

Template Week 1 – Bits & Bytes

Student number: 563064

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit (binary digit) is the smallest unit of data in a computer, representing a value of either 0 or 1. It serves as the basic building block of binary code, the language of computers, where each bit signifies a binary choice, such as On or Off or True or False. Bits are fundamental to all digital data representation.

A byte is made up of 8 bits and serves as the standard unit for representing a piece of data, like a letter or symbol.

What is a nibble?

A nibble is 4 bits.

What relationship does a nibble have with a hexadecimal value?

A nibble is 4 bits, which is equivalent to one symbol in hexadecimal.

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

Displaying binary data as hexadecimal is a lot easier for humans to read and understand than long sequences of bits. Hexadecimal is also easier to convert back to binary than decimal.

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

A byte is 8 bits, which is equivalent to 2 hex symbols.

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

Decimal subnet: 255.255.255.0

Binary subnet (32 bits divided by a "." into 8 bits each): 11111111.11111111.11111111.00000000

11111111 = 255

$2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7 = 255$

$1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 = 255$

00000000 = 0

$$0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 0$$

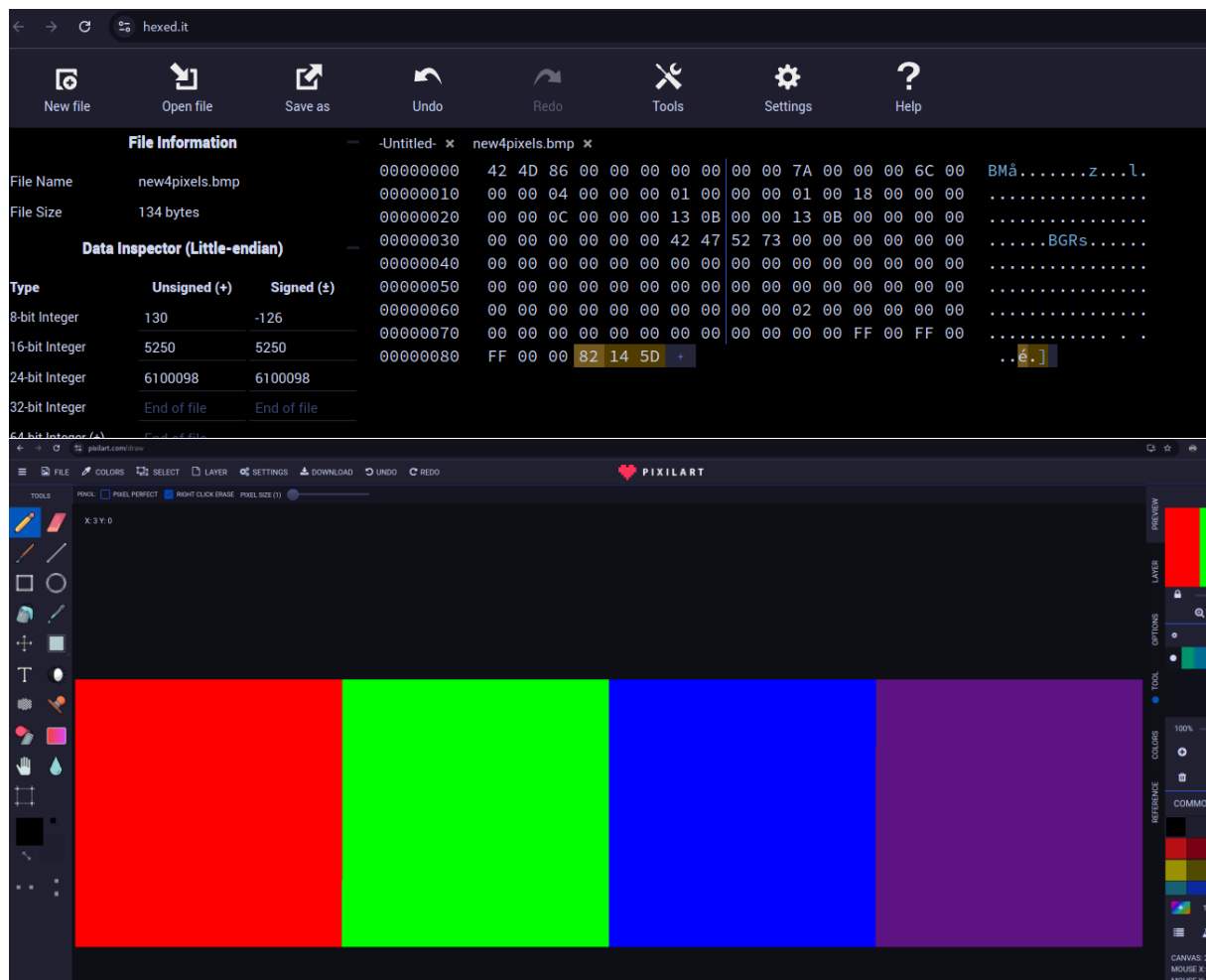
Assignment 1.2: Your favourite colour

Hexadecimal colour code: #5d1482

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	#000000	00 00 00	00 00 00
Favourite (previous assignment)	#5d1482	5D 14 82	82 14 5D

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.

$$563064 / 2 = 281532 \mid 0$$

$$281532 / 2 = 140766 \mid 0$$

$$140766 / 2 = 70383 \mid 0$$

$$70383 / 2 = 35191 \mid 1$$

$$35191 / 2 = 17595 \mid 1$$

$$17595 / 2 = 8797 \mid 1$$

$$8797 / 2 = 4398 \mid 1$$

$$4398 / 2 = 2199 \mid 0$$

$$2199 / 2 = 1099 \mid 1$$

$$1099 / 2 = 549 \mid 1$$

$$549 / 2 = 274 \mid 1$$

$$274 / 2 = 137 \mid 0$$

$$137 / 2 = 68 \mid 1$$

$$68 / 2 = 34 \mid 0$$

$$34 / 2 = 17 \mid 0$$

$$17 / 2 = 8 \mid 1$$

$$8 / 2 = 4 \mid 0$$

$$4 / 2 = 2 \mid 0$$

$$2 / 2 = 1 \mid 0$$

$$1 / 2 = 0 \mid 1$$

10001001011101111000

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