CSULB
CECS225
Lab1
Either type your lab in a word document and upload as a **pdf**
Or **write neatly**, scan the file and upload as a **pdf**.
Show your work, no work no credit even if the answer is correct
When you are done, **click on quizzes and convert your answers to the quiz**.
Make sure to follow the instructions on how to enter the answer (for grading purposes)

1- Find the decimal values of the following numbers using the digit position and the base of the system.

a. 365_{10}
    a. 365, already in base decimal
b. 11_2
    a. $1 * 2^1 + 1 * 2^0 = 3_{10}$
c. 11_7
    a. $1 * 7^1 + 1 * 7^0 = 8_{10}$
d. 1001_2
    a. $1 * 2^3 + 0 * 2^2 + 0 * 2^1 + 1 * 2^0 = 9_{10}$
e. 1010101_2
    a. $1*2^6 + 0*2^5 + 1*2^4 + 0*2^3 + 1*2^2 + 0*2^1 + 1*2^0 = 85_{10}$
f. 21_3
    a. $2*3^1 + 1*3^0 = 7_{10}$
g. 122_3
    a. $1*3^2 + 2*3^1 + 2*3^0 = 17_{10}$

2- Convert the following unsigned binary numbers to decimal, Hexadecimal, and Octal. Show your work.

a. 1110_2
    a. Decimal
        i. $1*2^3 + 1*2^2 + 1*2^1 + 0*2^0 = 14_{10}$
    b. Hexadecimal
        i. Using decimal 13_{10}, 10 = A, 14 = E
    c. Octal
        i. Using decimal 14_{10}
            1. 14 / 8 = 1, R = 6
            2. 1 / 8 = 0, R = 1
            3. 16_8
b. 100100_2
    a. Decimal
        i. $1*2^5 + 0*2^4 + 0*2^3 + 1*2^2 + 0*2^1 + 0*2^0 = 36_{10}$
    b. Hexadecimal
        i. Using decimal 36_{10},
            1. 36 / 16 = 2, R = 4

2. 2 / 16 = 0, R = 2
3. 24_{16}

c. Octal
   i. Using decimal 36_{10}
      1. 36 / 8 = 4, R = 4
      2. 4 / 8 = 0, R = 4
      3. 44_8

c. 11010111_2
   a. Decimal
      i. $1*2^0 + 1*2^1 + 1*2^2 + 0*2^3 + 1*2^4 + 0*2^5 + 1*2^6 + 1*2^7 = 215_{10}$
   b. Hexadecimal
      i. Using decimal 215_{10}
         1. 215 / 16 = 13, R = 7
         2. 13 / 16 = 0, R = 13 = D
         3. $D7_{16}$
   c. Octal
      i. Using decimal 215_{10}
         1. 215 / 8 = 26, R = 7
         2. 26 / 8 = 3, R = 2
         3. 3 / 8 = 0, R = 3
         4. 327_8

d. 011101010100100_2
   a. Decimal
      i. $0*2^0 + 0*2^1 + 1*2^2 + 0*2^3 + 0*2^4 + 1*2^5 + 0*2^6 + 1*2^7 + 0*2^8 + 1*2^9 + 0*2^{10} + 1*2^{11} + 1*2^{12} + 1*2^{13} + 0*2^{14} = 15012_{10}$
   b. Hexadecimal
      i. Using decimal 15012_{10}
         1. 15012 / 16 = 938, R = 4
         2. 938 / 16 = 58, R = 10
         3. 58 / 16 = 3, R = 10
         4. 3 / 16 = 0, R = 3
         5. $3AA4_{16}$
   c. Octal
      i. Using decimal 15012_{10}
         1. 15012 / 8 = 1876, R = 4
         2. 1876 / 8 = 234, R = 4
         3. 234 / 8 = 29, R = 2
         4. 29 / 8 = 3, R = 5
         5. 3 / 8 = 0, R = 3
         6. 35244_8

3- Convert the following hexadecimal numbers to decimal, to unsigned Binary Show your work.

