

Year 8 Knowledge Organiser: Data Representation

What is Binary?

Binary is a number system that only uses two digits: 1 and 0. All information that is processed by a computer is in the form of a sequence of 1s and 0s. Therefore, all data that we want a computer to process needs to be converted into binary.

Hexadecimal: Hexadecimal (or **hex**) is a **base 16** system used to simplify how binary is represented. A hex digit can be any of the following **16 digits**:

0 1 2 3 4 5 6 7 8 9 A B C D E F. Each hex digit reflects a 4-bit binary sequence.

Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Denary	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Convert Denary and 8 bit Binary into Hexadecimal

Example: convert the Denary number **165** into hexadecimal.

1. Create a binary table:

128	64	32	16	8	4	2	1	Answer
								165

2. Place the number 1 under each number you need to make up 165 and a 0 under those not used.

128	64	32	16	8	4	2	1	Answer
1	0	1	0	0	1	0	1	165

3. Split the number into two nibbles:

8	4	2	1	8	4	2	1	Answer
128	64	32	16	8	4	2	1	165
1	0	1	0	0	1	0	1	

4. Add up the nibbles separately. In this example, the first nibble adds up to 10, which in Hex is represented by the character **A** and the second adds up to 5 which means that **165 in Hex is A5**.

8	4	2	1	8	4	2	1	Answer
128	64	32	16	8	4	2	1	165
1	0	1	0	0	1	0	1	A5
A				5				

Binary Addition

Binary addition involves adding two or more binary numbers together.

When adding two numbers, you will have the following possible outcomes:

$$0+0=0$$

$$0+1=1$$

$$1+1=11$$

When adding binary numbers, do so right to left. ←

Example: add **0100** and **0101**

1 st num	0	1	0	0	+
2 nd num	0	1	0	1	
Carried	1				
Answer	1	1	0	1	=

0 + 1 = 1 ← START
0 + 0 = 0
1 + 1 = 11, so the one is carried
0 + 0 + 1 = 1
Therefore, the answer is **1101**

Overflow Error: An overflow error occurs when the largest number that a CPU register can hold is exceeded.

Images

Pixel: A single point in an image.

Resolution: The number of pixels that make up an image e.g. 800 x 600

Colour Depth: The number of bits used for each colour. E.g. 8 bit colour and 24 bit 'True Colour'.

ASCII vs Unicode



	Advantages	Disadvantages
ASCII	Only uses 7 bits to store a character, meaning less memory is used.	Limited to 128 different characters.
Unicode	Uses up to 32 bits per character meaning it can store a wider range of language characters.	More bits per character means more memory is used.