Unit 3. Exercises about representation of information

## 1. Convert from decimal to binary:

A) 234 = 11.101.010

234 = 2^7 + 2^6 + 2^5 + 2^3 + 2^1= 234, you need to get a value of 234 using the powers of 2.

Starting from 0.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2^7 | 2^6 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

2 + 8 + 32 + 64 + 128 = 234 or 234 – 128= 106 – 64 = 42 – 32 = 10 – 8 = 2 – 2 = 0

Both options are valid.

B) 555 = 1.000.101.011

C) 12321 = 11.000.000.100.001

D)152 = 10.011.000

E)32768 = 1.000.000.000.000.000

## 2. Convert from binary to decimal:

Doing the oposite of the excersice 1:

You count the position that have 1, and put together the amount using power of 2.

Starting from the right side: 0 \* 2^0 + 0\*2^1 + 0\*2^2 + 0\*2^3 + 0\*2^4 + 0\*2^5 + 0\*2^6 + 0\*2^7 +1\*2^8 = 256

A)100.000.000 = 256

B)1.011.110.100 = 756

C)10011101 = 157

D)1.111.111.111 = 2047

## 3. Convert from hexadecimal to binary:

For the hexadecimal to binary are more posibilities. But we are doing like this way:

We ll traduce every caracter from hexadecimal using 4 bits for binary like this table:

|  |  |
| --- | --- |
| 0 | 0000 |
| 1 | 0001 |
| 2 | 0010 |
| 3 | 0011 |
| 4 | 0100 |
| 5 | 0101 |
| 6 | 0110 |
| 7 | 0111 |
| 8 | 1000 |
| 9 | 1001 |
| A | 1010 |
| B | 1011 |
| C | 1100 |
| D | 1101 |
| E | 1110 |
| F | 1111 |

A)45A0 = 100.0101.1010.0000: 4 = 0100; 5 = 0101; A = 1010; 0 = 0000

The last 0 at the left, you can deleted, because isnt significative.

B) CF = 1100.1111

C) AAB2 = 1010.1010.1011.0010

D)3020 = 11.0000.0010.0000

## 4. Convert from binary to hexadecimal:

Starting from the right, why pick four bits and do the same process as before.

a: 1.1000.1000 = 188; 1000 = 8, 1000 = 8, 0001 = 1

b: 100010110 = 116

## 5. Complete the following conversions related to octal numeral system:

Convert the numbers from exercise 4to octal:

From binary to octal, is the same as hexadecimal, but just with 3 bits

a: 110.001.000 = 610; 000 = 0, 001 = 1, 110 = 6

b: 100010110 = 426

Convert the octal 3020 to binary:

3020 = 011.000.010.000

## 6. Fillinthe gaps, using all the conversions you need. You have to write the steps to transform each number.

|  |  |  |  |
| --- | --- | --- | --- |
| Binary | Decimal | Hexadecimal | Octal |
| 100 001 | 33 | 21 | 41 |
| 11.111.111 | 255 | FF | 377 |

## 7. How many bits do you need to represent the following numbers in binary?

a: **hexadecimal**: 4B, 4AA, FF4FA, 345F:

**4B**: Needs 7 bits; **4AA** :11; **FF4FA**: 20; **345F**: 14

b: **decimal:** 100, 256, 255, 32, 31, 3, 4350, 1024, 45, 2^30, 63

**100**: Needs 7 bits; **256**: 9; **255**: 8; **32**: 6; **31**: 5; **3**: 2; **4350**: 13; **1024**: 11; **45**: 6; **2^30**: 31; **63**: 6

## 8.Solve the following parts using ASCII extended (8 bits).