Guião 1 e 2

1

Decimal	octal	hexadecimal	Binário
0	0	0	0000
1	1	1	1
2	2	2	10
3	3	3	11
4	4	4	100
5	5	5	101
6	6	6	110
7	7	7	111
8	10	8	1000
9	11	9	1001
10	12	A	1010
11	13	B	1011
12	14	C	1100
13	15	D	1101
14	16	E	1110
15	17	F	1111

2.

a) $0000\,1111_2$ ($2^3\ 2^2\ 2^1\ 2^0$)

$2^3 + 2^2 + 2 + 1 = 15_{10}$

b)

1347_8

$8^3 + 3 \times 8^2 + 4 \times 8 + 7 = 743_{10}$

c)

$D\ F\ 5_{16}$

$16^2 \times 13 + 16 \times 15 + 5 = 3575_{10}$

d)

$\underbrace{1010}_{A}\ \underbrace{0011}_{3}{}_2$

$16 \times 10 + 3 = 163_{10}$

e) 7751_8 =

$8^3 \times 7 + 8^2 \times 7 + 5 \times 8 + 1 = 4073_{10}$

f) $A7A2$

$16^3 \times 10 + 16^2 \times 7 + 16 \times 10 + 2 = 42914_{10}$

g) 11111111_2

$FF_{16} = 15 \times 16 + 15 = 255_{10}$

h) 2013_8

$2 \times 8^3 + 0 \times 8^2 + 8 + 3 = 1035_{10}$

i) $40FF_{16}$

$4 \times 16^3 + 15 \times 16 + 15 = 16639_{10}$

3

a) 1036_{10}

$40C_{16}$

2014_8

1036	16
1024	64 | 16
12	64 4
	0

1036	8
1032	129 | 8
4	128 16 | 8
	1 16 2
	0

$2014_8 = 010000001100_2$

b) $7354_8 = 111011101100_2 = EEC_{16}$

$EEC_{16} =$

$16^2 \times 14 + 16 \times 14 + 12 = 3820_{10}$

c) $16B5_{16} = 0001011010110101_2 = 13265_8$

$16^3 + 16^2 \times 6 + 16 \times 11 + 5 = 5813_{10}$

d)

$1111001111_2 = 747_8 = 1E7_{16}$

$16^2 \times 1 + 16 \times 14 + 7 = 487_{10}$

e)

7564_{10}

$1D8C_{16}$

16614_8

7564 | 16
7552 | 472 | 16
12 | 464 | 29 | 16
8 | 16 | 1
13

7564 | 8
7560 | 945 | 8
4 | 944 | 118 | 8
1 | 112 | 14 | 8
6 | 8 | 1
6

$1D8C_{16} = 0001110110001100_2$

f)

$6102_8 = 110001000010_2 = C42_{16}$

$C42_{16}$

$16^2 \times 12 + 16 \times 4 + 2 = 3138_{10}$

g)

$D3F9_{16} = 1101001111111001_2 = 151771_8$

$D3F9_{16}$

$16^3 \times 13 + 16^2 \times 3 + 16 \times 15 + 9 = 54265_{10}$

h) $110101011_2 = 653_8 = 1AB_{16}$

$1AB_{16}$

$16^2 + 10 \times 16 + 11 = 427_{10}$

4

a) $110110.1101001_2 = 66.644_8$

$6 \times 8 + 6 + 6 \times 8^{-1} + 4 \times 8^{-2} + 4 \times 8^{-3} \simeq 54.8203125_{10}$

$\simeq 54.820_{10}$

$\lfloor 3 \times \log_8 10 \rfloor = 3$

b)

$\lfloor 3 \times \log_8 10 \rfloor = 3$

127.444_8

$8^2 + 2 \times 8 + 7 + 8^{-1} \times 4 + 8^{-2} \times 4 + 8^{-3} \times 4 = 87.570_{10}$

c)

$\lfloor 1 \times \log_{16} 10 \rfloor = 0$

$2D.8_{16}$

$2 \times 16 + 13 + 8 \times 16^{-1} = 45.5_{10} \simeq 45_{10}$

5

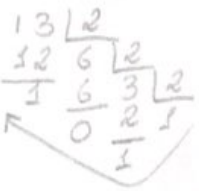
a)

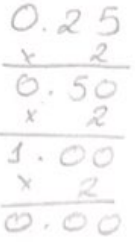
13.25_{10} $\quad \lfloor 2 \times \log_2 10 \rfloor = 6$

