BASE 2, 8, 16 } → BASE 10

We did Ex. of BASE 10 (DEC.) → BASE 2 (BIN.)

Ex. $(357)_{10} = (101100101)_2$

Ex. Binary $\leftrightarrow$ Octal.

$(101100101)_2 \leftrightarrow (545)_8$

Octal	Bin
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

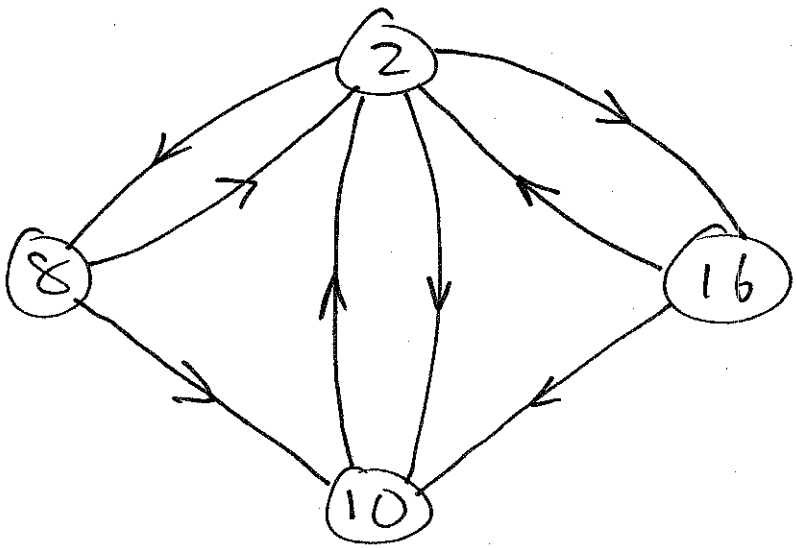
(# Bit strings of length n) $= 2^n$

Why? $\underbrace{2 \cdot 2 \cdot 2 \cdots 2 \cdot 2}_{n \text{ slots to fill}} = 2^n$

Ex. Binary $\leftrightarrow$ Hexidecimal

$(101\ 100101)_2 \leftrightarrow (165)_{16}$

Hex.	Bin
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111



Ex. $(12.75)_{10} = (\ ?\ )_2$

$$12.75 = 8+4+.5+.25 = 2^3+2^2+2^{-1}+2^{-2}$$

$$= 1\cdot 2^3+1\cdot 2^2+0\cdot 2^1+0\cdot 2^0+1\cdot 2^{-1}+1\cdot 2^{-2}$$

$$= (1100.11)_2$$

Ex

$(15.375)_{10} = (\ ?\ )_2$

$15.375 = 8 + 4 + 2 + 1 + .25 + .125$

$= 2^3 + 2^2 + 2^1 + 2^0 + 2^{-2} + 2^{-3}$

$= (1111.011)_2$

Ex

$$\begin{array}{r} 1\ 1\ 1\ 1\quad\ 1 \\ 1\ 0\ 1\ 1\ 0\ 0\ 1 \\ 1\ 1\ 0\ 1\ 0\ 0\ 1 \\ \hline 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0 \end{array}$$

$(10)_b = b$

$1 \cdot b^1 + 0 \cdot b^0$

Ex.
$$\begin{array}{r} {\scriptstyle 1\quad 1\quad 1} \\ (545)_8 \\ (763)_8 \\ \hline (1530)_8 \end{array}$$

$(11)_{10} = 1\cdot 8^1 + 3\cdot 8^0 = (13)_8$

$(13)_{10} = 1\cdot 8^1 + 5\cdot 8^0 = (15)_8$

REP. OF POS. INTEGERS IN BINARY

Ex. SUPPOSE YOU HAVE 16 BITS OF MEMORY.
WHAT ARE LARGEST & SMALLEST INTEGERS?
HOW MANY INTEGERS?

$$\text{Smallest} = (0000\ 0000\ 0000\ 0000)_2 = 0$$
$$\text{largest} = (1111\ 1111\ 1111\ 1111)_2 = 65535$$
$$= 2^{16} - 1$$
$$\#\text{ of }\#\text{s} = 2^{16} = 65536$$