

Nov 17, 1947 Transistor

July 6, 1947 Roswell

Cost of electronics in general

1985	\$600 / 80 MB	\$7.50/MB	\$7500/GB
2019	\$149 / 8 TB		< \$0.02/GB

1977	2018	2061
\$120,000	\$1,200	\$12
300 KHz	3.0 GHz	30 THz
16 K RAM	8 G	4 Penta Bytes
3'x3'x4' x(5) 216 cu ft	1 cu ft	finger nail
8 MB HD	1 TB	.125 Exa Bytes

Base 10

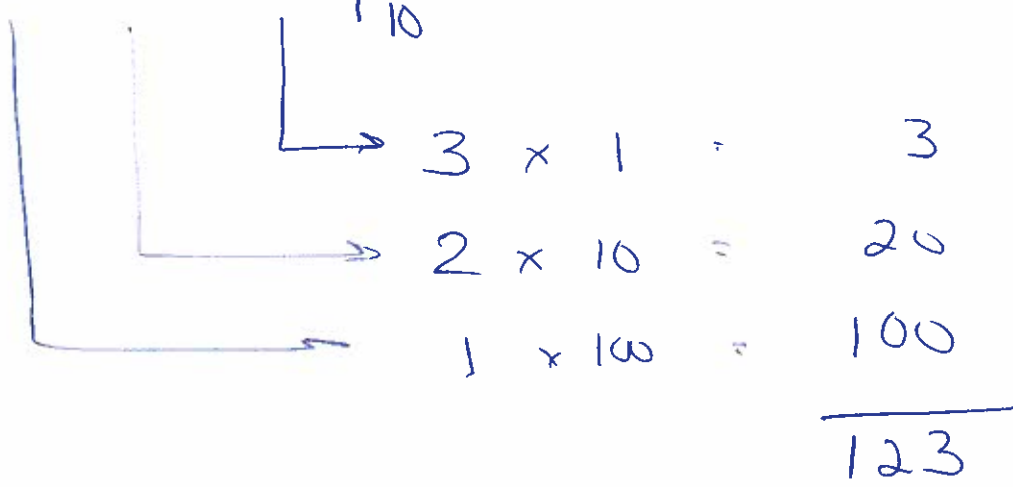
10 symbols 0, 1, 2, 3, ..., 9

100 10 1

10^2 10^1 10^0

1 2 3

10



Base 8

8 symbols 0, 1, 2, 3, 4, 5, 6, 7

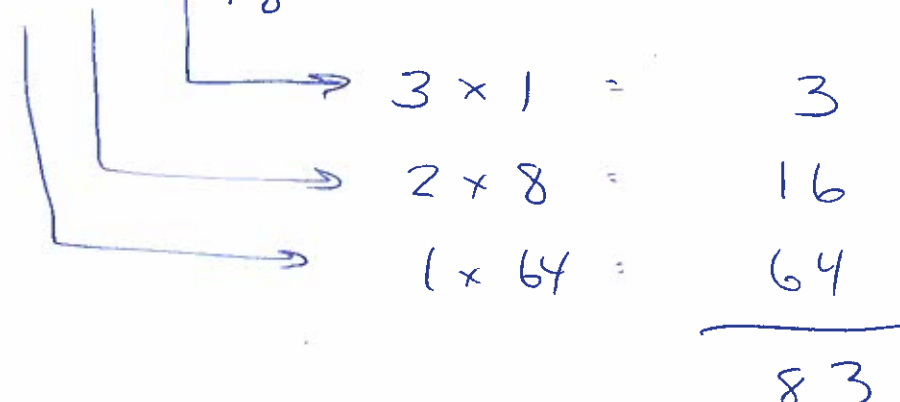
64 8 1

8^2 8^1 8^0

1 2 3

8

Octal



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

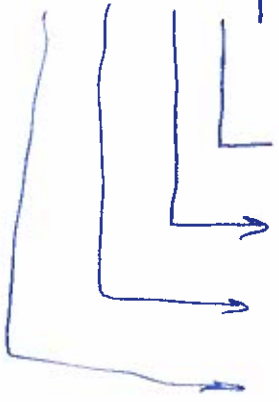
Base 16

16 symbols (0, 1, ..., 8, 9, ⁰A, ¹B, ²C, ³D, ⁴E, ⁵F)

Hexadecimal

16^3 4096
 16^2 256
 16^1 16
 16^0 1
 2BAD |

= |
10



$D \times 1 = 13 \times 1 =$
 $A \times 16 = 10 \times 16 =$
 $B \times 256 = 11 \times 256 =$
 $2 \times 4096 =$

13
 160
 2816
 8192

 11,181

$2BAD|_{16} = 11,181|_{10}$

Base 2 (Binary) 2 symbols (0, 1)

16 8 4 2 1

$$10110|_2 = ?|_{10}$$

0	×	1	=	0
1	×	2	=	2
1	×	4	=	4
0	×	8	=	0
1	×	16	=	16
				<hr/>
				22

$$10110|_2 = 22|_{10}$$

64 32 16 8 4 2 1

$$101110|_2 = ?|_{10}$$

64
16
8
4
1
<hr/>
93

$$\begin{array}{c} \downarrow \\ 123 \end{array} \Big|_8 = \begin{array}{c} \downarrow \\ 83 \end{array} \Big|_{10}$$

$$2BAD \Big|_{16}^{\downarrow} = \begin{array}{c} \downarrow \\ 11, 18 \end{array} \Big|_{10}$$

$$\begin{array}{c} \downarrow \\ 10110 \end{array} \Big|_2 = \begin{array}{c} \downarrow \\ 22 \end{array} \Big|_{10}$$

inverse relationship btwn value & base

0100 0001

65

'A'

Convert $123|_{10}$ to base 8

Base
converting
to \rightarrow

$$8 \overline{) 123}$$

$$8 \overline{) 15} \quad R3$$

$$8 \overline{) 1} \quad R7$$

$$8 \overline{) 0} \quad R1$$

$$0 \quad R0$$



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

$$\begin{array}{l} 3 \times 1 \\ 7 \times 8 \\ 1 \times 64 \end{array}$$

$$\begin{array}{r} 3 \\ 56 \\ 64 \\ \hline 123 \end{array} \quad \checkmark$$

$$64206|_{10} = ?|_{16}$$

Base
converting
to \rightarrow

$$16 \overline{) 64206}$$

$$16 \overline{) 4012}$$

$$R 14 (E)$$

$$16 \overline{) 250}$$

$$R 12 (C)$$

$$16 \overline{) 15}$$

$$R 10 (A)$$

$$0$$

$$R 15 (F)$$

WRONG ANSWER: 15101214

$$64206|_{10} = FACE|_{16}$$