Week 1 – Bits & Bytes

Student number: 579444

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

Bit is the smallest unit of data in a computer; it can represent only two values – 0 and 1 (or false and true). Byte is a unit of data that consists of 8 bits. It's the standard unit used to represent a character, because it can represent 256 different values.

What is a nibble?

Nibble is unit of data that consists of 4 bits – it's half a byte.

What relationship does a nibble have with a hexadecimal value?

When hexadecimal values are converted to binary, each number of the hexadecimal value is represented by a nibble – 4 bits that determine its value. For example: 4A3 = 4 A 3 = 0100 1010 0011.

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

Because hexadecimal values are shorter than binary values, which makes them easier to track and read for people.

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

One byte can store 2 hexadecimal values, because it consists of 8 bits or 2 nibbles.

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

An IPv4 subnet has 4 octets, each octet consists of 8 bits, so that's why it has 4 * 8 = 32 bits in total.

Assignment 1.2: Your favourite color

Hexadecimal color code: #f54a2c

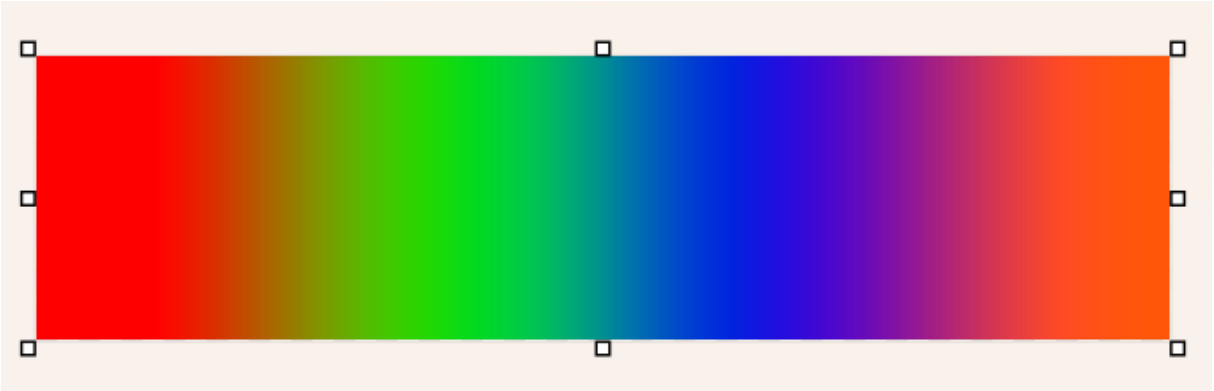
Assignment 1.3: Manipulating binary data

Color	Color code hexadecimaal (RGB)	Big Endian	Little Endian
RED	FF0000	FF0000	0000FF
GREEN	00FF00	00FF00	00FF00
BLUE	0000FF	0000FF	FF0000
WHITE	FFFFFF	FFFFFF	FFFFFF
Favourite (previous assignment)	F54A2C	F54A2C	2C4AF5

Screenshot modified BMP file in hex editor:

-Untitled- × 4pixels.bmp ×

```
00000000  42 4D 86 00 00 00 00 00 00 00 7A 00 00 00 6C 00  BMå.......z...l.
00000010  00 00 04 00 00 00 01 00 00 00 01 00 18 00 00 00  ................
00000020  00 00 0C 00 00 00 13 0B 00 00 13 0B 00 00 00 00  ................
00000030  00 00 00 00 00 00 42 47 52 73 00 00 00 00 00 00  ......BGRs......
00000040  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
00000050  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ................
00000060  00 00 00 00 00 00 00 00 00 00 02 00 00 00 00 00  ................
00000070  00 00 00 00 00 00 00 00 00 00 00 00 FF 00 FF 00  ............ . .
00000080  FF 00 00 2C 4A F5                                ..,J
```



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.

579444 / 2 = 289722 0

289722 / 2 = 144861 0

144861 / 2 = 72430 1

72430 / 2 = 36215 0

36215 / 2 = 18107 1

18107 / 2 = 9053 1

9053 / 2 = 4526 1

4526 / 2 = 2263 0

2263 / 2 = 1131 1

1131 / 2 = 565 1

565 / 2 = 282 1

282 / 2 = 141 0

141 / 2 = 70 1

70 / 2 = 35 0

35 / 2 = 17 1

17 / 2 = 8 1

8 / 2 = 4 0

4 / 2 = 2 0

2 / 2 = 1 0

1 / 2 = 0 1

10001101011101110100

1000 1101 0111 0111 0100 = 8D774

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