipulating binary data

Colour	Colour 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)	FF0000	FF 00 00	00 00 FF

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.

$$568209 / 2 = 284104 \quad \text{remainder}=1$$

$$284104 / 2 = 142052 \quad \text{remainder}=0$$

$$142052 / 2 = 71026 \quad \text{remainder}=0$$

$$71026 / 2 = 35513 \quad \text{remainder}=0$$

$$35513 / 2 = 17756 \quad \text{remainder}=1$$

$$17756 / 2 = 8878 \quad \text{remainder}=0$$

$$8878 / 2 = 4439 \quad \text{remainder}=0$$

$$4439 / 2 = 2219 \quad \text{remainder}=1$$

$$2219 / 2 = 1109 \quad \text{remainder}=1$$

$$1109 / 2 = 554 \quad \text{remainder}=1$$

$$554 / 2 = 277 \quad \text{remainder}=0$$

$$277 / 2 = 138 \quad \text{remainder}=1$$

$$138 / 2 = 69 \quad \text{remainder}=0$$

$$69 / 2 = 34 \quad \text{remainder}=1$$

$$34 / 2 = 17 \quad \text{remainder}=0$$

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

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

$4 / 2 = 2$ remainder=0

$2 / 2 = 1$ remainder =0

$1 / 2 = 0$ reminder =1

The binary representation of 568209 is : 10001010101100110001

Given Decimal: 568209 1. $568209 \div 16 = 35512$, Remainder = 1 \rightarrow Hex: 1

2. $35512 \div 16 = 2219$, Remainder = 8 \rightarrow Hex: 8

3. $2219 \div 16 = 138$, Remainder = 11 \rightarrow Hex: B

4. $138 \div 16 = 8$, Remainder = 10 \rightarrow Hex: A

5. $8 \div 16 = 0$, Remainder = 8 \rightarrow Hex: 8

The binary number **10001010101100110001** converts to the hexadecimal value **8ACB1**.

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