BASE NUMBERING SYSTEMS

BITWISE OPERATIONS

Base 10	$10^2 = 100$	$10^1 = 10$	$10^0 = 1$
0	0	0	**0**
1	0	0	**1**
2	0	0	**2**
3	0	0	**3**
4	0	0	**4**
5	0	0	**5**
6	0	0	**6**
7	0	0	**7**
8	0	0	**8**
9	0	0	**9**
10	0	**1**	**0**
11	0	**1**	**1**
12	0	**1**	**2**
13	0	**1**	**3**
14	0	**1**	**4**
15	0	**1**	**5**

Base 2	$2^3 = 8$	$2^2 = 4$	$2^1 = 2$	$2^0 = 1$
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

Base 16	$16^1 = 16$	$16^0 = 1$
0	0	0
5	0	5
10	0	A
11	0	B
12	0	C
13	0	D
14	0	E
15	0	F
16	1	0
21	1	5
26	1	A
27	1	B
28	1	C
29	1	D
30	1	E
32	2	0

Compliment (~)

~	
~0000	1111
~1111	0000

Bitwise AND (&)

&	0	1
0	0	0
1	0	1

Decimal	Binary
10	1010
7	0111
2	**0010**

Bitwise OR (|)

|	**0**	**1**
0	0	1
1	1	1

Decimal	**Binary**
10	1010
7	0111
15	**1111**

Bitwise EOR (^)

^	0	1
0	0	1
1	1	0

Decimal	Binary
10	1010
7	0111
13	**1101**

Bitwise Right Shift (>>)

Shifts bits to the right:

8 >> 1 = 1000 >> 1 = 0100 = 4

8 >> 2 = 1000 >> 2 = 0010 = 2

8 >> 3 = 1000 >> 3 = 0001 = 1

8 >> 4 = 1000 >> 4 = 0000 = 0

Bitwise Left Shift (<<)

Shifts bits to the left:

8 << 1 = 1000 << 1 = 10000 = 16

8 << 2 = 1000 << 2 = 100000 = 32

8 << 3 = 1000 << 3 = 1000000 = 64

8 << 4 = 1000 << 4 = 10000000 = 128