

# Template Week 1 – Bits & Bytes

Student number: 581429

## Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit is the smallest unit of data, representing either a 0 or 1. A byte consists of 8 bits and can store values from 0 to 255, commonly used to represent characters, small numbers, or parts of larger data structures.

What is a nibble?

Nibble is a 4-bit number, or half a byte.

What relationship does a nibble have with a hexadecimal value?

A nibble is a group of 4 bits, and it directly relates to a single hexadecimal digit. Since hexadecimal is base-16 and 4 bits can represent 16 values from 0000 to 1111, each hex digit matches one nibble.

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

Displaying binary data as hexadecimal is wise because it offers a compact and readable format that can be clearly transferred to binary.

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

In the case of nibble, it represented only one hexadecimal value, whereas byte (which is 2 nibbles) consists of 2 hexadecimal digits, with a maximum value of 255.

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

IPv4 address format is A.B.C.D (for instance: 192.168.1.1). Each part (A, B, C, D) is an 8-bit number (0-255). So, 4 parts x 8 bits = 32 bits.

## Assignment 1.2: Your favourite color

Hexadecimal color code:

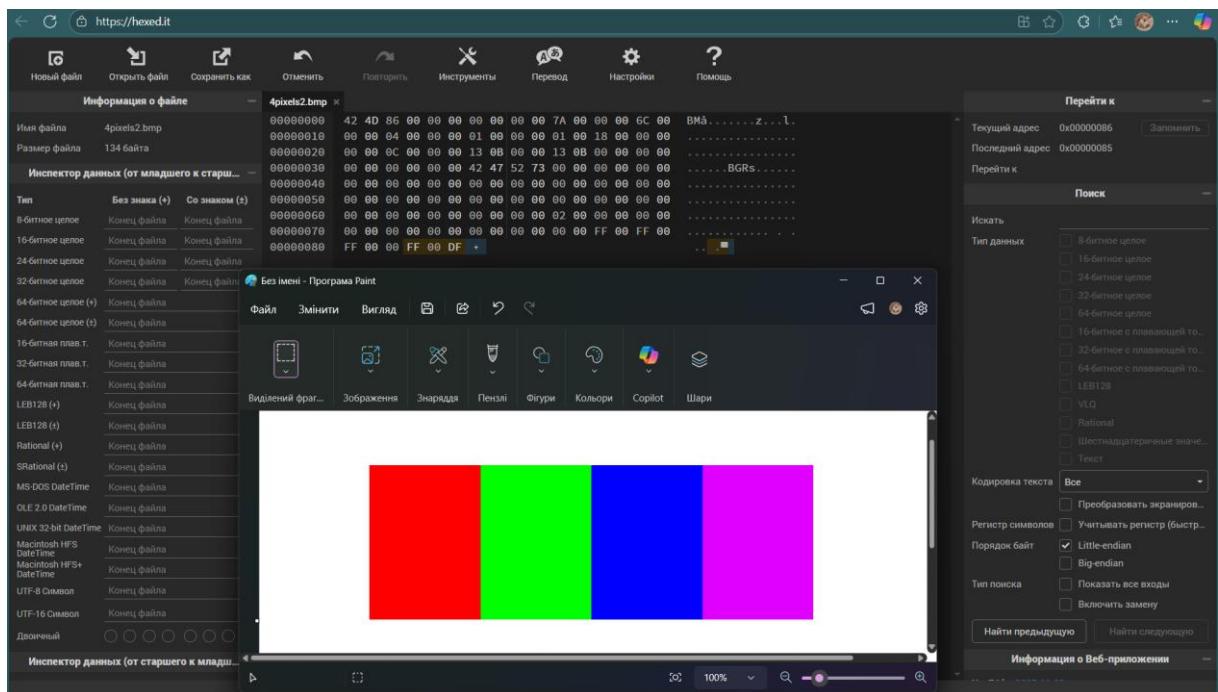
DF00FF



### Assignment 1.3: Manipulating binary data

| Color                              | Color code<br>hexadecimaal (RGB) | Big Endian | Little Endian |
|------------------------------------|----------------------------------|------------|---------------|
| RED                                | 255,0,0                          | FF0000     | 0000FF        |
| GREEN                              | 0,255,0                          | 00FF00     | 00FF00        |
| BLUE                               | 0,0,255                          | 0000FF     | FF0000        |
| WHITE                              | 255,255,255                      | FFFFFF     | FFFFFF        |
| Favourite<br>(previous assignment) | 223,0,255                        | DF00FF     | FF00DF        |

Screenshot modified BMP file in hex editor:



#### **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.

Hexadecimal: 8DF35

Explanation:  $581429 \div 16 = 36339$  remainder 5

$36339 \div 16 = 2271$  remainder 3

$2271 \div 16 = 141$  remainder 15 (F)

$141 \div 16 = 8$  remainder 13 (D)

$8 \div 16 = 0$  remainder 8

Binary: 10001110011101100101

Explanation:  $581429 \div 2 = 290714$  remainder 1

$290714 \div 2 = 145357$  remainder 0

$145357 \div 2 = 72678$  remainder 1

$72678 \div 2 = 36339$  remainder 0

$36339 \div 2 = 18169$  remainder 1

$18169 \div 2 = 9084$  remainder 1

$9084 \div 2 = 4542$  remainder 0

$4542 \div 2 = 2271$  remainder 0

$2271 \div 2 = 1135$  remainder 1

$1135 \div 2 = 567$  remainder 1

$567 \div 2 = 283$  remainder 1

$283 \div 2 = 141$  remainder 1

$141 \div 2 = 70$  remainder 1

$70 \div 2 = 35$  remainder 0

$35 \div 2 = 17$  remainder 1

$17 \div 2 = 8$  remainder 1

$8 \div 2 = 4$  remainder 0

$4 \div 2 = 2$  remainder 0

$2 \div 2 = 1$  remainder 0

$1 \div 2 = 0$  remainder 1

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