$1101.001000_2 =$

$= D.40_{16}$

$= 15.20_8$





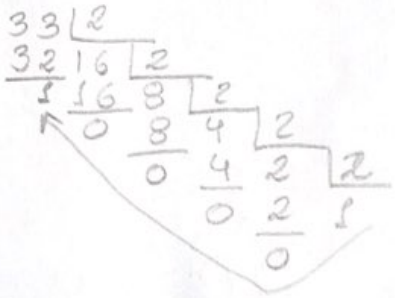
b)

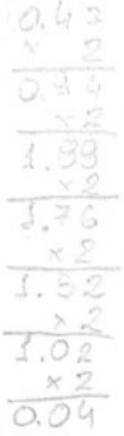
33.47_{10} $\quad \lfloor 2 \times \log_2 10 \rfloor = 6$

100001.001111_2

$= 21.3C_{16}$

$= 41.17_8$





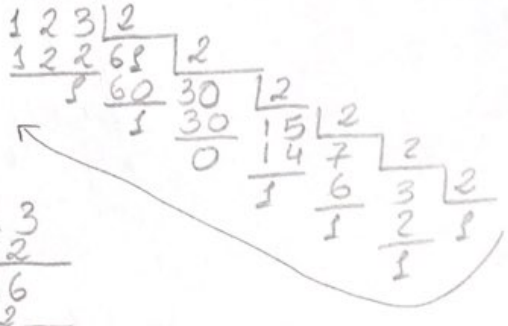
c)

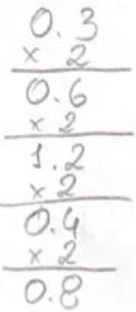
123.3_{10} $\quad \lfloor \log_2 10 \rfloor = 3$

1111011.001

$= 173.1_8$

$= 7B.2_{16}$





6

a)

$10101110_2 = AE_{16}$ $\quad 16 \times 10 + 14 = 174_{10}$

$+ \underline{00011111_2 = 1F_{16}}$ $\quad 16 + 15 = 31_{10}$ $\quad = 205_{10}$

$11001101_2 = CD_{16}$ $\quad 16 \times 12 + 13 = 205_{10}$

b) $\begin{array}{r} {\scriptstyle 1}\,{\scriptstyle 1} \\ 125_8 \\ +\,17_8 \\ \hline 144_8 \end{array}$

$8^2 + 2\times 8 + 5 = 85_{10} = 100_{10}$

$8 + 7 = 15_{10}$

$8^2 + 4\times 8 + 4 = 100_{10}$

c)

$\begin{array}{r} 125_{16} \\ +\,1A7_{16} \\ \hline 2CC_{16} \end{array}$

$16^2 + 2\times 16 + 5 = 293_{10}$

$16^2 + 10\times 16 + 7 = 423_{10} = 716_{10}$

$2\times 16^2 + 12\times 16 + 12 = 716_{10}$

d)

$00111011_2 = 3B_{16} = 16\times 3 + 11 = 59_{10} = 232_{10}$

$\begin{array}{r} {\scriptstyle 1} \\ AD \\ +\,3B \\ \hline E8_{16} \end{array}$

$AD_{16} = 16\times 10 + 13 = 173_{10}$

$E8_{16} = 16\times 14 + 8 = 232_{10}$

7

a)

$\begin{array}{r} 10101110 = AE_{16} \\ -\,00011111 = 1F_{16} \\ \hline 10001111_2 = 8F_{16} \end{array}$

$10\times 16 + 14 = 174_{10} = 143_{10}$

$16 + 15 = 31_{10}$

$8\times 16 + 15 = 143_{10}$

b)

$\begin{array}{r} {\scriptstyle 1}\,{\scriptstyle 1} \\ 125_8 \\ -\,17_8 \\ \hline 106_8 \end{array}$

$8^2 + 8\times 2 + 5 = 85_{10} = 70_{10}$

$8 + 7 = 15_{10}$

$8^2 + 6 = 70_{10}$

c)

$\begin{array}{r} {\scriptstyle 1}\,{\scriptstyle 1} \\ 107_{16} \\ -\,DC_{16} \\ \hline 02B_{16} \end{array}$

$16^2 + 7 = 263_{10} = 43_{10}$

$16\times 13 + 12 = 220_{10}$

$16\times 2 + 11 = 43_{10}$

d)

$00111011_2 = 3B_{16}$

$\begin{array}{r} {\scriptstyle 1} \\ AD_{16} \\ -\,3B_{16} \\ \hline 72_{16} \end{array}$

$16\times 10 + 13 = 173_{10} = 114_{10}$

$16\times 3 + 11 = 59_{10}$

$16\times 7 + 2 = 114_{10}$

8

a) 11111110_{C2}

$-2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2 = -256 + 254 = -2_{10}$

b) 0

c) 11111111_{C2}

$-2 + 1 = -1_{10}$

d) 00110011_{C2}

$2^5 + 2^4 + 2 + 1 = 51_{10}$

9) Todas exceto a d).

