

Template Week 1 – Bits & Bytes

Student number: 579185

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit is either 0 or 1 and a Byte is 8 bits and they represent how a computer stores data

What is a nibble?

4 bits

What relationship does a nibble have with a hexadecimal value?

One nibble (4 bits) can represent a hexadecimal digit

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

Easier to read for humans less error prone too

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

Following the nibble question we answered before a byte can represent two hexadecimal digits

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

when we convert the subnet for example 255.255.0.0 in binary we get 4 octets.

11111111.11111111.11111111.00000000

since 0 or 1 = 1 b

$8+8+8+8=32$ bits

Assignment 1.2: Your favourite color

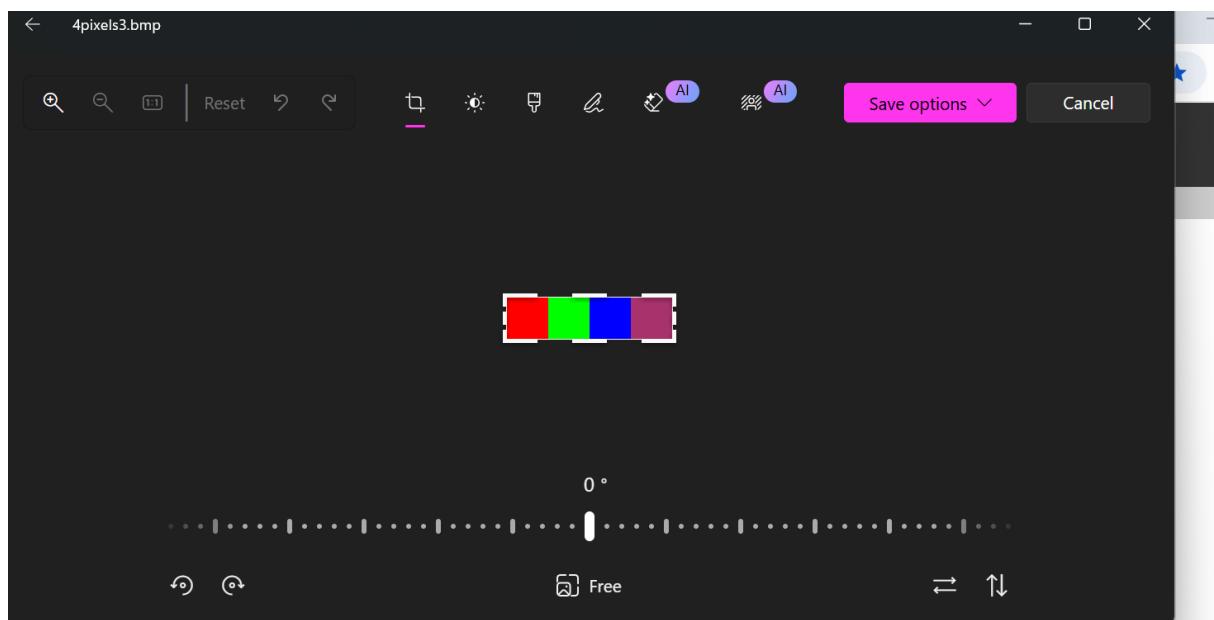
Hexadecimal color code:

