

Big Question: Why do humans use the Hexadecimal number system?

Monday, 04 April
2022

Learning Intention

To develop knowledge

Understand what the hexadecimal number system is

To secure understanding by

To convert between binary, denary and hexadecimal numbers

To achieve excellence by

Explain the use of hexadecimal numbers and justify why it is used

binary to hex

1110011100010000
E710



Hexadecimal number system

A number system containing 16 possible digits

Task 1 – Neatly draw the Hexadecimal conversion table into books (slide 6)

Task 2

Write a couple of sentences explaining:

- a) What is Hexadecimal?
- b) Why is it used?

Task 3 – Complete the Hexadecimal to binary work sheet.

There are 2 sheets in this worksheet

1. Hex to binary
2. Binary to hex – **label each task clearly in your book**

Excellence – Complete the extra questions

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Hexadecimal



Hexadecimal codes are used in many areas of computing to **simplify binary numbers**.

Computers do not use hexadecimal - it is used by humans to shorten binary to a more easily understandable form.

Hexadecimal is translated into binary for computer use.

To develop knowledge

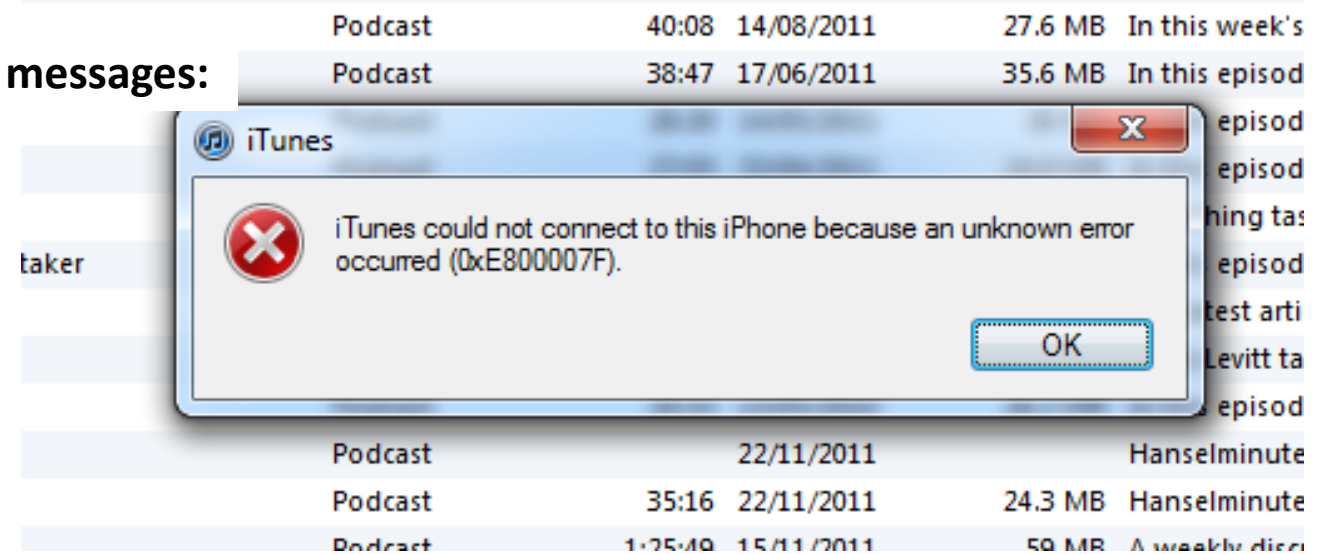
Understand what the hexadecimal number system is

Some examples of where hex is used in computing:

colour references:



error messages:



