

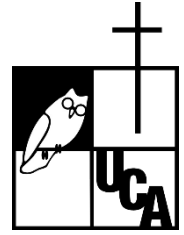
Universidad Centroamericana “José Simeón Cañas”

Facultad de Ingeniería y Arquitectura

Tutorías - Fundamentos de Programación

Ciclo 01/2021

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Conversión de números de una base a otra

| Decimal | Binario | Octal | Hexadecimal |
|---------|---------|-------|-------------|
| 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |
| 2 | 10 | 2 | 2 |
| 3 | 11 | 3 | 3 |
| 4 | 100 | 4 | 4 |
| 5 | 101 | 5 | 5 |
| 6 | 110 | 6 | 6 |
| 7 | 111 | 7 | 7 |
| 8 | 1000 | 10 | 8 |
| 9 | 1001 | 11 | 9 |
| 10 | 1010 | 12 | A |
| 11 | 1011 | 13 | B |
| 12 | 1100 | 14 | C |
| 13 | 1101 | 15 | D |
| 14 | 1110 | 16 | E |
| 15 | 1111 | 17 | F |

1. Conversión de Números en Base 10 a otras bases (Ejercicios)

a) $(690)_{10} = (1262)_8$

$$(690)_{10} \rightarrow 8$$

$$\begin{array}{r} 690 \overline{) 8} \\ 2 \ 86 \overline{) 8} \\ \quad 6 \ 10 \overline{) 8} \\ \qquad 2 \ 1 \overline{) } \end{array}$$



$$(1262)_8$$

b) $(38.123)_{10} = (100110.00011)_2$

$(\underline{38}, \underline{123})_{10} \rightarrow 2$

$$\begin{array}{r}
 38 \overline{) 2} \\
 \underline{0} 19 \overline{) 2} \\
 1 9 \overline{) 2} \\
 1 4 \overline{) 2} \\
 02 \overline{) 2} \\
 1 \overline{) }
 \end{array}$$

100110

5 C.S.

$0.123 \times 2 = 0$

$0.246 \times 2 = 0$

$0.492 \times 2 = 0$

$0.984 \times 2 = 1$

$0.936 \times 2 = 1$

00011

$(100110.00011)_2$

c) $(333.598)_{10} = (14D.991)_{16}$

$$(\underline{333}.\underline{598}) \rightarrow 16$$

$$\begin{array}{r} 333 \overline{) 16} \\ \underline{13} 20 \overline{) 16} \\ 4 1 \overline{) } \end{array}$$



1413

$$0.598 \times 16 = 9$$

$$0.568 \times 16 = 9$$

$$0.568 \times 16 = 1$$



991

$$(14D.991)_{16}$$

2. Conversión de Números expresados en otras bases a Base 10

a) $(513)_8 = (331)_{10}$

$$(513)_8 \rightarrow 10$$

$$\begin{array}{ccc} 5 & 1 & 3 \\ 2 & 1 & 0 \end{array}$$

$$(5 \times 8^2) + (1 \times 8) + (3 \times 8^0)$$

$$320 + 8 + 3$$

$$(331)_{10}$$

b) $(100110.00011)_2 = (38.09375)_{10}$

$$(1\ 00110.00011)_2 \rightarrow 10$$

$$\begin{array}{ccccccccccc} 1 & \cancel{0} & \cancel{0} & 1 & 1 & \cancel{0} & . & \cancel{0} & \cancel{0} & \cancel{0} & 1 & 1 \\ 5 & 4 & 3 & 2 & 1 & 0 & & -1 & -2 & -3 & -4 & -5 \end{array}$$

$$(1 \times 2^5) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^{-4}) + (1 \times 2^{-5})$$

$$32 + 4 + 2 + 0.0625 + 0.03125$$

$$(38.09375)_{10}$$

c) $(14D.991)_{16} = (333.597)_{10}$

$$(14D.991)_{16} \rightarrow 10$$

$$\begin{array}{cccccc} 1 & 4 & D & . & 9 & 9 & 1 \\ \textcolor{red}{2} & \textcolor{red}{1} & \textcolor{red}{0} & & \textcolor{red}{-1} & \textcolor{red}{-2} & \textcolor{red}{-3} \end{array}$$

$$(1 \times 16^2) + (4 \times 16^1) + (13 \times 16^0) + (9 \times 16^{-1}) + (9 \times 16^{-2}) + (1 \times 16^{-3})$$

$$256 + 64 + 13 + 0.56^{\textcolor{green}{000}} + 0.03^{\textcolor{green}{000}} + 0.0002^{\textcolor{green}{00}}$$

$$\simeq (333.597)_{10}$$

3. Conversión de Números entre dos bases cualesquiera

3.1. Conversión de la base a, hacia base 10 y luego a base b

a) $(10101)_2 = (21)_{10} = (15)_{16}$

$$(10101)_2 \rightarrow 10$$

$$\begin{array}{ccccc} 1 & \cancel{0} & 1 & \cancel{0} & 1 \\ 4 & 3 & 2 & 1 & 0 \end{array}$$

