DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCES  
MSc CYBER SCEURITY  
20XC14 DIGITAL SYSTEM DESIGN

WORKSHEET 1

CONTEXT: NUMBER SYSTEM REPRESENTATION

1. What is the decimal equivalent of the largest binary integer that can be obtained with **(a)** 11 bits and **(b)** 25 bits?
2. Express the following numbers in decimal:

(a) (10110.0101)2 (b) (16.5) 16 (c) (26.24)8 (d) (DADA.B) 16 (e) (1010.1101) 2

1. Perform the required conversions in the following table

**Decimal Binary Octal Hexadecimal**

1. 369.3125 ? ? ?
2. ? 10111101.101 ? ?
3. ? ? 326.5 ?
4. ? ? ? F3C7.A
5. Perform the following conversion by using base 2 instead of base 10 as the intermediate base for the conversion:
   * 1. (673.6)8 to hexadecimal (b) (E7C.B)16 to octal (c) (310.2)4 to octal
6. Considerable evidence suggests that base 20 has historically been used for number systems in a number of cultures.
7. Write the digits for a base 20 system, using an extension of the same digit representation scheme employed for hexadecimal.
8. Convert (2007)10 to base 20.
9. Convert (BCI.G)20 to decimal.
10. In each of the following cases, determine the radix *r*:

(a) (BEE)*r =* (2699)10 (b) (365)*r* =(194)10

1. Do the following conversion problems:

(a) Convert decimal 27.315 to binary.

(b) Calculate the binary equivalent of 2/3 out to eight places. Then convert from binary to decimal. How close is the result to 2/3?

(c) Convert the binary result in (b) into hexadecimal. Then convert the result to decimal...Is the answer the same?

1. Convert the following numbers with the indicated bases to decimal:

(a) (4310)🡪( ) 5 (b) (198)🡪( ) 12 (c) (435)🡪( ) 8 (d) (345)🡪( ) 6

1. What is the exact number of bytes in a system that contains (a) 32K bytes, (b) 64M bytes, and (c) 6.4G bytes?
2. The king receives 64 gold coins in taxes but has reason to believe that one is counterfeit. He summons you to identify the fake coin. You have a balance that can hold coins on each side. How many times do you need to use the balance to find the lighter, fake coin?