Template Week 1 – Bits & Bytes

Student number: 579864

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A single place or symbol in a binary number is called a bit (a binary digit). Each bit can either be 0 or 1. Byte is a sequens of 8 bits.

What is a nibble?

Half of a byte or a sequens of 4 bits.

What relationship does a nibble have with a hexadecimal value?

Each symbol in a hexadecimal value is one nibble.

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

Every four bits in binary correspond to one symbol in hexadecimal. Therefore, a byte can be easily represented with two hexadecimal symbols. A 16-bit number can be represented with four hex symbols, a 32-bit number with eight hex symbols, and so on. Thus hexadecimal values take less space for same amount of data and are easier to process for human eye.

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

Every byte corresponds to two symbols in hexadecimal.

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

255.255.0.0

IPv4 has 4 octets, so the number of distinct addresses would be 256 to the power of 4 which is around 4,2 bn unique addresses:

$256^4=256*256*256*256=4\ 294\ 967\ 296$

And:

$256=2^8$ so $256^4=(2^8)^4=2^{32}$

So an IPv4 address is exactly 2^{32} possible values — so a 32-bit address (4 × 8 bits = 32 bits).

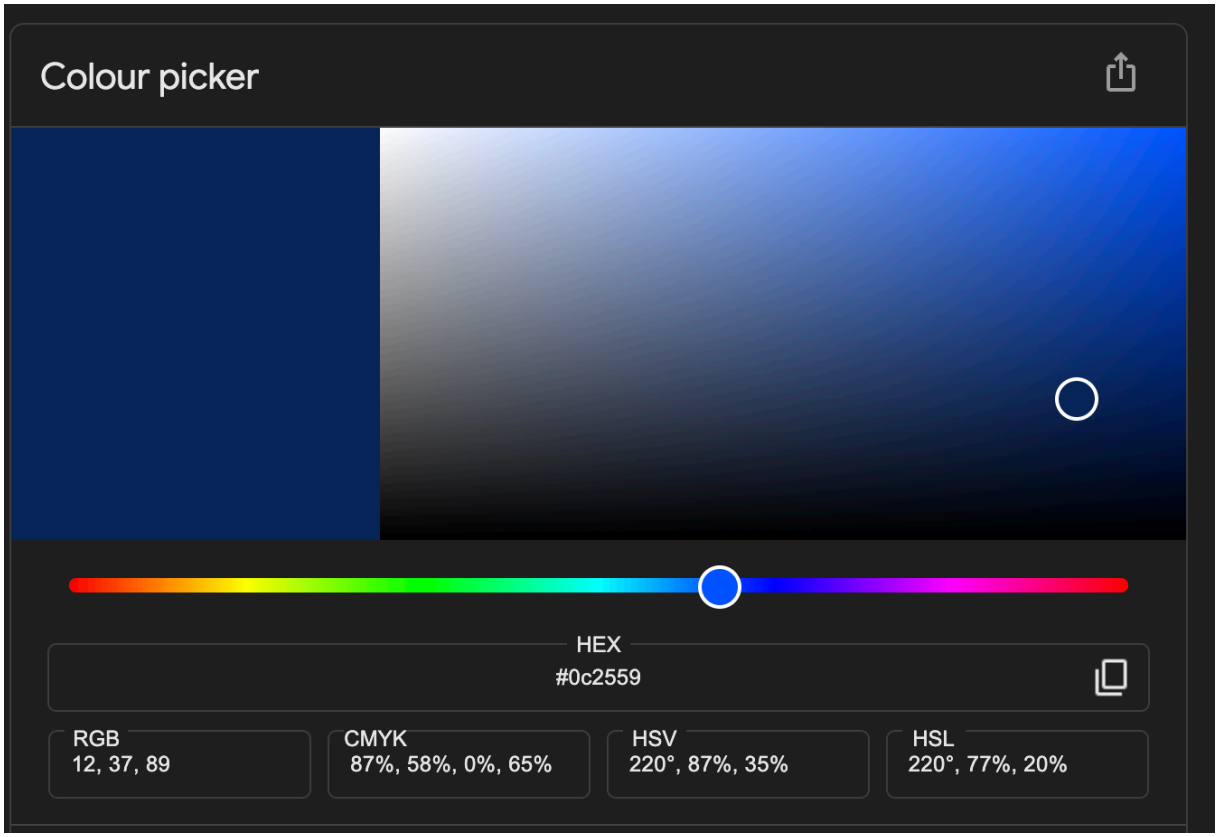
Assignment 1.2: Your favourite color

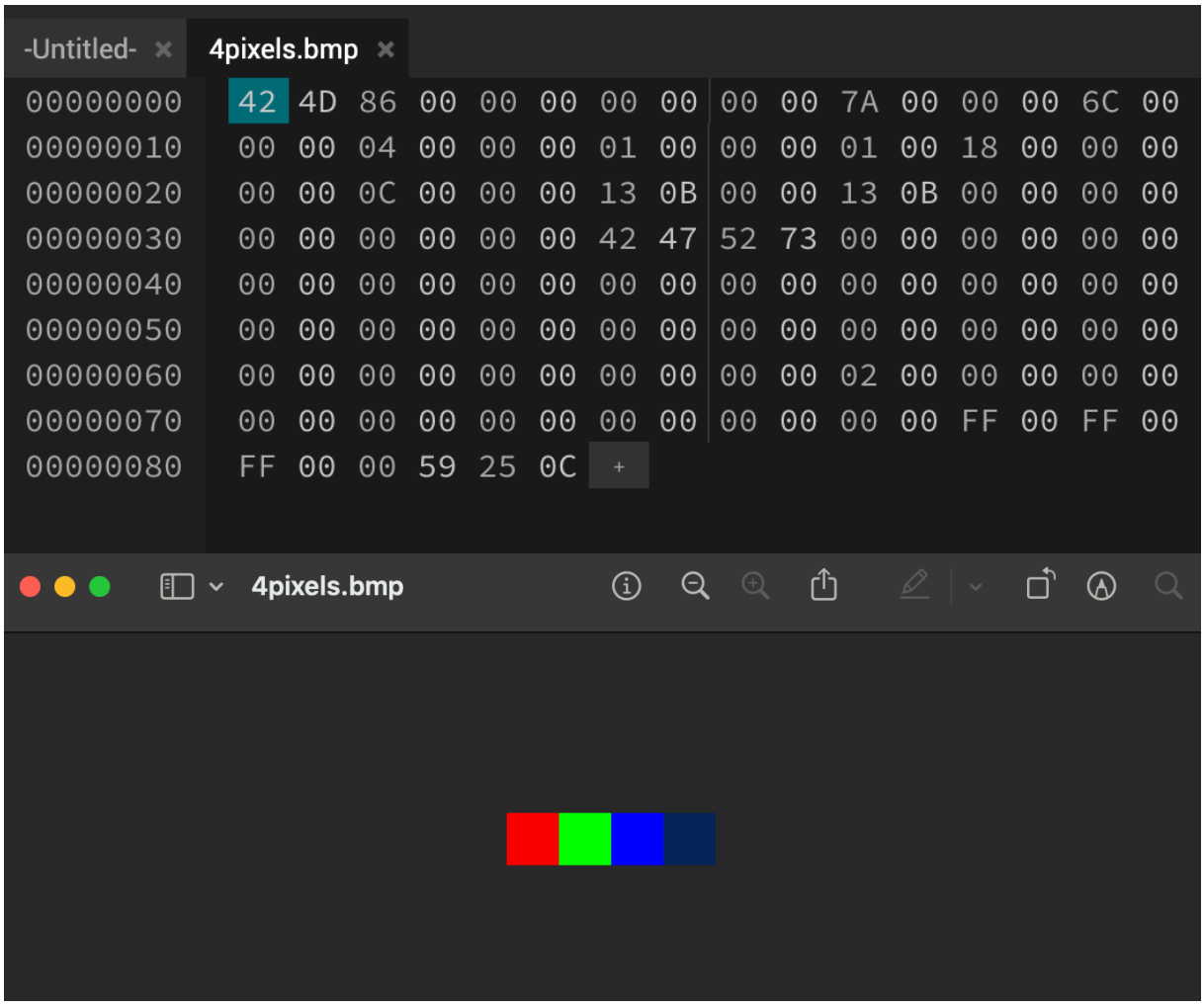
Hexadecimal color code: #0C2559

Assignment 1.3: Manipulating binary data

Color	Color code hexadecimaal (RGB)	Big Endian	Little Endian
RED	255 0 0	FF0000	0000FF
GREEN	0 255 0	00FF00	00FF00
BLUE	0 0 255	0000FF	FF0000
WHITE	255 255 255	FFFFFF	FFFFFF
Favourite (previous assignment)	12 37 89	0C2559	59250C

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: **579864**

1. 579864/2=289932, remainder 0
2. 289932/2=144966, remainder 0
3. 144966/2=72483, remainder 0
4. 72483/2=36241, remainder 1
5. 36241/2=18120, remainder 1
6. 18120/2=9060, remainder 0
7. 9060/2=4530, remainder 0
8. 4530/2=2265, remainder 0
9. 2265/2=1132, remainder 1
10. 1132/2=566, remainder 0
11. 566/2=283, remainder 0
12. 283/2=141, remainder 1
13. 141/2=70, remainder 1
14. 70/2=35, remainder 0
15. 35/2=17, remainder 1
16. 17/2=8, remainder 1
17. 8/2=4, remainder 0
18. 4/2=2, remainder 0

19. 2/2=1, remainder 0
20. 1/2= 0, remainder 1

1000 1101 1001 0001 1000

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

$2^{19} + 2^{15}+2^{14}+2^{12}+2^{11}+2^{8}+2^{4}+2^{3} = 579864$

1000 1101 1001 0001 1000

8 D 9 1 8

$8*16^{4} + 13*16^{3} + 9*16^{2} + 1*16^{1} + 8*16^{0} =$ **579864**

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