

# Taller 01

## Electrónica Digital

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**Problema 1.** Dada la siguiente igualdad:

$$(100)_{10} = (400)_b$$

Determinar el valor de la base  $b$  y el valor de  $(104)_{10}$  en la base  $b$ .

**Solución: a.**

$$10^2 = 4b^2$$

$$\boxed{\therefore b = 5}$$

**b.**

$$\frac{104}{5} = 20(5) + 4$$

$$\frac{20}{5} = 4(5)$$

$$\Rightarrow (104)_{10} = 4(5)^2 + 0(5) + 4(5)^0$$

$$\boxed{\therefore (104)_{10} = (404)_5}$$

**Problema 2.** Dado la siguiente igualdad:

$$(174)_{10} = (450)_b$$

Determinar el valor de la base  $b$  y el valor de  $(104)_{10}$  en la base  $b$ .

**Solución: a.**

$$10^2 + 7(10) + 4 = 4b^2 + 5b$$

$$b^2 + \frac{5}{4}b = \frac{174}{4}$$

$$\left(b + \frac{5}{8}\right)^2 = \frac{2809}{64}$$

$$b + \frac{5}{8} = \frac{53}{8}$$

$$\boxed{\therefore b = 6}$$

b.

$$\begin{aligned}\frac{104}{6} &= 17(6) + 2 \\ \frac{17}{6} &= 2(6) + 5 \\ \implies (104)_{10} &= 2(6)^2 + 5(6) + 2\end{aligned}$$

$$\therefore (104)_{10} = (252)_6$$

**Problema 3.** Decodificar el siguiente mensaje codificado en ASCII y escribir el mensaje en hexadecimal.

```
1001000 1100101 1101100 1101100 1101111 0101110 0100000 1001000 1101111 1110111
0100000 1100001 1110010 1100101 0100000 1111001 1101111 1110101 0111111
```

**Solución:** a Decodificación:

- $(1001000)_2 = 2^6 + 2^3 = (72)_{10} = \text{H}$
- $(1100101)_2 = 2^6 + 2^5 + 2^2 + 1 = (101)_{10} = \text{e}$
- $(1101100)_2 = 2^6 + 2^5 + 2^3 + 2^2 = (108)_{10} = \text{l}$
- $(1101111)_2 = 2^6 + 2^5 + 2^3 + 2^2 + 2 + 1 = (111)_{10} = \text{o}$
- $(0101110)_2 = 2^5 + 2^3 + 2^2 + 2 = (46)_{10} = \text{.}$
- $(0100000)_2 = 2^5 = (32)_{10} = \text{(space)}$
- $(1110111)_2 = 2^6 + 2^5 + 2^4 + 2^2 + 2 + 1 = (119)_{10} = \text{w}$
- $(1100001)_2 = 2^6 + 2^5 + 1 = (97)_{10} = \text{a}$
- $(1110010)_2 = 2^6 + 2^5 + 2^4 + 2 = (114)_{10} = \text{r}$
- $(1111001)_2 = 2^6 + 2^5 + 2^4 + 2^3 + 1 = (121)_{10} = \text{y}$
- $(1110101)_2 = 2^6 + 2^5 + 2^4 + 2^2 + 1 = (117)_{10} = \text{u}$
- $(0111111)_2 = 2^5 + 2^4 + 2^3 + 2^2 + 1 = (63)_{10} = \text{?}$

Mensaje: Hello. How are you?

b. Codificación hexadecimal:

- $(72)_{10} = 4(16) + 8 = (48)_{16}$
- $(101)_{10} = 6(16) + 5 = (65)_{16}$
- $(108)_{10} = 6(16) + 12 = (6C)_{16}$
- $(111)_{10} = 6(16) + 15 = (6F)_{16}$
- $(46)_{10} = 2(16) + 14 = (2E)_{16}$
- $(32)_{10} = 2(16) = (20)_{16}$
- $(119)_{10} = 7(16) + 7 = (77)_{16}$
- $(97)_{10} = 6(16) + 1 = (61)_{16}$

- $(114)_{10} = 7(16) + 2 = (72)_{16}$
- $(121)_{10} = 7(16) + 9 = (79)_{16}$
- $(117)_{10} = 7(16) + 5 = (75)_{16}$
- $(63)_{10} = 3(16) + 15 = (3F)_{16}$

Mensaje (Hexadecimal): 48 65 6C 6C 6F 2E 20 48 6F 77 20 61 72 65 20 79 6F 75 3F

**Problema 4.** Hallar analíticamente el valor de  $b$  que satisfaga la igualdad. Las operaciones aritméticas deben ser realizadas en una base diferente a decimal.

$$(179)_b = (666)_7 + (1023)_4$$

**Solución:**

$$\begin{aligned}(1023)_4 &= 4^3 + 2(4) + 3 \\ &= (75)_{10} \\ &= 7^2 + 3(7) + 5 \\ &= (135)_7\end{aligned}$$

$$\begin{aligned}(179)_b &= (666)_7 + (135)_7 \\ &= (1134)_7 \\ b^2 + 7b + 9 &= 7^3 + 7^2 + 3(7) + 4 \\ b^2 + 7b &= 408 \\ \left(b + \frac{7}{2}\right)^2 &= \frac{1681}{4} \\ b + \frac{7}{2} &= \frac{41}{2}\end{aligned}$$

$$\therefore b = 17$$