

C2- S13 REVISIONS

CORRECTION

Exercise 1:

The alphabet is given below to help you:

a b c d e f g h i j k l m n o p q r s t u v w x y z

Q1 a w b s c o

Q2 e e z j j y o o x t t w y y

Exercise 2:

Q1 An ASCII represents 245 characters. What is the size (in bits) of an ASCII? *(Justify your answer)*

245 = 11110101 that have 8bits

So, 245 characters need size 8 bits

Q2 with 8 bytes, how many values can be represented? *(Justify your answer)*

3bytes = $8 \times 8 \text{bits} = 64 \text{bits}$

Have 2^{64} values can be represented.

Q3 How many bits to store alphabet and number in keyboard 0...9, A...Z and a...z

0...9 have 10 values

A...Z have 26 values

a...z have 26 values

Total of number $10 + 26 + 26 = 62$

0bit = $2^0 = 1$ values

1bit = $2^1 = 2$ values

2bits = $2^2 = 4$ values

3bits = $2^3 = 8$ values

4bits = $2^4 = 16$ values

5bits = $2^5 = 32$ values

6bits = $2^6 = 64$ values

So, we 6bits to store.

Exercise 3:

Q1 What is the result of this operation with binary numbers?

$$\begin{array}{r} 1011 \ 0101 \\ - \ 0101 \ 1110 \end{array}$$

The answer is **1010111**

Q2 What is the result of this operation with binary numbers?

$$\begin{array}{r} 1111 \ 0011 \\ - \ 0111 \ 1101 \\ - \ 0011 \ 1011 \end{array}$$

The answer is **111011**

Q3 What is the result of this operation with binary numbers?

$$\begin{array}{r} 1011 \ 0011 \\ - \ 0101 \ 1101 \\ - \ 0011 \ 1011 \\ - \ 0001 \ 1000 \end{array}$$

The answer is **11**

Q4 What is the result of this operation with binary numbers?

$$\begin{array}{r} 1011 \ 0101 \\ + \ 0111 \ 1111 \end{array}$$

The answer is **100110100**

Q5 What is the result of this operation with binary numbers?

$$\begin{array}{r} 1111 \ 0011 \\ + \ 1001 \ 1101 \end{array}$$

+ 0111 1011
The answer is **1000001011**

Q6 What is the result of this operation with hexadecimal numbers?

D2F7
+ CF84
+ 3CDE

The answer is **1DF59**

Exercise 4:

Compute the following conversions

Base 2	Base 10
101101	<i>Explanation:</i> $101101 = 32 + 0 + 8 + 4 + 0 + 1 = 45$

Base 2	Base 16
101101	<i>Explanation:</i> $1101 = D$ $10 = 2$ So, $101101 = 2D$

Base 16	Base 8
D8F	<i>Explanation</i> Base16→Base2 $D8F = 110110001111$ Base2→Base8 $110110001111 = 6617_{\text{base8}}$ So $D8F = 6617$

Base 16	Base 2
D8F	<i>Explanation:</i> $D = 1101$ $8 = 1000$ $F = 1111$ So $D8F = 110110001111$

Exercise 5:

Q1. Rules:

- 3 characters "AOU", repeated many times (min repetition is 1 , max repetition is 10)
- In the end you can have X, Y or Z, only one letter

Examples:

AOUAOUX
AOUY
AOUAOUAOUAOUX

a) Explain your encoding

Meaning	Encoding in decimal	Encoding in binary
Number of repetition of the text AOU Example : 4 will produce AOU AOU AOU AOU	1 To 10	0001 To 1010
The characters at the end	0: X 1: Y 2: Z	00 01 10

b) Give examples

0001 10 = AOUZ

c) Explain the size : 101010 = 6bits

Q2. Rules:

- 3 signs: @, #, %
- The signs can be displayed in any order
- Each sign is repeated from 0 to 5 times
- In the end you can have A, B or C, only one letter

Examples:

@ @###A
%% @ @ @ @ @#B
#####C

d) Explain your encoding, give the example and your explanation

GROUP 1 GROUP 2 GROUP 3

Meaning	Encoding in decimal	Encoding in binary
GROUP 1		
Character	0 @ 1 # 2 %	00 01 10
Repetition	0 To 5	000 To 101
GROUP 2		
Character	0 @ 1 # 2 %	00 01 10
Repetition	0 To 5	000 To 101
GROUP 3		
Character	0 @ 1 # 2 %	00 01 10
Repetition	0 To 5	000 To 101
LAST CHARACTER		
Last Character	0 A 1 B 2 C	00 01 10

e) For this example, %%%%C, what is the littlest size possible with your encoding?

