

Understanding 'base n' number systems

In base 10 we have 10 different numerals that we use: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

We group things in 10s and use the concept of place value in order to write any number at all, using only these 10 numerals.

For example in base 10 the number 348 is composed of three main parts.

$3 \cdot 10^2$ 3 $3 \cdot 100$	$4 \cdot 10^1$ 4 $4 \cdot 10$	$8 \cdot 10^0$ 8 $8 \cdot 1$
There are 3 hundreds. A hundred is a group of 10 tens. Each ten is in turn made up of 10 ones. This is equivalent to 30 tens, or 300 ones.	There are 4 tens. A ten is a group of 10 ones. This is equivalent to 40 ones.	There are 8 ones.

But what about other base number systems? In base 2, there are only 2 numerals: 0 and 1. This means you group things in 2s.

In base 3 there would be 3 numerals: 0, 1, and 2. This means you would group things in 3s.

Fill out the following charts, counting to 10 in each number system. Just as above, explain each place value in each number. The first few are done as examples:

(pictorial representation)	10^2 10^1 10^0 Base 10	2^3 2^2 2^1 2^0 Base 2 eights fours two ones
	0	0
I	1 1 one	1 1 one
II	2 2 ones	10 1 two, and 0 ones
III	3 3 ones	11 1 two, 1 one
IIII	4 4 ones	100 1 four, 0 twos, 0 ones
IIIII	5 5 ones	101 1 four, 0 twos, 1 one
IIIIII	6 6 ones	110 1 four, 1 two, 0 ones
IIIIIIII	7 7 ones	111 1 four, 1 two, 1 one
IIIIIIIIII	8 8 ones	1000 1 eight, 0 fours, 0 twos, 0 ones
IIIIIIIIIIII	9 9 ones	1001 1 eight, 0 fours, 0 twos, 1 one
IIIIIIIIIIIIII	10 1 ten, 0 ones	1010 1 eight, 0 fours, 1 two, 0 ones