

## The Binary System

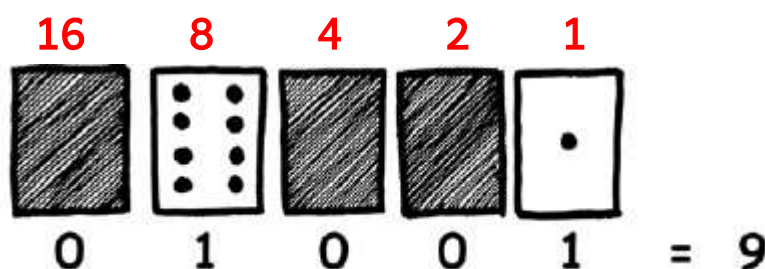


Everything that you see on computers (i.e. numbers, words, movies, pictures, sound) operates in Binary!

The Binary system (or base-2) is a numeric system that only uses two digits – 0 and 1.

Therefore computers count different from us. Humans count with the decimal number system which uses ten different digits (from 0 to 9) and the binary number system uses only two different digits (0 and 1).

For example 9 is represented by 01001. How?



The place value in the binary system is different than the decimal system.

The value of the next digit is double the value of the previous digit.

(See above)

If the first digit (far right) is on (1) its value is (1) one.

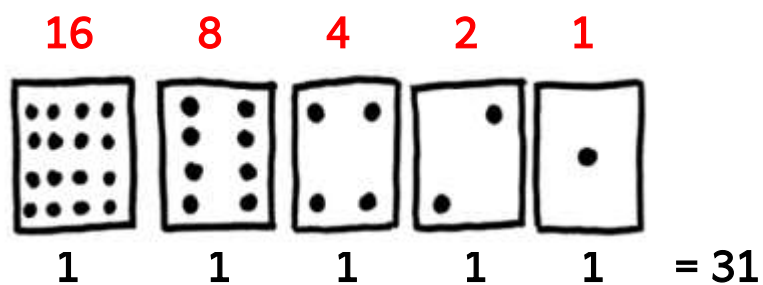
If the second digit is on (1) its value is (2) two.

If the third digit is on (1) its value is (4) four.

If the fourth digit is on (1) its value is (8) eight, etc.

Therefore 1 0 0 1 is  $(8 + 0 + 0 + 1) = 9$

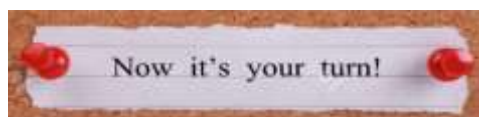
31 is represented by 11111. How?



$$16 + 8 + 4 + 2 + 1 = 31$$

For more information about binary numbers, you can watch [this](#) video.

Notice that the digit on the right hand side represents double the digit on it's left.



So let's see how the binary system represents our decimal numbers.

Decimal	Binary Number						
	?	32	16	8	4	2	1
1							1
2						1	0
3						1	1
4					1	0	0
5							
10							
21							
34							
47							

50	
67	
100	

Now let's figure out what the decimal number is.

Decimal	Binary Number					
	<b>?</b>	<b>16</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>1</b>
8 + 2 = 10	0	1	0	1	0	
	1	1	0	1	0	
	0	1	0	1	1	
	0	1	1	1	1	
	1	1	1	1	1	

Can you work out what this binary number is in decimal number?

1 1 0 0 1 0 0 0