Counting in Base 10 (Decimal)

10^2	10^1	10^0	
100	10	1	
		0	$0 \cdot 1 = 0$
		1	$1 \cdot 1 = 1$
		2	$2 \cdot 1 = 2$
		3	$3 \cdot 1 = 3$
		4	$4 \cdot 1 = 4$
		5	$\vdots$
		6	
		7	
		8	
		9	$9 \cdot 1 = 9$
	1	0	$1 \cdot 10 + 0 \cdot 1 = 10$
	1	1	$1 \cdot 10 + 1 \cdot 1 = 11$

Counting in Base 2 (Binary)

2^3	2^2	2^1	2^0	Base 10

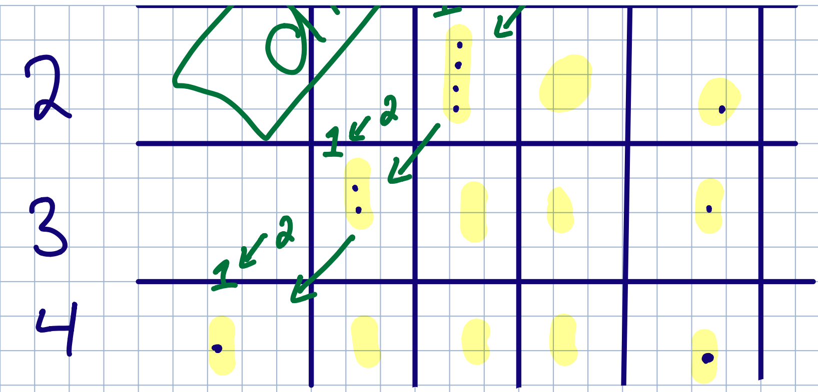
8	4	2	1	
			1	1
		1	0	2
		1	1	3
	1	0	0	4
	1	0	1	5
	1	1	0	6
	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10

Conversion from Base 10 to Base 2

What are the 'in-between' steps involved in converting $17_{10} = 10001_2$?

Step	2^4	2^3	2^2	2^1	2^0
	16	8	4	2	1
0					
1					

Division by 2



$17_{10} = (1 \quad 0 \quad 0 \quad 0 \quad 1)_2$

A faster way... same idea (repeated division by 2) but without using dots!

$17_{10} = \boxed{10011}_2$

Step	2^4	2^3	2^2	2^1	2^0
	16	8	4	2	1
0					17
1				8	1
2			4	0	1
3		2	0	0	1
4	1	0	0	0	1

$17 \div 2 = 8R1$

$8 \div 2 = 4R0$

$4 \div 2 = 2R0$

$2 \div 2 = 1R0$

$\therefore 17_{10} = 10001_2$

One more example... $27_{10} = ?_2$

				27
			13	1
		6	1	1
	3	0	1	1
1	1	0	1	1

$27 \div 2 = 13R1$

$13 \div 2 = 6R1$

$6 \div 2 = 3R0$

$3 \div 2 = 1R1$

$\therefore 27_{10} = 11011_2$

Keep dividing by 2
until you have the
digits that are
allowed in binary... 1 or 0!