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Exercices Information Representation

7. Express in binary code the following: signed magnitude, one' complement, two's complement, and the number 83_{10} and the number -83_{10} with 8 bits.

SM: 83_{10} –> 01010011_2
-83_{10} –> 11010011_2

Ca1: 83_{10} –> 01010011_2
-83_{10} –> 10101100_2

Ca2: 83_{10} –> 01010011_2
-8310 –> 10101100_2 + 1 = 10101101_2 –> 01010010_2 + 1 = 01010011_2

01010011 → $1*2^6 + 1*2^5 + 1*2^1 + 1*2^0$ == $\mathbf{83_{10}}$

8. Depending on the following systems, what number is expressed in binary code 10001011_2.

binary code

10001011_2 –> -13_{10}

signed magnitud

10001011_2 –> -13_{10}
00001011_2 –> 13_{10}

one's complement

10001011_2 –> 01110100_2
00001011_2 –> 11110100_2

two's complement

10001011_2 –> 01110100 + 1 = 01110101_2

00001011_2 –> 11110100 + 1 = 11110101_2 –> 00001010 + 1 = 00001011_2 –> $1*2^3 + 1*2^1 + 1*2^0$ = $\mathbf{13_{10}}$

9. If we use 8 bits in order to represent information, what is the range of representation that would have the following systems of representation:

binary code

0111111_2

signed magnitud

0111111_2 → 127_{10}
1111111_2 → -127_{10}

one's complement

0111111_2
1000000_2

two's complement

0111111_2
1000000 → 1000000 + 1 = 1000001 → $\mathbf{-65_{10}}$

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10. We are using fixed point. The most significant 4 bit (leftmost) represent the whole part and the other 4 bits for the real part. What number is represented in: 10101100.

10101100_2

$1010{,}1100 \rightarrow 1*2^3 + 0*2^2 + 1*2^1 + 0*2^0 + 0*2^{-1} + 1*2^{-2} = 8+2+0{,}5+0{,}25 = \mathbf{10{,}075_{10}}$