

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.

Base 2 and Base 10 Number Systems

Denary / Decimal number system: Uses the digits 0,1,2,3,4,5,6,7,8 and 9. The value of each **place value** is calculated by multiplying by 10. The Denary or Decimal system is also known as a **base 10** system.

Binary: Binary is a number system used by computers that only uses two digits: 1 and 0. The binary system is known as a **base 2** system.

Convert 8 bit Binary to Denary

Example: convert the Binary number **01000110** into Denary.

1. Create a binary table:

128	64	32	16	8	4	2	1	Answer

2. Add the binary number:

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

3. Add up all the numbers with a 1 underneath them to get the answer!

128	64	32	16	8	4	2	1	Answer
0	1	0	0	0	1	1	0	70

Convert Denary to 8 bit Binary

Example: convert the Denary number **45** into binary .

1. Create a binary table:

128	64	32	16	8	4	2	1	Answer
								45

2. Place the number 1 under each number you need to make up 45

128	64	32	16	8	4	2	1	Answer
		1		1	1		1	45

3. Add a 0 for the unused numbers. The binary number is:

00101101

128	64	32	16	8	4	2	1	Answer
0	0	1	0	1	1	0	1	45

Memory	Number of bytes
Bit	1/8 (a byte is made up of 8 bits)
Nibble	1/2 (a nibble is 4 bits)
Byte	1 byte
Kilobyte (KB)	1 000 bytes
Megabyte (MB)	1 000 000 bytes
Gigabyte (GB)	1 000 000 000 bytes
Terabyte (TB)	1 000 000 000 000 bytes

ASCII

ASCII stands for **American Standard Code for Information Interchange**. ASCII uses **seven-bit binary number** which means it can create a possible 128 distinct characters. Use the table opposite to create ASCII character code by combining the first half of the code with the second.

Explanation

1. Find the character you are looking for in the ASCII table.
2. Locate the **first half** binary number at the top of the **column**.
3. Add the **second half** binary number at the start of the **row** that your character is in.

ASCII Table

First half

ASCII (7 bit)	000	001	010	011	100	101	110	111
0000	NULL	DLE		0	@	P	.	p
0001	SOH	DC1	!	1	A	Q	a	q
0010	STX	DC2	"	2	B	R	b	r
0011	ETX	DC3	#	3	C	S	c	s
0100	EDT	DC4	\$	4	D	T	d	t
0101	ENQ	NAK	%	5	E	U	e	u
0110	ACK	SYN	&	6	F	V	f	v
0111	BEL	ETB	'	7	G	W	g	w
1000	BS	CAN	(	8	H	X	h	x
1001	HT	EM	)	9	I	Y	i	y
1010	LF	SUB	*	:	J	Z	j	z
1011	VT	ESC	+	;	K	[	k	{
1100	FF	FS	,	<	L	\	l	|
1101	CR	GS	=	=	M	]	m	}
1110	SO	RS	.	>	N	^	n	~
1111	SI	US	/	?	O	_	o	DEL

Second half

4. Join them together to form your binary code. For example: **A = 100 0001**