Template Week 1 – Bits & Bytes

Student number: 564595

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A single place or symbol in a binary number is called a **bit.**

Computers group bits together in sets of eight, called **byte**s.

So, 8 bits = 1 byte

What is a nibble?

A 4-bit number which is half a byte is a **nibble**.

It can be written **nybble** or **nyble** as well.

What relationship does a nibble have with a hexadecimal value?

Every four bits**(nibble)** in binary correspond to one symbol in **hexadecimal**

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

Hexadecimal is used because it's easier for humans to read than long **binary** strings and makes converting to and from **binary** much simpler.

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

Since each hex digit represents 4 bits, a **byte** can be easily represented with two **hexadecimal** symbols.

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

255.255.255.255

$2^8 . 2^8 . 2^8 . 2^8$

4 * 8 = 32

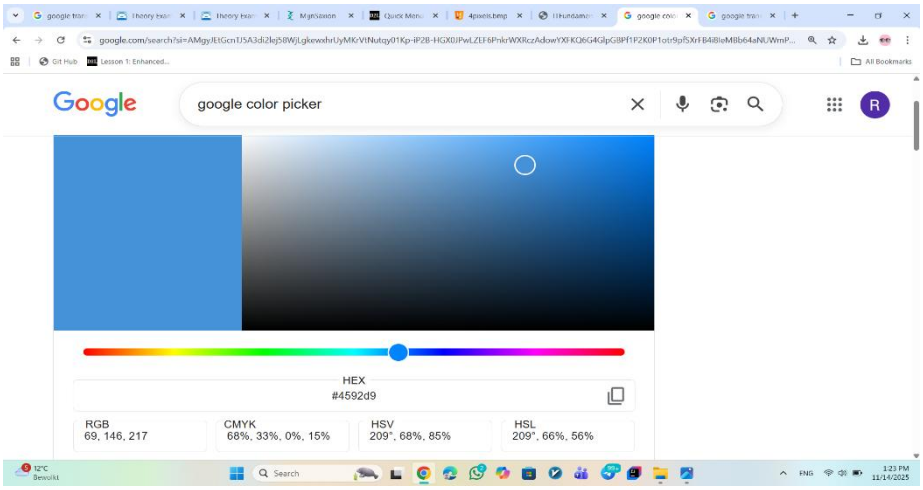
Or in other words:

An IPv4 address has **4 octets**, each **8 bits**.

So: **4 × 8 = 32 bits** → IPv4 is 32-bit.

Assignment 1.2: Your favourite color

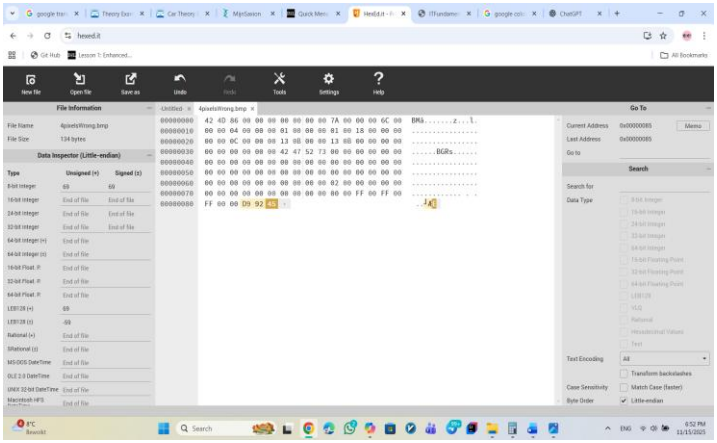
Hexadecimal color code: #4592d9

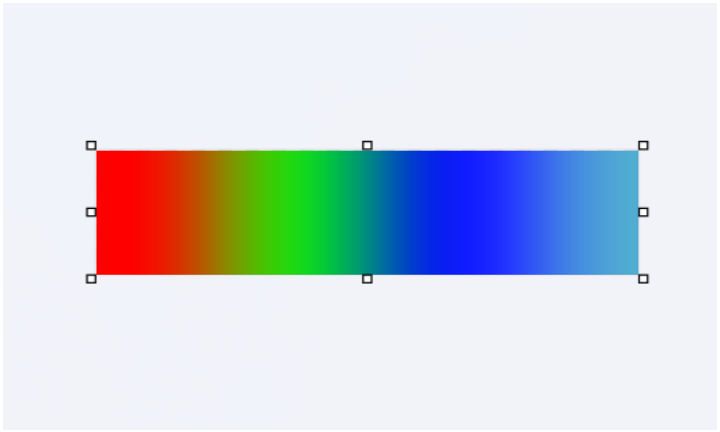


Assignment 1.3: Manipulating binary data

Color	Color code hexadecimaal (RGB)	Big Endian	Little Endian
RED	(255, 0, 0)	FF 00 00	00 00 FF
GREEN	(0, 255, 0)	00 FF 00	00 FF 00
BLUE	(0, 0, 255)	00 00 FF	FF 00 00
WHITE	(255, 255, 255)	FF FF FF	FF FF FF
Favourite (previous assignment)	(69, 146, 217)	45 92 D9	D9 92 45

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: 564595 / convert to → Binary

564595 / 2 remainder 1

282297/2 remainder 1

141148/2 remainder 0

70574/ 2 remainder 0

35287/2 remainder 1

17643/ 2 remainder 1

8821/ 2 remainder 1

4410/2 remainder 0

2205/2 remainder 1

1102/2 remainder 0

551/2 remainder 1

275/2 remainder 1

137/2 remainder 1

68/2 remainder 0

34/2 remainder 0

17/ 2 remainder 1

8/2 remainder 0

4/2 remainder 0

2/2 remainder 0

1/2 remainder 1

Binary = 1000 1001 1101 0111 0011

2^{19} 2^{18} 2^{17} 2^{16} 2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^{9} 2^{8} 2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}

1 0 0 0 1 0 0 1 1 1 0 1 0 1 1 1 0 0 1 1

$2^{19} + 2^{15} + 2^{12} + 2^{11} + 2^{10} + 2^{8} + 2^{6} + 2^{5} + 2^{4} + 2^{1} + 2^{0}$ = 56459

Student number: 564595 / convert to → Hexadecimal

564595 / 16 remainder 3

35287/16 remainder 7

2205/16 remainder 13 = D

137/16 remainder 9

8/16 remainder 8

Hexadecimal = 89D73

16^4 16^3 16^2 16^1 16^0

8 9 D 7 3

$(16^4 * 8) + (16^3 * 9) + (16^2 * 13) + (16^1 * 7) + (16^0 * 3) =$ 564595

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