Badji Mokhtar-Annaba University
Department of Science and Technology
1st year

Practice Exercises N 1+ correction

Exercise 1: Convert the following numbers:

$(32)_8 = (\ ?\ )_2 = (\ ?\ )_{16}$

$(18)_{10} = (\ ?\ )_8 = (\ ?\ )_{16}$

$(A01)_{16} = (\ ?\ )_2 = (\ ?\ )_8$

$(101101{,}01)_2 = (\ ?\ )_8 = (\ ?\ )_{10} = (\ ?\ )_{16}$

Exercise 2

1. The number (10101010) is represented in 2's complement. What is its decimal value?
2. Calculate in binary (2's complement on 8 bits) : 30-12.

Exercise 3

1. Convert π to binary (base 2) (with the approximation $\pi = 3.125$)
2. Code $\pi = 3.125$ according to IEEE 754 standard (single precision) and give the result in Hexadecimal form.
3. Deduce $-\pi$.

Exercise 4

The number $X = (C0\ D4\ 00\ 00)_{16}$ is coded according to IEEE 754 Standard - single precision

What is the decimal value of X ?

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Correction

Exercise 1 :

$(32)_8 = (011010)_2 = (1A)_{16}$
$(18)_{10} = (22)_8 = (12)_{16}$
$(A01)_{16} = (1010\ 0000\ 0001)_2 = (5001)_8$
$(101101,01)_2 = (55,2)_8 = (45,25)_{10} = (2D,4)_{16}$

Exercise 2 :

1. The nomber (10101010) **is represented in** C à 2

   To find its value in decimal, simply transform it into decimal but multiply the most significant bit by -1 (the most significant bit (in red) = 1 means that the number is negative.

   $10101010 = 2^0*0 + 2^1*1+2^2*0+2^3*1+2^4*0+2^5*1+2^6*0+2^7*(-1)$

   $= 2+8+32-128$

   $= (-86)_{10}$

2. Let's calculate 30-12 in binary in C to 2 on 8 bits:

   30-12=30 + (-12)

   Alors :

   $30=(00011110)_2$

   Now let's represent (-12) in binary (using the C to 2) $12=(00001100)_2$
   So $(-12)= (11110100)_2$

Therefore :

$30-12= 00011110+11110100= (00010010)_2$

Exercice 3

1. $\pi = (3.125)= (11.001)_2$
2. Coding of π according to IEEE 754 standard

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$11.001 = 1.1001 * 2^{1}$ □ décalage =1

E= 127+1=$(128)_{10}$ = $(10000000)_2$

S=0

E= 10000000
M=1001 . We add zeros to represent M sur 23 bit

(3.125)10 = (**0**1000000010010000000000000000000)2

= (40480000)16

4. Deduce – π (just change the sign bit S)

π = **0**1000000010010000000000000000000)$_2$
– π = (1100000001001000000000000000000)$_2$
= (C0480000)$_{16}$

Exercice 4 :

Simply decode the number into binary to extract the components: S, E, M

X= $(C0\ D4\ 00\ 00)_{16}$
= (1100 0000 1101 0100 0000000000000000) 2
S= 1 so x is negative

E= $(10000001)_2$ =129 dec =2

X= $-1.10101 * 2^2 = (110.101)_2$

X= $(-6.625)_{10}$

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