Week 1 – Bits & Bytes

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Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

Bits are the smallest form of data, they consist of a 1 or a 0.

A byte consists of 8 bits, a single byte represents a character like a letter, number or symbol

What is a nibble?

A nibble is a form of data that consists of 4 bits.

What relationship does a nibble have with a hexadecimal value?

A hexadecimal value consists of 4 bits and so does a nibble. So, 1 hexadecimal value consists of 1 nibble.

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

Since 1 hexadecimal value consists of 4 binary digits, larger binary data can be represented with fewer digits by displaying it as hexadecimal numbers.

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

Two hexadecimal values consist of 8 bits, and 1 byte consists of 8 bits. So, with a byte you can display 2 hexadecimal values.

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

An IPv4 subnet consists of 32 binary values. Each binary value consists of 1 bit, 32 x 1 = 32. An IPv4 subnet is therefore 32-bit.

Calculator used: https://www.calculator.net/ip-subnet-calculator.html

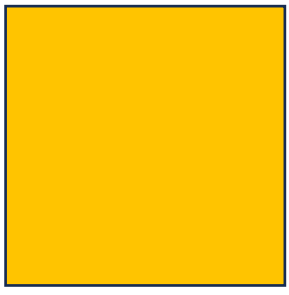
IPv4 Subnet Calculator

Result

IP Address:	217.120.43.52
Network Address:	217.120.43.52
Usable Host IP Range:	NA
Broadcast Address:	217.120.43.52
Total Number of Hosts:	1
Number of Usable Hosts:	0
Subnet Mask:	255.255.255.255
Wildcard Mask:	0.0.0.0
Binary Subnet Mask:	11111111.11111111.11111111.11111111
IP Class:	C
CIDR Notation:	/32
IP Type:	Public
Short:	217.120.43.52 /32
Binary ID:	11011001011110000010101100110100

Assignment 1.2: Your favourite colour

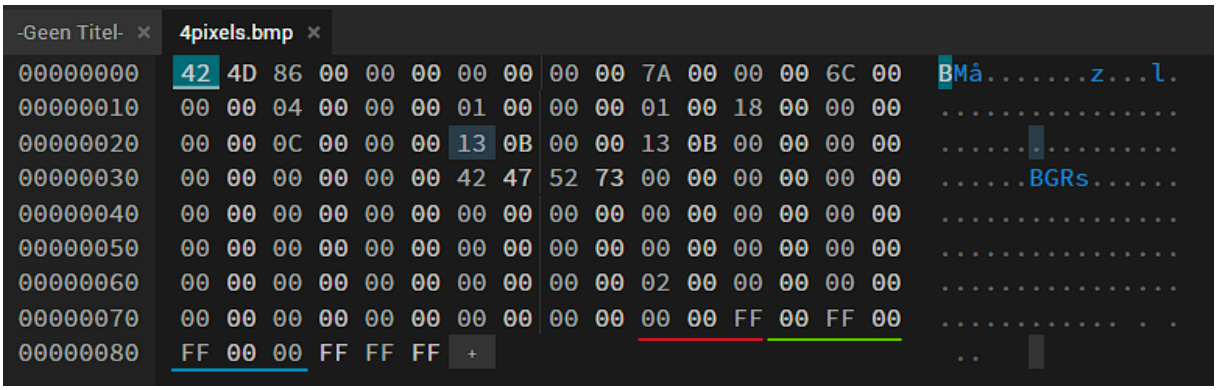
Hexadecimal colour code: #ffc400



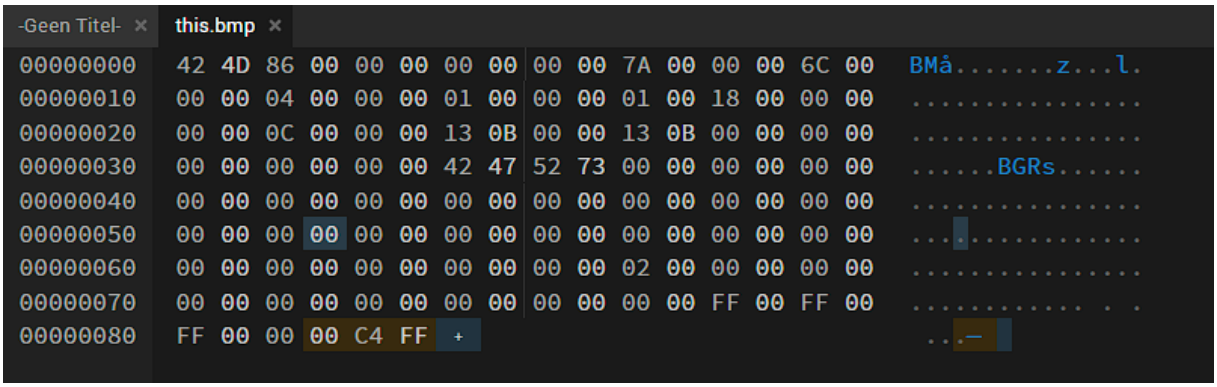
Assignment 1.3: Manipulating binary data

Colour	Colour code hexadecimaal (RGB)	Big Endian	Little Endian
RED	#ff0000	#ff0000	#0000ff
GREEN	#00ff00	#00ff00	#0000ff
BLUE	#0000ff	#0000ff	#ff0000
WHITE	#ffffff	#ffffff	#ffffff
Favourite (previous assignment)	#ffc400	#ffc400	#00c4ff

Regular BMP file in hex editor:



Screenshot modified BMP file in hex editor:



Bonus point assignment – week 1

Studentnummer: 565228

Decimal to Hex:

565228 : 16 = 35326
565228 – (35326 x 16) = 12
12 = C

35326 : 16 = 2207
35326 – (2207 x 16) = 14
14 = E

2207 : 16 = 137
2207 – (137 x 16) = 15
15 = F

137 : 16 = 8
137 – (8 X 16) = 9
9 = 9

8 : 16 = 0
8 = 8

Hex number = #89FEC

Decimal to Binary

1. 565228 : 2 = 282614
Remainder = 0

2. 282614 : 2 = 141307
Remainder = 0

3. 141307 : 2 = 70653
Remainder = 1

4. 70653 : 2 = 35326
Remainder = 1

5. 35326 : 2 = 17663
Remainder = 0

6. 17663 : 2 = 8831
Remainder = 1

7. 8831 : 2 = 4415
Remainder = 1

8. 4415 : 2 = 2207
Remainder = 1

9. 2207 : 2 = 1103
Remainder = 1

10. 1103 : 2 = 551
Remainder = 1

11. 551 : 2 = 275
Remainder = 1

12. 275 : 2 = 137
Remainder = 1

13. 137 : 2 = 68
Remainder = 1

14. 68 : 2 = 34
Remainder = 0

15. 34 : 2 = 17
Remainder = 0

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

Binary numbers = 10001001111111101100