10)

a) 11111110_{C2}

b) 00000011_{C2}

c) 11111100_{C2}

d) 00000001_{C2}

11) $7650_8 = 111111101000_{C2} = 101000_{C2}$

$-2^5 + 2^3 = -24$

12)

a) 45 | 2
44 22 | 2
1 22 11 | 2
0 10 5 | 2
1 4 2 | 2
1 2 | 1
0

$101101_{C2} \rightarrow 11101101_{C2}$

b) -13_8

$13_8 = 001011_{C2} \rightarrow 00001011_{C2}$ ← Positivo

11110101_{C2} ← Negativo

c) $-F1_{16}$

$F1_{16} = 11110001_{C2}$

Positivo — Negativo, por isso não da para representar só com 8 bits

d) 130_{10}

$130 > 127$

$2^8 = \frac{255}{2} = 128 - 1 = 127$

número decimal mais alto que se pode representar em C2 com 8 bits

13

a) $-1_{10} + 63_{10}$

$-1_{10} = 11111111_{C2}$

$63_{10} = 00111111_{C2}$

00111110_{C2}

63|2
62 31|2
1 30 15|2
1 14 7|2
1 6 3|2
1 2 1
1

b)

$$\begin{array}{r} 11111111_{C2} \\ -11110101_{C2} \\ \hline 11110010_{C2} \end{array}$$

c)

$11 \rightarrow 00001011_{C2}$

$-11 \rightarrow 11110100_{C2}$

$123 \rightarrow 01111011_{C2}$

$-123 \rightarrow 10000101_{C2}$

$$\begin{array}{r} 11110100_{C2} \\ +\ 10000101_{C2} \\ \hline 01111010_{C2} \end{array}$$

123|2
122 61|2
1 60 30|2
1 30 15|2
0 14 7|2
1 6 3|2
1 2 1
1

↑ overflow, soma de 2 números negativos ficou positivo

d)

$54_{16} \rightarrow 01010100_2$

$2F_{16} \rightarrow 00101110_2$

$$\begin{array}{r} 01010100 \\ +00101110 \\ \hline 10000010 \end{array}$$

Overflow

14

$1000000000000_{c2} = -2^{11} = -2048_{10} = -800_{16} = -4000_8$

$0111111111111_{c2} = 2047_{10} = 7FF_{16} = 3777_8$

$2048 \mid 16$
$2048 \quad 128 \mid 16$
$0 \quad 128 \quad 8$
0

$2047 \mid 16$
$2035 \quad 127 \mid 16$
$15 \quad 112 \quad 7$
15

$2048 \mid 8$
$2048 \quad 256 \mid 8$
$0 \quad 256 \quad 32 \mid 8$
$0 \quad 32 \quad 4$
0

$2047 \mid 8$
$2040 \quad 255 \mid 8$
$7 \quad 248 \quad 31 \mid 8$
$7 \quad 24 \quad 3$
7

15

3 bits

000 ← 1
001 ← 2
010 ← 3
011 ← 4
100 ← 5
101 ← 6 objetos

16

a) $111_{10} = 000100010001_{BCD}$

b) 125_8

$8^2 + 8 \times 2 + 5 = 85_{10} = 10000101_{BCD}$

c) ABC

$16^2 \times 10 + 16 \times 11 + 12 = 2748 = 0010\ 0111\ 0100\ 1000_{BCD}$

17

3 e 4 bits

Binário	Gray
000	000
001	001
010	011
011	010
100	110
101	111
110	101
111	100
1000	1100
1001	1101
1010	1111
1011	1110
1100	1010
1101	1011
1110	1001
1111	1000

5 bits

Binário	Gray
10000	11000
10001	11001
10010	11011
10011	11010
⋮	⋮
11100	10010
11101	10011
11110	10001
11111	10000

18

a) 00001000_{Gray}

b) 11010101_{Gray}

c) 10000000_{Gray}

19

a) 00001010_2

b) 11101110_2

c) 10101010_2

20

a) 10101010 → 8 de distância
01010101

b) 11110000 → 4 de distância
11 0000 11

c) 10101111 → 0 de distância
10101111