$$(1 \times 2^4) + (1 \times 2^2) + (1 \times 2^0)$$

$$16 + 4 + 1$$

$$(21)_{10} \rightarrow 16$$

$$\begin{array}{r|l} 21 & 16 \\ \hline & 5 \quad 1 \end{array}$$

$$(15)_{16}$$

b) $(14A)_{16} = (330)_{10} = (512)_8$

$$(14\overset{10}{A})_{16} \rightarrow 10$$

| | | |
|---|---|---|
| 1 | 4 | A |
| 2 | 1 | 0 |

$$(1 \times 16^2) + (4 \times 16^1) + (10 \times 16^0)$$

$$256 + 64 + 10$$

$$(330)_{10} \rightarrow 16$$

| | | | |
|---|---|---|---|
| 3 | 3 | 0 | 8 |
| | 2 | 4 | 1 |
| | | 1 | 5 |
| | | | |

$$(512)_8$$

Conversión de Números entre dos bases cuando una es potencia de la otra

3.1.1. Base origen es menor que la base destino

a) $(1001.1001)_2 = (11.44)_8$

$$(1001.1001)_2 \rightarrow 8 \quad 2^3 = 8$$

| | | | |
|---|---|---|---|
| $\begin{array}{ccc} 3 & 2 & 1 \\ \cancel{0} & \cancel{0} & 1 \\ 2 & 1 & 0 \\ 1 \times 2^0 & & \\ 1 & & \end{array}$ | $\begin{array}{ccc} 3 & 2 & 1 \\ \cancel{0} & \cancel{0} & 1 \\ 2 & 1 & 0 \\ 1 \times 2^0 & & \\ 1 & & \end{array}$ | $\begin{array}{ccc} 1 & 2 & 3 \\ 1 & \cancel{0} & \cancel{0} \\ 2 & 1 & 0 \\ 1 \times 2^2 & & \\ 4 & & \end{array}$ | $\begin{array}{ccc} 1 & 2 & 3 \\ 1 & \cancel{0} & \cancel{0} \\ 2 & 1 & 0 \\ 1 \times 2^2 & & \\ 4 & & \end{array}$ |
|---|---|---|---|

$\rightarrow (11.44)_8$

b) $(1101.1101)_2 = (D.D)_{16}$

$$(1101.1101)_2 \rightarrow 16 \quad 2^{4^{\swarrow}} = 16$$

| 4 | 3 | 2 | 1 | 1 | 2 | 3 | 4 |
|---|---|--------------|---|---|---|---|---|
| 1 | 1 | 0 | 1 | . | 1 | 1 | 0 |
| 3 | 2 | 1 | 0 | | | | |

$$(1 \times 2^3) + (1 \times 2^2) + (1 \times 2^0)$$

$$8 + 4 + 1$$

$$13 = D$$

$$13 = D$$

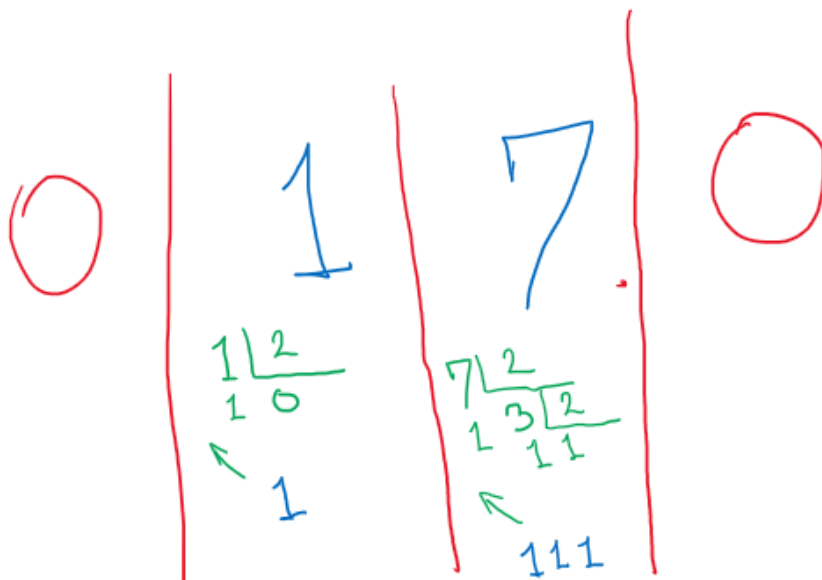
$$(D.D)_{16}$$

3.2.2 Base origen es mayor que la base destino

a) $(17)_8 = (1111)_2$

$$(17)_8 \rightarrow 2$$

$$8 = 2^3$$



$$(1111)_2$$

b) $(F)_{16} = (1111)_2$

$$\overset{15}{(F)}_{16} = 2 \quad 16 = 2^4$$

$$0 \mid 1 \ 5 \mid 0$$

$$\begin{array}{r|l} 15 & 2 \\ \hline 1 & 7 \mid 2 \\ \hline \cdot & 1 \ 3 \mid 2 \\ \hline & 1 \cdot \ 1 \ 1 \mid \\ \hline \end{array}$$

↖

$$(1111)_2$$