Template Week 1 – Bits & Bytes

Student number:

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

Bits are the smallest unit of data in computing they can be either 0 or 1.
Bytes are made up of 8 bits and are used to represent a single character (like a letter or number).

What is a nibble?

A nibble is a group of 4 bits, which is half of a byte.

What relationship does a nibble have with a hexadecimal value?

Each nibble (4 bits) corresponds exactly to one hexadecimal digit

- **Binary 1010 (one nibble) = Hexadecimal A**

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

Because of these three reasons

1. Compact – Hex uses fewer digits (4 bits per hex digit), making long binary numbers shorter and easier to read.

2. Clear – Each hex digit directly maps to 4 binary bits, so conversion is simple.

3. Readable – Easier for humans to understand and work with than long binary strings.

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

A byte (8 bits) corresponds to two hexadecimal digits, because each hex digit represents 4 bits.

Binary 11110000 → Hex F0

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

An IPv4 address is made up of 4 octets, and each octet = 8 bits.

So the total number of bits is:

$$\mathbf{4\ octets \times 8\ bits\ per\ octet = 32\ bits}$$

Therefore, an IPv4 address (and subnet) is 32 bits long.

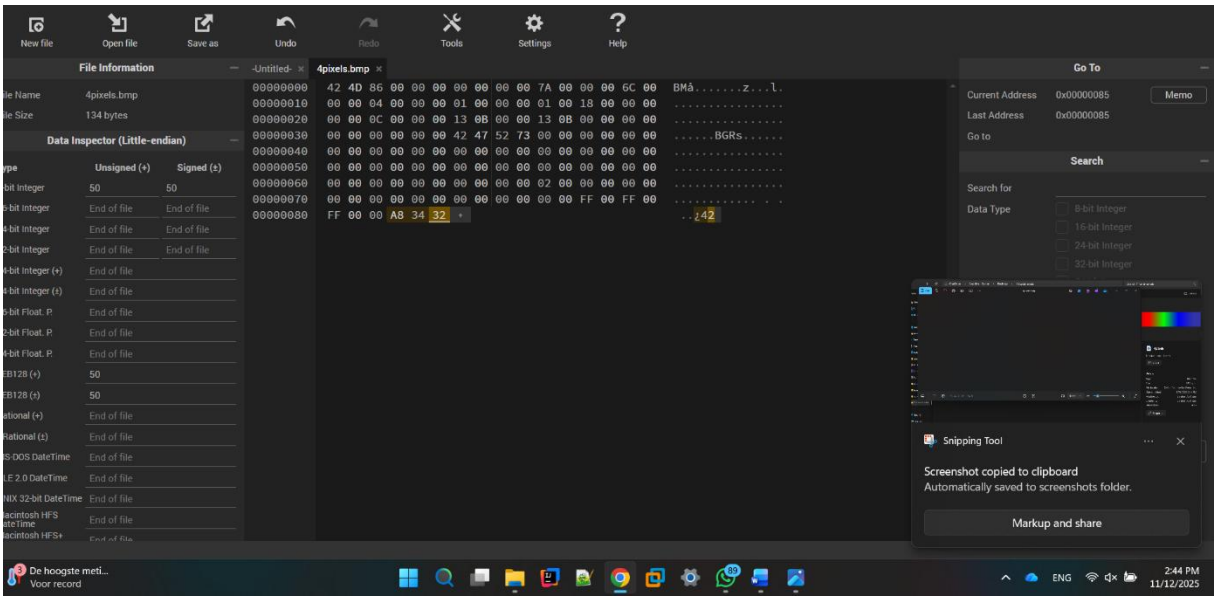
Assignment 1.2: Your favourite color

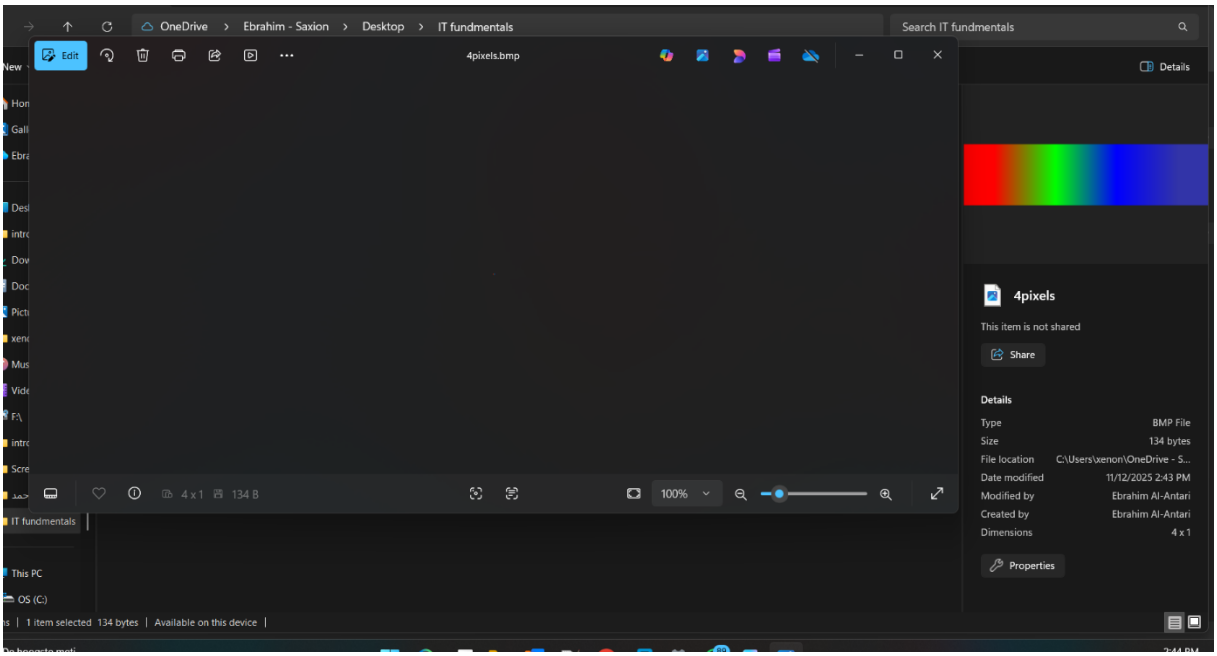
Hexadecimal color code: **#3234A8**

Assignment 1.3: Manipulating binary data

Color	Color 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)	#3234A8	32 34 A8	A8 34 32

Screenshot modified BMP file in hex editor:




