Discussion 2
ECS17
Communicating with a computer

1) ***What is the highest possible value for a natural number that can be stored on 8 bits?***

255

The range of values that can be stored on 8 bits is 0-255 (i.e. you can store 256 different values, but the largest one is 255).

2) ***Let A be the hexadecimal number F1 and B the hexadecimal number 101; which number (hexadecimal notation) satisfies A+C = B?***

#10

A = #F1 = 15x16+1 = 241 (in decimal)
B = #101 = 1x16^2 + 0x16 + 1 = 257 (in decimal)

Therefore C = 257 – 241 = 16 = #10

3) ***The binary representation of the hexadecimal 3D is***

00111101

3D
3 D
0011 1101 (see table)
00111101

4) ***Assume that the UNICODE contains 250,000 characters. What is the minimal number of bits needed to store the character with the largest binary representation?***

18

The largest character to store has index 250,000. With 17 bits, the largest number is 2^17-1= 131071; i.e. 17 bits are not enough. With 18 bits, the largest number is 2^18-1 = 262143, i.e. large enough.

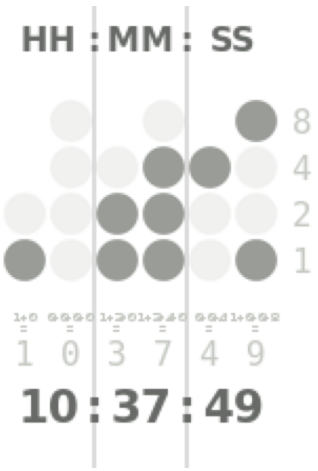
5) ***Let A be the binary number 1010 and B the binary number 11011; which of these binary numbers C satisfies A+C = B?***

10001

A = 1010 (binary) = 10 (decimal)

B = 11011 (binary) = 27 (decimal)
Therefore C = 17 (decimal) = 10001 (binary)

6) A new type of binary-encoded clock is introduced and work as described below:



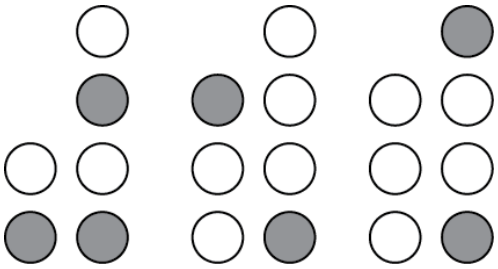
Add the values of each column to get six decimal digits. There are two columns each for hours, minutes and seconds.

In the example shown:

Hours: 1 in the left column
0 in the right column
Therefore: 10 hours

Minutes: 3 (1+2) in the left column
7 (1+2+4) in the right column
Therefore: 37 minutes

Seconds: 4 in the left column
9 (8+1) in the right column
Therefore: 49 seconds.



What time is it on this clock?

a. 13:41:10
b. 13:41:09
c. 15:41:08
d. 15:41:09