

July 1947 Roswell

Nov 1947 Transistor

$$\begin{array}{r}
 100 \ 10 \ 1 \\
 10^2 \ 10^1 \ 10^0 \\
 \hline
 1 \ 2 \ 3 \quad | \quad 10 \\
 \begin{array}{l}
 \rightarrow 3 \times 1 = 3 \\
 \rightarrow 2 \times 10 = 20 \\
 \rightarrow 1 \times 100 = 100 \\
 \hline
 123
 \end{array}
 \end{array}$$

$$123|_{10} = 123|_{10}$$

(10 symbols)

$$\begin{array}{r}
 64 \ 8 \ 1 \\
 8^2 \ 8^1 \ 8^0 \\
 \hline
 1 \ 2 \ 3 \quad | \quad = \quad ? \quad | \quad 10 \\
 \begin{array}{l}
 \rightarrow 3 \times 1 = 3 \\
 \rightarrow 2 \times 8 = 16 \\
 \rightarrow 1 \times 64 = 64 \\
 \hline
 83
 \end{array}
 \end{array}$$

$$123|_8 = 83|_{10}$$

(8 symbols)  
0, 1, ..., 6, 7

$$\begin{array}{r}
 256 \ 16 \ 1 \\
 16^2 \ 16^1 \ 16^0 \\
 \hline
 1 \ 2 \ 3 \quad | \quad = \quad ? \quad | \quad 10 \\
 \begin{array}{l}
 \rightarrow 3 \times 1 = 3 \\
 \rightarrow 2 \times 16 = 32 \\
 \rightarrow 1 \times 256 = 256 \\
 \hline
 291
 \end{array}
 \end{array}$$

$$123|_{16} = 291|_{10}$$

(16 symbols)  
0, 1, 2, ..., 7, 8, 9, A, B, C, D, E, F

$$2 \text{BAD} \Big|_{16} = ? \Big|_{10}$$

$D \times 1 = 13 \times 1 =$	13
$A \times 16 = 10 \times 16 =$	160
$B \times 256 = 11 \times 256 =$	2816
$2 \times 4096$	8192
	<hr style="border: 0.5px solid black;"/>
	11181 $\Big _{10}$

$$2 \text{BAD} \Big|_{16} = 11181 \Big|_{10}$$

$$10110110 \Big|_2 = ? \Big|_{10} = 182 \Big|_{10}$$

	2
	4
	16
	32
	<hr style="border: 0.5px solid black;"/>
	128
	<hr style="border: 0.5px solid black;"/>
	182

(2 Symbols - 0, 1)

FACE |<sub>16</sub> = ? |<sub>10</sub>

→ E × 1 = 14 × 1 = 14  
→ C × 16 = 12 × 16 = 192  
→ A × 256 = 10 × 256 = 2560  
→ F × 4096 = 15 × 4096 = 61440

---

64206

68319

64206

64207

61440

61902

64706

68303

64156

67786

Base	Name
10	Decimal
8	Octal
16	Hexadecimal
2	Binary

### Terminology

Bit - Binary Digit (0 or 1)

Byte - 8 bits

Nibble = 4 bits

Word - machine dependant  
(most efficient number of  
bits to transfer a  
one time)

Today most PCs = 64 bits

$$123|_{10} = ? |_8 = 173|_{10}$$

$$64206|_{10} = ? |_{16} = \text{FACE}$$

Base converting to

$$\begin{array}{r}
 8 \overline{) 123} \\
 \underline{8} \phantom{0} \\
 4 \phantom{0} \\
 8 \overline{) 43} \\
 \underline{32} \\
 11 \\
 8 \overline{) 11} \\
 \underline{8} \\
 3
 \end{array}$$

R 3  
R 7  
R 1

↑

$$\begin{array}{r}
 16 \overline{) 64206} \\
 \underline{48} \phantom{00} \\
 16 \phantom{00} \\
 16 \overline{) 16206} \\
 \underline{16} \phantom{00} \\
 0 \phantom{00} \\
 16 \overline{) 1620} \\
 \underline{16} \phantom{00} \\
 0 \phantom{00} \\
 16 \overline{) 162} \\
 \underline{16} \\
 0
 \end{array}$$

R 14 (E)  
R 12 (C)  
R 10 (A)  
R 15 (F)

~~15 10 12 14~~

Repeat until quotient is 0  
MAKE SURE to write remainder for last division