CENTRE ESPECÍFIC
D´EDUCACIÓ A DISTÀNCIA DE
LA COMUNITAT VALENCIANA

# UNIT 1.
# INFORMATION REPRESENTATION
## Activities

**Computer Systems**
**CFGS DAW**

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2020/2021
Versión:200927.1905

## Nomenclatura

A lo largo de este tema se utilizarán distintos símbolos para distinguir elementos importantes dentro del contenido. Estos símbolos son:

Actividad opcional. Normalmente hace referencia a un contenido que se ha comentado en la documentación por encima o que no se ha hecho, pero es interesante que le alumno investigue y practique. Son tipos de actividades que no entran para examen

Atención. Hace referencia a un tipo de actividad donde los alumnos suelen cometer equivocaciones.

# UD01. INFORMATION REPRESENTATION
## Activities

(1) Convert to decimal the following values:

a) $1001_{(2}$ b) $110010_{(2}$ c) $1010_{(2}$ d) $100101,101_{(2}$ e) $1011_{(2}$

(2) Convert to binary the following values:

a) $8_{(10}$ b) $512_{(10}$ c) $20,625_{(10}$ d) $255_{(10}$ e) $3560,75_{(10}$

(3) Convert to hex the following values:

a) $100100101_{(2}$ b) $1000000000_{(2}$ c) $1001001_{(2}$ d) $11111_{(2}$

(4) Convert to binary the following values:

a) $5A43_{(16}$ b) $BEA_{(16}$ c) $23A_{(16}$ d) $100_{(16}$ e) $F410_{(16}$

(5) Convert to octal the following values:

a) $100101_{(2}$ b) $11101_{(2}$ c) $110011_{(2}$ d) $100_{(2}$ e) $11010101_{(2}$

(6) Convert to binary the following values:

a) $521_{(8}$ b) $1234_{(8}$ c) $100_{(8}$ d) $7543_{(8}$ e) $111_{(8}$

(7) Convert to decimal the following values:

a) $F2A3_{(16}$ b) $4227_{(16}$ c) $4227_{(8}$ d) $AAFF_{(16}$

(8) Convert to hex the following values:

a) $16_{(10}$ b) $427_{(10}$ c) $255_{(10}$ d) $534_{(10}$

(9) Convert to octal the following values:

a) $16_{(10}$ b) $427_{(10}$ c) $255_{(10}$ d) $534_{(10}$

(10) Add the numbers 45 + 31 in binary code. Check the result by performing the conversion to decimal.

(11) 👁 Subtract the numbers 80 – 46 in binary code. Check the result by performing the conversion to decimal.

(12) Substract the numbers 109 – 23 in binary code. Check the result by performing the conversion to decimal.

(13) Multiply the numbers 30 * 6 in binary code. Check the result by performing the conversion to decimal.

(14) What is the negative representation of 58 in binary code? Give the result in sign and magnitude, 1's complement, 2's complement and Excess-K with K = $2^{n-1}$ , all for a value of 8-bit word.

(15) What is the decimal value of 10101010 if it is represented using Excess-K with K = $2^{n-1}$?

(16) Perform the following logical operations:

a) NOT (10001001 OR 10111001) b) 11011011 XOR 10111001

c) 00000111 AND 11111111 d) 00000111 XOR 11111111

(17) 👁 How many bits should I need to represent the number 62?

(18) 👁 With a 12 bits binary number, how many numbers can we represent?

(19) What is UNICODE? How many bits are used to encode a symbol?

(20) Encode in decimal, octal and hex the phrase “Sistemas de representación” using the ASCII code. Note that the o is accentuated.

(21) 👁 What is the decimal value of C19E0000? The number is represented using 32 bits IEEE754

(22) Perform the following conversions:

a) 34 TB → MB b) 1200 GB → EB c) 👁 100 Mb → kB d) 👁 6Mb/s → GB/week

(23) 🎖 Divide the numbers 105/5 in binary code. Check the result by performing the conversion to decimal.

(24) How long will it take (maximum) to download a 3.5GB movie if your Internet provider tells you that it provides 100 Mb/s ? And if they told you that the error rate is 5%,?

(25) In computer systems, when representing a color an RGB coding is used, so that any color is defined by the amount of Red, Green and Blue that it contains. The range of values each component can take depends on what is called *color depth*, but a general value could be 255 (or 11111111 or FF). In this way the red color would be represented by 255,0,0 or 111111110000000000000000(2 o $FF0000_{16}$ and an orange would be something like 255,128,0 or 111111111000000000000000000000000000000(2 o $FF8000_{(16}$.

With this information, you must draw (with colors obviously), the image that represents the binary code that is indicated below. To do this, use the HTML code provided. The only thing you have to do is change the color by the code in each of the *<td>* of the code. By default is green (#00FF00). The image is 6 x 6 pixels (or cells ;) )

000000001111111100000000 000000001111111100000000 000000001111101000101000

000000001111101000101000 000000001111111100000000 000000001111111100000000

000000001111111100000000 000000001111101000101000 101010101010101011111111

101010101010101011111111 000000001111101000101000 000000001111111100000000

000000001111111100000000 000000001111101000101000 101010101010101011111111

101010101010101011111111 000000001111101000101000 000000001111111100000000
000000001111111100000000 000000001111101000101000 000000001111101000101000
000000001111101000101000 000000001111101000101000 000000001111111100000000
000000001111111100000000 111011101110111010101010 111011101110111010101010
111011101110111010101010 111011101110111010101010 000000001111111100000000
111011101101110101100110 000000001111111100000000 111011101101110101100110
111011101101110101100110 000000001111111100000000 111011101101110101100110

(26) To save memory many programmers use a “word” (the minimum storage unit in memory that has a computer system) to indicate a state for each bit in the word. For example, if the word is 4 bits you could use the first one to know if the player is alive, the second one to know if he plays with a keyboard or a joystick, the third one to know if he has extra life and the fourth one to know if it's a network game. Thus, instead of using 16 bits (4 data to be stored, each 4-bit), it only uses 4.

The problem arises when you have to activate or deactivate one of these bits and, of course, get the value you save. With what you already know about binary operations, can you think of any way to do it easily?

For instance, with the word 0101:

How can I activate bit 1 to get the word 0111? and disable bit 0 to get the word 0110? and how can i get the state of the bit 3 (zero)?

**Share the solution of the last 3 exercises and your doubts in the forum! If a classmate has troubles with them, try to help.**