Discussion 1/19

Problem 1:

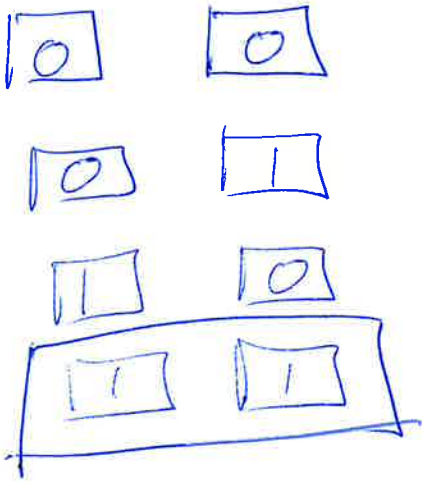
Natural numbers.

If you have N bits:

- you can represent 2^N numbers
- The highest of this number is $2^N - 1$

$N = 2$

4 possibilities (2^2)



largest: $3 = 2^2 - 1$

Let us assume we want to be able to read texts written in occitan. How many bits in minimum do you need to represent a character from occitan, knowing that there are 300 characters in that language.

2 letters

a 0
b 1

} 2 bits
2^1

4 letters:

a 0 0
b 0 1
c 1 0
d 1 1

} 4bit
2^2

2^2 bits	→	4 characters	$\rightarrow 2^2$
3 bits	→	8 characters	$\rightarrow 2^3$
4 bits	→	16	2^4
5 bits	→	32	2^5
6 bits	→	64	2^6
7 bits	→	128	2^7
8 bits	→	256	2^8
9 bits	→	512	2^9

N	bits	→	2^N
$N+1$	bits	→	2^{N+1}

To represent Q characters, you need N bits, with

$$2^N \leq Q < 2^{N+1}$$

Problem 2

Convert the number #(1E6) in binary format.

$(000,\ 1110\ 0110)_2$

Problem 3

There are 100 politicians in a room. These politicians can be honest or crooked. At least one is honest. For any pairs of politicians, at least one is crooked. How many crooked politicians are there?

What do we know?

H: number of honest politicians.
C: " " crooked politicians.

$H + C = 100$

$H \geq 1$

Two politicians P_1, P_2 then either P_1 is crooked or P_2 is crooked (or both)

Solving

Let us work on the number of honest politicians: H:

$H = 0$? No

$H = 1$? Yes

$H = 2$? Let us assume we have two honest politicians: H_1 and H_2 However then among (H_1, H_2) one would be crooked.

We cannot have 2 honest politicians. (or more)

therefore, there is a single honest politicians.

(1)

The portrait is not here
The portrait is not in 2

(2)

The portrait is in 3
The portrait is here

(6)

The portrait is not in 1
The portrait is not in 2.

1 of the caskets has 1 true statement only ✓

2 other caskets have 2 true statements.

C_1	C_2	C_3
P	E	E
E	P	E
E	E	P

C_{1-1}	C_{1-2}	C_{2-1}	C_{2-2}	C_{3-1}	C_{3-2}
F	T	F	F	F	T
T	F	F	T	T	F
T	T	T	F	T	T