# Homework 1 Number systems

1. Natural numbers are used for counting amounts of objects and are described as the set of values = {0, 1, 2, 3, ... }.
   1. Explain how the definition of integer values is an extension of the one above for natural numbers: [2]
   2. A positive integer can be represented as a binary value.   
        
      Prove that 14910 is equivalent to 100101012: [3]
   3. Hexadecimal values can be used to summarise binary values.   
        
      Convert 100101012 to a hexadecimal value and show that this value to equivalent to 14910: [5]
2. Real numbers, represented by the set ℝ include natural, rational and irrational numbers.
   1. Give an example of a rational number. [2]
   2. Give one example of an irrational number. [1]
   3. Explain what makes a number irrational. [1]
   4. Define what an Ordinal number is, by use of an example. [2]
3. 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]
   2. How many bytes will this MAC address occupy in a computer’s memory? [1]
   3. Explain why a MAC address is expressed in hexadecimal rather than pure binary. [1]

[Total 20 Marks]