

GCSE Computer Science

# *Binary & Hexadecimal Numbers*



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# Binary to Denary

MSB

LSB

128	64	32	16	8	4	2	1
1	0	0	1	1	1	0	1



$$128 + 16 + 8 + 4 + 1 = 157$$

Why do computers use binary?

- Electricity!

SSD

[2]



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1 Hz = 1 cycle per second  
 1 MHz = 1 million  
 1 GHz = 1 billion

# Denary to Binary

128	64	32	16	8	4	2	1
1	0	1	0	0	1	0	0

164 =

359 = <sup>256</sup> 1 0

0 0 1 1 1  
 Where are the most & least significant bits?

164 - 128 = 36  
 36 - 32 = 4  
 4 - 4 = 0

359 - 256 = 103  
 103 - 64 = 39  
 39 - 32 = 7  
 7 - 4 = 3



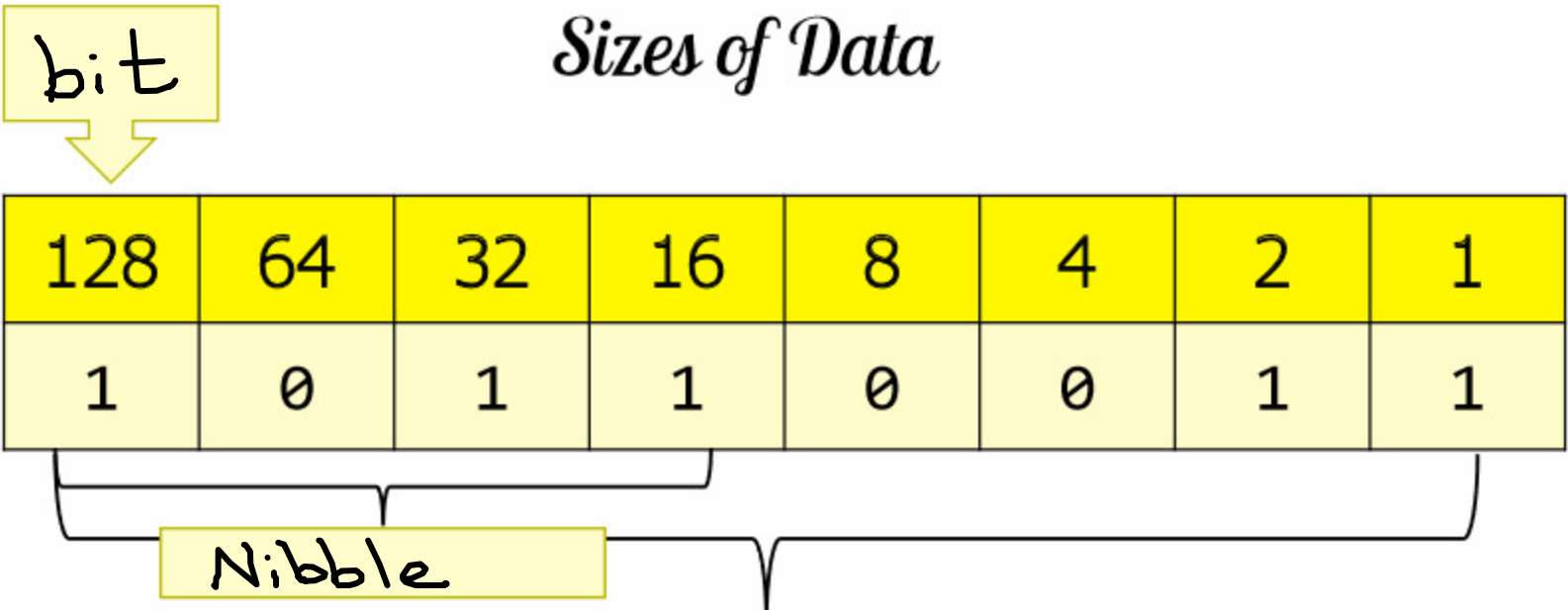
MSB = leftmost col.  
 LSB = 1

[2]



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KB  
Kilobyte = 1000 Bytes

MB  
Megabyte = 1000 KB

Kibibyte = 1024 Bytes.

Mebibyte = 1024 KB

Dec 25  
= Oct 31  
#FFF with

Hexadecimal ← Why?! nibble

<del>128</del>	<del>64</del>	<del>32</del>	<del>16</del>	8	4	2	1
1	0	1	0	0	1	0	0

10 = A

4 = 4

= A4

it goes from 0 - F

would hexadecimal go up in a certain number?

