

The bit with the greatest weight (furthest to the left) is called the **Most Significant Bit (MSB)**.

The bit with the smallest weight (furthest to the right) is called the **Least Significant Bit (LSB)**.

Converting a number from binary to decimal is a straightforward process. We simply multiply the value of each bit by its weight, and sum them together.

E.g. what is the decimal value of 1101_2 ?

$$1101_2 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 10^1 + 1 \times 2^0$$

$$1101_2 = 8 + 4 + 1$$

$$1101_2 = 13_{10}$$

Converting a number from decimal to binary is a slightly harder process, but still very manageable if we use the following method: we divide the original decimal number by 2, and write down the quotient and the remainder. We then repeat this process, halving the obtained quotients and noting down the remainders, until the quotient is equal to zero. The binary number can be found by looking at the remainders, with the MSB being the last (bottom) remainder and the LSB being the first (top) remainder.

E.g. convert 79_{10} to binary.

$79/2 = 39$	Remainder = 1	→ LSB
$39/2 = 19$	Remainder = 1	
$19/2 = 9$	Remainder = 1	
$9/2 = 4$	Remainder = 1	
$4/2 = 2$	Remainder = 0	
$2/2 = 1$	Remainder = 0	
$1/2 = 0$	Remainder = 1	→ MSB

Quotients Binary number

The binary equivalent of 79_{10} is therefore 1001111_2 .

Binary is the number system used in the world of digital electronics and computers, and it is a useful skill to be able to convert quickly between binary and decimal.

1.3 Octal

Octal is yet another number system, with a base of eight. The digits in an octal number can be one of eight symbols, which are (0,1,2,3,4,5,6,7,). The digit positions in an octal number indicate increasing powers of eight.