# Template Week 1 – Bits & Bytes

Student number: 581558

**Assignment 1.1: Bits & Bytes intro**

What are Bits & Bytes?

*Bits short for "binary digits" is the smallest unit of data a computer can process.*

*Bytes is unit of digital information that consists of 8 bits.*

What is a nibble?

*Nibble is unit of digital information that consists of 4 bits (half a byte)*

What relationship does a nibble have with a hexadecimal value?

*The relation is a one to one mapping, because every nibble can be represented by a single character in hexadecimal. The number of possible combinations for a single nibble is $2^4 = 16$ and we have 16 characters in hexadecimal so, every combination of nibbles can be perfectly mapped to one digit in hexadecimal.*

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

*We can store long strings of binary digits in a few hexadecimal digits (1 hex = 16 bits). This helps human readability significantly.*

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

*Each digit in hexadecimal can represent 2 digits in byte. (1 hex = 2 bytes = 16 bits)*

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

*IPv4 consists of 4 numbers ranging from 0 to 255 (numbers are in bytes: $2^8 = 256$). and so 4 * 8-bits gives us 32 bits.*

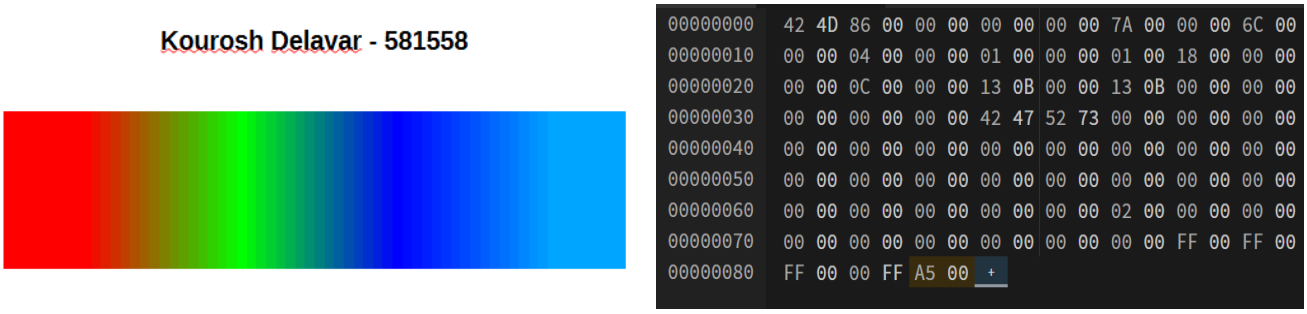
**Assignment 1.2: Your favourite color**

Hexadecimal color code: *FFA500*

**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) | FFA500 | FF A5 00 | 00 A5 FF |

**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.

*student number:* ***581558***

*581558 / 16 = 36347, remainder = 6*

*36347 / 16 = 2271, remainder = 11 (hex: B)*

*2271 / 16 = 141, remainder = 15 (hex: F)*

*141 / 16 = 8, remainder = 13 (hex: D)*

*8 / 16 = 0, remainder = 8*

*Hexadecimal:* ***8DFB6***

*581558 / 2 = 290779, remainder = 0*

*290779 / 2 = 145389, remainder = 1*

*145389 / 2 = 72694, remainder = 1*

*72694 / 2 = 36347, remainder = 0*

*36347 / 2 = 18173, remainder = 1*

*18173 / 2 = 9086, remainder = 1*

*9086 / 2 = 4543, remainder = 0*

*4543 / 2 = 2271, remainder = 1*

*2271 / 2 = 1135, remainder = 1*

*1135 / 2 = 567, remainder = 1*

*567 / 2 = 283, remainder = 1*

*283 / 2 = 141, remainder = 1*

*141 / 2 = 70, remainder = 1*

*70 / 2 = 35, remainder = 0*

*35 / 2 = 17, remainder = 1*

*17 / 2 = 8, remainder = 1*

*8 / 2 = 4, remainder = 0*

*4 / 2 = 2, remainder = 0*

*2 / 2 = 1, remainder = 0*

*1 / 2 = 0, remainder = 1*

*Binary:* ***10001101111110110110***

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