

# Template Week 1 – Bits & Bytes

Student number: 560830

## Assignment 1.1: Bits & Bytes intro

### What are Bits & Bytes?

A bit is a binary chunk of data which has the value 0 or 1. A byte is 8 bits, so anywhere between 00000000 to 11111111.

### What is a nibble?

A nibble is half a byte, or 4 bits.

### What relationship does a nibble have with a hexadecimal value?

Because a nibble consists of 4 bits, it can store 16 different pieces of data. You need one nibble to represent a hexadecimal number.

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

It's easier to read. The binary number is far longer than the same number in Hexadecimal;

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

A byte is 8 bits, so two hexadecimal characters. This is why hexadecimal is a standardized way to display 8-bit numbers.

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

Every number can be anywhere between 0 and 255, so an 8-bit number. Four of those is  $4 \times 8 = 32$  bits total.

## Assignment 1.2: Your favourite color

### Hexadecimal color code:

#b87bd5

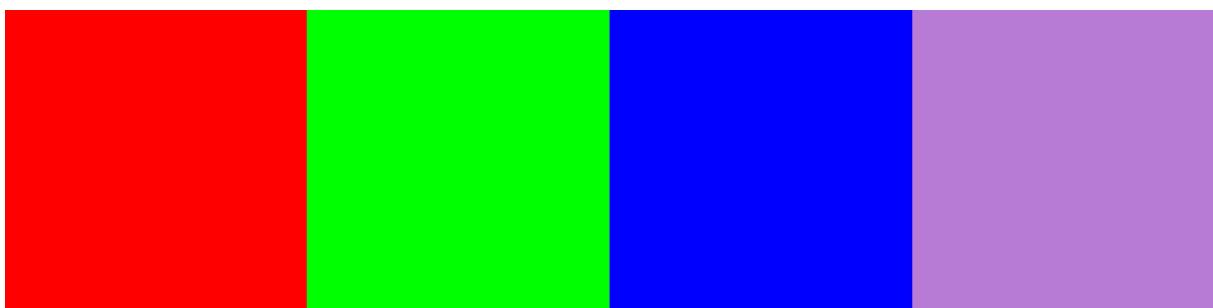
### Assignment 1.3: Manipulating binary data

Color	Color code hexadecimaal (RGB)	Big Endian	Little Endian
RED	#ff0000		
GREEN	#00ff00		
BLUE	#0000FF		
WHITE	#FFFFFF		
Favourite (previous assignment)	#b87bd5		

Screenshot modified BMP file in hex editor:

```
-Untitled- × 4pixels.bmp ×
00000000 42 4D 42 00 00 00 00 00 | 00 00 36 00 00 00 28 00
00000010 00 00 04 00 00 00 01 00 | 00 00 01 00 18 00 00 00
00000020 00 00 00 00 00 00 13 0B | 00 00 13 0B 00 00 00 00
00000030 00 00 00 00 00 00 00 00 | FF 00 FF 00 FF 00 00 D5
00000040 7B B8 +
```

Image:



#### **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 in decimal: 560830

Binary sequence:

1 - 2 - 4 - 8 - 16 - 32 - 64 - 128 - 256 - 512 - 1024 - 2048 - 4096 - 8192 - 16384 - 32768 - 65536 -  
131072 - 262144 - 524288 - 1048576

The largest fitting number is 524288.

010000000000000000000000

After that, the next biggest number fitting in the remainder ( $560830 - 524288 = 36542$ ) is nearly exactly 32768, which is the 4th number from 524288.

01000**1**000000000000000000

After that, the next biggest number fitting in the remainder ( $36542 - 32768 = 3774$ ) is 2048, leaving 1726.

010001000**1**000000000000

After that, the largest is ( $3774 - 2048 = 1726$ ) 1024.

0100010001**1**000000000000

Then 512 ( $702 - 512 = 190$ )

01000100011**1**0000000000

Then 128, skipping 256 ( $190 - 128 = 62$ )

010001000111010000000

Then 32, skipping 64 ( $62 - 32 = 30$ )

010001000111010100000

Then 16 ( $30 - 16 = 14$ )

0100010001110101**1**0000

Then 8 ( $14 - 8 = 6$ )

01000100011101011**1**000

Then 4 ( $6 - 4 = 2$ )

010001000111010111**1**00

Then finally the last fitting number; 2.

0100010001110101111**1**0