assembly language programs:

```
000FA EB 21 53 61 66 65 42 6F 6F 74 20 00 06 01 00 00 00 00 00 00 6A 0F 00 00 00 00 00 FA B5 24 00 00 00 00 00
03600 00 9C 02 68 00 7C 80 12 08 0E 1F 0E 07 FC BB AE 7D B9 04 00 8D 5F 10 80 3F 80 E0 F8 75 62 80 7F 04 12 75
0725C BE 5E 7C BF 00 06 57 B9 09 00 F3 A4 8B 17 8B 4F 02 BB 00 7C C3 B8 01 02 CD 13 07 1F 61 CF 8A C4 80 E4 0F
10880 FC 09 7E 03 80 C4 27 B1 04 D2 E8 3C 09 7E 02 04 27 01 06 9B 7D AC 0A C0 75 06 AC 98 03 F0 EB F5 79 06 4E
144C6 04 20 F6 D8 B4 0E BB 07 00 CD 10 EB E4 B4 92 BE 6A 7D EB C2 FA 33 C0 8E D0 BC 00 7C FB 66 A1 14 7C 66 8B
18016 18 7C BD E0 07 BE A3 7D 66 89 44 08 66 89 54 0C 89 6C 06 B4 42 B2 80 8E C5 CD 13 73 3B B4 08 B2 80 CD 13
21666 33 DB 8A DE 43 66 83 E1 3F 66 A1 AB 7D 66 8B 16 AF 7D 66 F7 F1 8B CA 33 D2 66 F7 F3 41 C0 CC 02 86 C4 0B
82 7D 72 96 66 26 81 3E E0 01 53 42 66 73 75 85 A1 24 7C 26 3B 06 E5
D1 C8 66 26 03 07 8D 5F 04 80 FF 02 75 F1 66 0B C0 75 D7 26 A0 E9 01
F4 01 66 26 8B 16 F8 01 66 8B C8 66 0B CA 0F 85 57 FF 68 00 00 68 00
65 92 63 6F 72 72 75 70 74 65 9C 00 13 0D 45 70 65 50 9D 68 61 72 9C
6F 8E 30 30 68 29 0D 0A 00 FE 10 00 01 00 00 00 00 00 00 00 00 00 00
00 80 20 21 00 07 FE FF FF 00 08 00 00 00 F0 FF 02 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

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000FA EB 21 53 61 66 65 42 6F 6F 74 20 00 06 01 00 00 00 00 00 00 6A 0F 00 00 00 00 00 FA B5 24 00 00 00 00 00
03600 00 9C 02 68 00 7C 80 12 08 0E 1F 0E 07 FC BB AE 7D B9 04 00 8D 5F 10 80 3F 80 E0 F8 75 62 80 7F 04 12 75
0725C BE 5E 7C BF 00 06 57 B9 09 00 F3 A4 8B 17 8B 4F 02 BB 00 7C C3 B8 01 02 CD 13 07 1F 61 CF 8A C4 80 E4 0F
10880 FC 09 7E 03 80 C4 27 B1 04 D2 E8 3C 09 7E 02 04 27 01 06 9B 7D AC 0A C0 75 06 AC 98 03 F0 EB F5 79 06 4E
144C6 04 20 F6 D8 B4 0E BB 07 00 CD 10 EB E4 B4 92 BE 6A 7D EB C2 FA 33 C0 8E D0 BC 00 7C FB 66 A1 14 7C 66 8B
18016 18 7C BD E0 07 BE A3 7D 66 89 44 08 66 89 54 0C 89 6C 06 B4 42 B2 80 8E C5 CD 13 73 3B B4 08 B2 80 CD 13
21666 33 DB 8A DE 43 66 83 E1 3F 66 A1 AB 7D 66 8B 16 AF 7D 66 F7 F1 8B CA 33 D2 66 F7 F3 41 C0 CC 02 86 C4 0B
82 7D 72 96 66 26 81 3E E0 01 53 42 66 73 75 85 A1 24 7C 26 3B 06 E5
D1 C8 66 26 03 07 8D 5F 04 80 FF 02 75 F1 66 0B C0 75 D7 26 A0 E9 01
F4 01 66 26 8B 16 F8 01 66 8B C8 66 0B CA 0F 85 57 FF 68 00 00 68 00
65 92 63 6F 72 72 75 70 74 65 9C 00 13 0D 45 70 65 50 9D 68 61 72 9C
6F 8E 30 30 68 29 0D 0A 00 FE 10 00 01 00 00 00 00 00 00 00 00 00 00