%%%%C = 10 101 10 = 7bits

f) Explain the size

@ @ @ @ @ ##### %%%%C = 00 101 01 101 10 101 10 = 17bits

EXERCICE 6: Encoding problem

Rules:

- 4 letters: A, B, C, D
- Any order
- Max text length = 14

Examples:

ABCDDDDDDD
DBCAA
ADABCAA

g) Explain your encoding

SOLUTION 1

Meaning	Encoding in decimal	Encoding in binary
We repeat this as needed:		
Character	0 A 1 B 2 C 3 D	00 A 01 B 10 C 11 D

Example

ADABCAA

00 11 00 01 10 00 00

SOLUTION 2

Meaning	Encoding in decimal	Encoding in binary
We repeat this as needed:		
Character	0 A 1 B 2 C 3 D	00 A 01 B 10 C 11 D
Repetition	0 to 14	0000 to 1110

Example

ADABCAA

00 0001 11 0001 01 0001 10 0001 00 0010

EXERCICE 7: Encoding problem

Rules:

- First 2 characters "AB", repeated many times (max repetition is 5)
- Then 1 character "*", repeated many times (max repetition is 5)
- Then 1 number (0-9)

Examples:

ABABAB***8

AB*****7

ABABAB*****3

h) Explain your encoding

Meaning	Encoding in decimal	Encoding in binary
Number of repetition of the text AB	1...5	001...101
Number of repetition of the text *	1...5	001...101
Have one number at the end	1...9	0001...1001

i) Give examples

ABABAB**7 = 001 010 0111

j) Explain the size

ABABABABAB*****9 = 101 101 1001 = 10bits

EXERCICE 8: Encoding problem

Rules:

- 4 letters: A, E, O, U
- Each letter is repeated minimum 0 time and maximum 7 times.
- The letters are always in the alphabetic order: A then E then O then U

Examples:

AAAAEEEEOUU
EEEEUUUUUUU
AAEEEEOUU

- a) Find an encoding of maximum **12 bits**. Explain the method, explain the size and give examples.

Meaning	Encoding in decimal	Encoding in binary
Number of repetition of the Letter A	0...7	000...111
Number of repetition of the Letter E	0...7	000...111
Number of repetition of the Letter O	0...7	000...111
Number of repetition of the Letter U	0...7	000...111

AAAAAAEEEEEEEEOOOOOOOUUUUUUU= 111 111 111 111

- b) Is your encoding lossless or loosely?

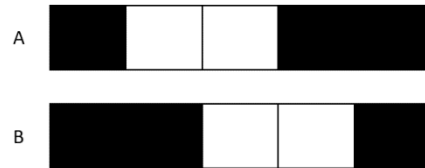
It is lossless because (000 000 001 010 = OOU)

EXERCICE 9: Encoding problem

Rules:

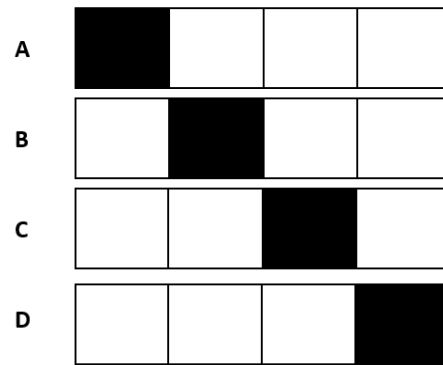
- The image has only 2 options A & B

Question - Find an encoding



Meaning	Encoding in decimal	Encoding in binary
Position of Black Color.	0: one black at first and two black and last 1:two black at first and one black at last	0 1

EXERCICE 10: Encoding problem



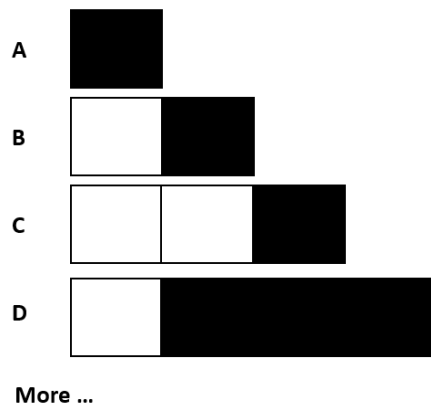
Rules:

- The image has only 4 options A, B, C, D

Question - Find an encoding

Meaning	Encoding in decimal	Encoding in binary
Position of Image	0 : The black is the 1 st pixel 1 : The black is the 2 nd pixel 2: The black is the 3 rd pixel 3: The black is the 4 th pixel	00 01 10 11

EXERCICE 10: Encoding problem



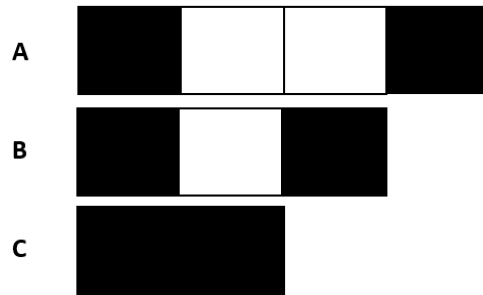
Rules:

- The image has 1 to 4 pixels
- 1 to 3 black pixels
- The black pixels shall be together

Question - Find an encoding

Meaning	Encoding in decimal	Encoding in binary
Width of Image	1...4	001...100
Position of black color	1...4	001...100
Number of black color	1...3	01...11

EXERCICE 11: Encoding problem



Rules:

- Pixels can be white or black
- The image size can be from 2 to 4 pixel
- The white pixels have 0 to 2
- Black pixel always first and last cells

Question - Find an encoding

Meaning	Encoding in decimal	Encoding in binary
Width of Pixel	2..4	010...100