# Homework 1 Primitive data types, binary and hexadecimal

1. a. Convert the binary number 01001101 to denary. 1 + 4 + 8 + 64 = 77 [1]

b. Convert the hexadecimal number 5A to denary. 5 = 0101 A = 10 = 1010

01011010 [1]

c. Convert the hexadecimal number F18C to binary. [1]

2. a. A positive integer can be represented as a binary value.   
  
Show that 14910 is equivalent to 100101012: [3]

10010101 = 128 + 16 + 4 + 1 = 149

First 1 is 128 spot

2nd 1 in the byte is in the 16 spot

3rd 1 in the byte is in the 4 spot

Last 1 in the byte is in the 1 spot

So the binary value 10010101 in denary (base 10) is 1 + 4 + 16 + 128 which is 149

b. Hexadecimal is a convenient way to express binary values in groups of four bits.   
  
Convert 100101012 to a hexadecimal value and show that this value to equivalent to 14910: [5]

8421 8421

1001 0101

8 + 1 4+1

=9 =5

Hex value = 95 (nine five)

Hex to denary:

5 \* 16^0 + 9 \* 16^1

= 5 + 144 = 149

2. MAC addresses are used to uniquely identify network enabled hardware devices. They are written in the format of six pairs of hexadecimal digits: 3A:D2:48:9E:61:AC.

* 1. Convert the first pair of digits 3A to binary. [2]

A = 10

Therefore:

8421 8421

0011 1010

= 00111010

* 1. How many bytes will this MAC address occupy in a computer’s memory? [1]

6 bytes, each hexadecimal is 1 byte

* 1. Explain why a MAC address is expressed in hexadecimal rather than pure binary. [1]

Mac addresses can be really long, the one in the question for example, is 6 bytes, each byte is 8 bits so 8 binary digits (1 or 0s), 8 times 6 means it takes 48 digits to express this mac address

[Total 15 Marks]