16 unique digits

0 1 2 3 4 5 6 7 8 9  
A B C D E F

What is the benefit of using hexadecimal?



Human = It's easier to read  
= It takes less space on the screen

[2]



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# Binary Addition

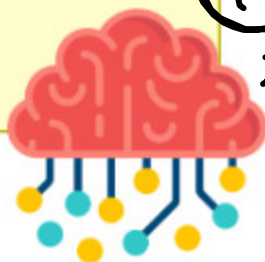
Rules of Binary Addition:

$$0 + 0 = 0$$

$$0 + 1 = 1$$

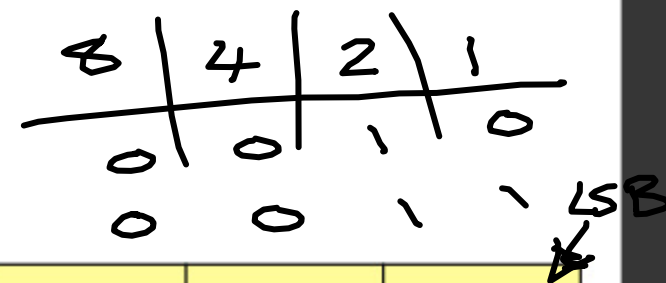
$$\rightarrow 1 + 1 = 10(2)$$

$$1 + 1 + 1 = 11(3)$$



overflow error

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



$$0 + 1 + 1 = 2 \rightarrow 10$$

$$1 + 0 + 1 = 2 \rightarrow 10$$

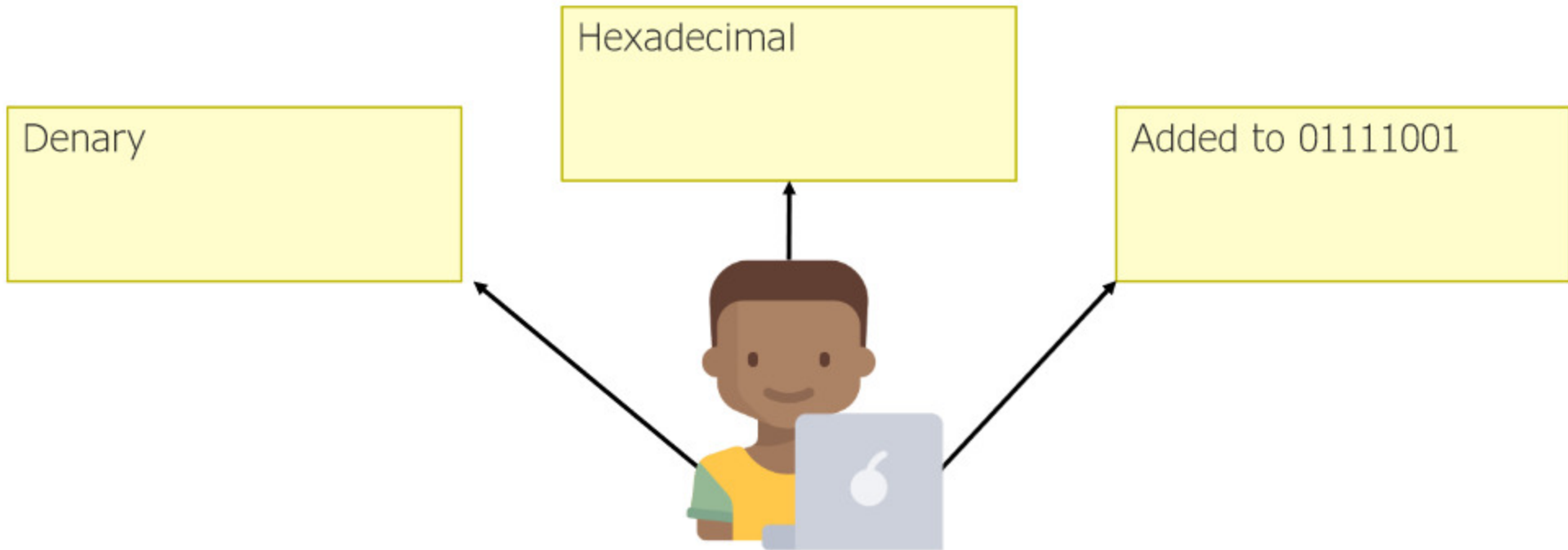


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## Practice Question

Convert the binary bit pattern 10011110 to:



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