00 80 20 21 00 07 FE FF FF 00 08 00 00 00 00 F0 FF 02 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

To develop knowledge Understand what the hexadecimal number system is

Number representation:



We've already covered:

Denary	10 digits	Base 10
Binary	2 digits	Base 2
Hexadecimal	16 digits	Base 16

- **Hex** = 6
- **Decimal** = 10
- Therefore **Hexadecimal** = 16
- Otherwise known as **base 16**.

To develop knowledge

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Hexadecimal



- Uses base 16, which represent a value.

0 1 2 3 4

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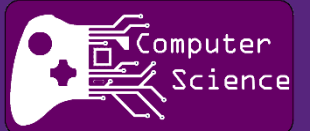
To secure understanding by

To convert between binary, denary and hexadecimal numbers

Binary	Decimal	Hexadecimal
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

different digits to

Hexadecimal - When is it used?



Colours can be represented in a computer as Hex values as it is simpler to use and understand than binary

The system below uses two hex digits instead of binary digits for each colour

Binary number



Hex value of this colour = #FF6600

Binary value = 111111110110011000000000

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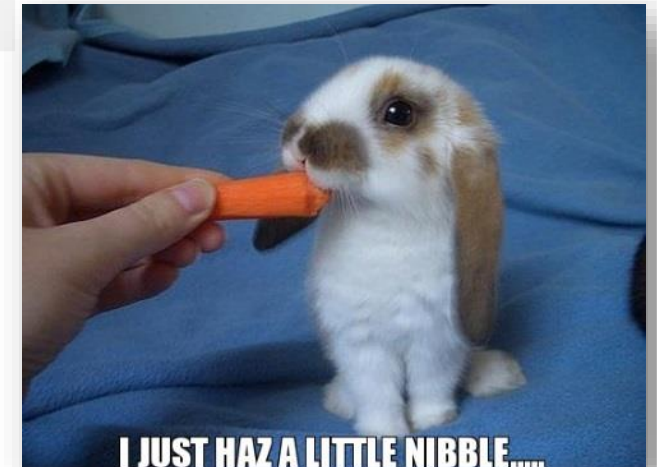
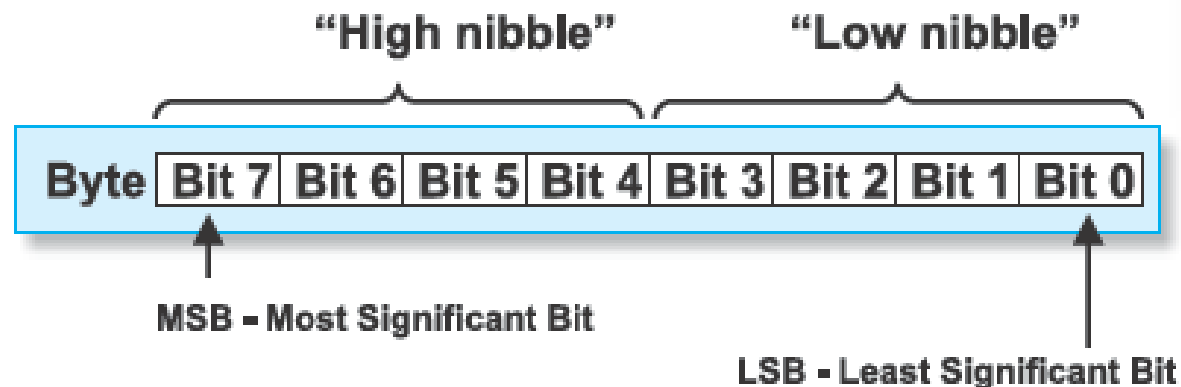
Binary - Nibbles



- How many Bits are there in a Byte?
 - *There are 8 bits in a Byte*

128	64	32	16	8	4	2	1
1	1	1	1	1	1	1	1

- How many bits in half a byte?
 - There are 4. This is called a **Nibble**.



- The binary for decimal 75 is

0 1 0 0 1 0 1 1

To secure understanding by
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- To convert it to Hex break it down into nibbles using spaces.
- We start by grouping it into 4 **starting from the right**

We then write it out with a space between each nibble.

0 1 0 0 1 0 1 1

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Binary to Hexadecimal

To secure understanding
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0100

8	4	2	1
0	1	0	0



4 (in decimal)



0100 1411 is

1011

8	4	2	1
1	0	1	1



11 (in decimal)



in hexadecimal

Hexadecimal to binary

To secure understanding by To convert between binary, denary and hexadecimal numbers

1. First split up the Hexadecimal number
2. Convert to nibbles
3. Put the nibbles together

4B

8	4	2	1
0	1	0	0

0 1 0 0

8	4	2	1
1	0	1	1

1 0 1 1

4B is 01 00 10 11 in binary