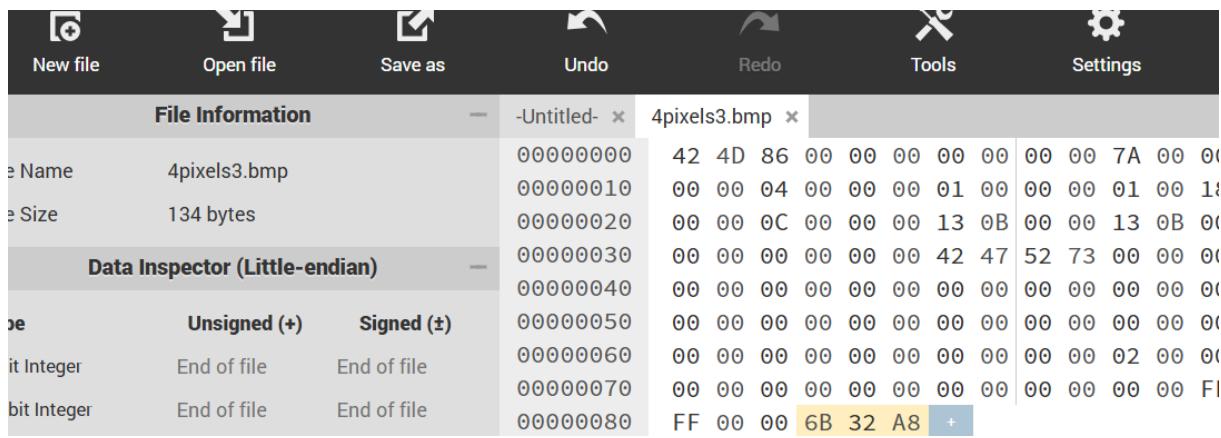
#a8326b

Assignment 1.3: Manipulating binary data

Color	Color code hexadecimaal (RGB)	Big Endian	Little Endian
RED	255,0,0	#ff0000	#ff0000
GREEN	0,255,0	#00FF00	00ff00
BLUE	0,0,255	#0000FF	#ff0000
WHITE	255,255,255	#FFFFFF	#FFFFFF
Favourite (previous assignment)	168, 50, 107	#a8326b	A8326b

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.

And convert it back to decimal after this is done with the calculations showing

After binary make it to hex and then prove it with the powers of 2 back to decimal

Decimal to binary :

$$579185 \div 2 = 289592 \ 1$$

$$289592 \div 2 = 144796 \ 0$$

$$144796 \div 2 = 72398 \ 0$$

$$72398 \div 2 = 36199 \ 0$$

$$36199 \div 2 = 18099 \ 1$$

$$18099 \div 2 = 9049 \ 1$$

$$9049 \div 2 = 4524 \ 1$$

$$4524 \div 2 = 2262 \ 0$$

$$2262 \div 2 = 1131 \ 0$$

$$1131 \div 2 = 565 \ 1$$

$$565 \div 2 = 282 \ 1$$

$$282 \div 2 = 141 \ 0$$

$$141 \div 2 = 70 \ 1$$

$$70 \div 2 = 35 \ 0$$

$$35 \div 2 = 17 \ 1$$

$$17 \div 2 = 8 \ 1$$

$$8 \div 2 = 4 \ 0$$

$$4 \div 2 = 2 \ 0$$

$$2 \div 2 = 1 \ 0$$

$$1 \div 2 = 0 \ 1$$

the number is : 1 0 0 0 1 1 0 1 0 1 1 0 0 1 1 1 0 0 0 1

Binary to hex :

First we divide the number to groups of 4

1000.1101.0110.0111.0001

Then we check the 4 bit unit that corresponds to hex

8 = 1000

D = 1101

6 = 0110

7 = 0111

1 = 0001

Final conversion : binary back to decimal with powers of 2 to confirm the match :

My binary number is 19 numbers long (starting from 0) so if each is raised to the powers of 2 :

$$2^{19} = 524288$$

$$2^{15} = 32768$$

$$2^{14} = 16384$$

$$2^{12} = 4096$$

$$2^{10} = 1024$$

$$2^9 = 512$$

$$2^6 = 64$$

$$2^5 = 32$$

$$2^4 = 16$$

$$2^0 = 1$$

Now we add them to check :

524288

+32768 = 557056

+16384 = 573440

+4096 = 577536

+1024 = 578560

+512 = 579072

+64 = 579136

+32 = 579168

+16 = 579184

+1 = 579185

The result is correct !!

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