OneDrive
Ebrahim - Saxion
Desktop
IT fundmentals
Search IT fundmentals
Edit
4pixels.bmp
Details
4pixels
This item is not shared
Share
Details
Type
BMP File
Size
134 bytes
File location
C:\Users\xenon\OneDrive - S...
Date modified
11/12/2025 2:43 PM
Modified by
Ebrahim Al-Antari
Created by
Ebrahim Al-Antari
Dimensions
4 x 1
Properties
4 x 1
134 B
100%
This PC
OS (C:)
1 item selected 134 bytes
Available on this device

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.

I converted my student number 546746 into hex and binary thus.

1. **Decimal to Hexadecimal (Base 16):**
    - **I divided the decimal number repeatedly by 16 and recorded the remainders:**
        - **546746 ÷ 16 = 34171 remainder 10 → A**
        - **34171 ÷ 16 = 2135 remainder 11 → B**
        - **2135 ÷ 16 = 133 remainder 7 → 7**
        - **133 ÷ 16 = 8 remainder 5 → 5**
        - **8 ÷ 16 = 0 remainder 8 → 8**
    - **Reading the remainders from bottom to top gives 857BA in hexadecimal.**
    - **Verification: Converting back to decimal:** $8 \times 16^4 + 5 \times 16^3 + 7 \times 16^2 + 11 \times 16^1 + 10 \times 16^0 = 546746$**, which confirms the calculation is correct.**
2. **Decimal to Binary (Base 2):**
    - **Each hexadecimal digit can be represented as 4 binary bits, so converting $857BA_{16}$ to binary:**
        - **8 → 1000**
        - **5 → 0101**
        - **7 → 0111**
        - **B → 1011**
        - **A → 1010**
    - **Combining these gives 10000101011110111010 in binary.**
    - **This can also be verified by converting the binary number back to decimal, which results again in 546746, confirming the accuracy.**

Ready? Save this file and export it as a pdf file with the name: **week1.pdf**