a. $4E_{16}$
   a. Decimal

i. $E = 14 * 16^0 + 4 * 16^1 = 14 + 64 = 78_{10}$

b. Unsigned Binary

i. Using 78_{10}

1. 78 / 2 = 39, R = 0
2. 39 / 2 = 19, R = 1
3. 19 / 2 = 9, R = 1
4. 9 / 2 = 4, R = 1
5. 4 / 2 = 2, R = 0
6. 2 / 2 = 1, R = 0
7. 1 / 2 = 0, R = 1
8. 01001110_2

b. $7C_{16}$

a. Decimal

i. $C = 12 * 16^0 + 7*16^1 = 12 + 112 = 124_{10}$

b. Unsigned Binary

i. Using 124_{10}

1. 124 / 2 = 62, R = 0
2. 62 / 2 = 31, R = 0
3. 31 / 2 = 15, R = 1
4. 15 / 2 = 7, R = 1
5. 7 / 2 = 3, R = 1
6. 3 / 2 = 1, R = 1
7. 1 / 2 = 0, R = 1
8. 01111100_2

c. $ED3A_{16}$

a. Decimal

i. $A = 10*16^0 + 3*16^1 + 13*16^2 + 14*16^3 = 60730_{10}$

b. Unsigned Binary

i. Using 60730_{10}

1. 60730 / 2 = 30365, R = 0
2. 30365 / 2 = 15182, R = 1
3. 15182 / 2 = 7591, R = 0
4. 7591 / 2 = 3795, R = 1
5. 3795 / 2= 1897, R = 1
6. 1897 / 2 = 948, R = 1
7. 948 / 2 = 474, R = 0
8. 474 / 2 = 237, R = 0
9. 237 / 2 = 118, R = 1
10. 118 / 2 = 59, R = 0
11. 59 / 2 = 29, R = 1
12. 29 / 2 = 14, R = 1
13. 14 / 2 = 7, R = 0
14. 7 / 2 = 3, R = 1
15. 3 / 2 = 1, R = 1

16. 1 / 2 = 0, R = 1
17. $1110\ 1101\ 0011\ 1010_2$

d. $403FB001_{16}$
   a. Decimal
      i. $1*16^0 + 0*16^1 + 0*16^2 + 11*16^3 + 15*16^4 + 3*16^5 + 0*16^6 + 4*16^7 = 1077915649_{10}$
   b. Unsigned Binary
      i. 1077915649_{10}
         1. 1077915649 / 2 = 538957824, R = 1
         2. 538957824 / 2 = 269478912, R = 0
         3. 269478912 / 2 = 134739456, R = 0
         4. 134739456 / 2 = 67369728, R = 0
         5. 67369728 / 2 = 33684864, R =0
         6. 33684864 / 2 = 16842432, R = 0
         7. 16842432 / 2 = 8421216, R = 0
         8. 8421216 / 2 = 4210608, R = 0
         9. 4210608 / 2 = 2105304, R = 0
         10. 2105304 / 2 = 1052652, R = 0
         11. 1052652 / 2 = 526326, R = 0
         12. 526326 / 2 = 263163, R = 0
         13. 263163 / 2 = 131581, R = 1
         14. 131581 /2 = 65790, R = 1
         15. 65790 / 2 = 32895, R = 0
         16. 32895 / 2 = 16447, R = 1
         17. 16447 / 2 = 8223, R = 1
         18. 8223 / 2 = 4111, R = 1
         19. 4111 / 2 = 2055, R = 1
         20. 2055 / 2 = 1027, R= 1
         21. 1027 / 2 = 513, R = 1
         22. 513 / 2 = 256, R = 1
         23. 256 / 2 = 128, R = 0
         24. 128 / 2 = 64, R = 0
         25. 64 / 2 = 32, R = 0
         26. 32 / 2 = 16, R = 0
         27. 16 / 2 = 8, R= 0
         28. 8 / 2 = 4, R = 0
         29. 4 / 2 = 2, R = 0
         30. 2 / 2 = 1, R = 0
         31. 1 / 2 = 0, R = 1
         32. $01000000001111111011000000000001_2$

4- How many different numbers can be represented with 23 bits?

Unsigned: 0 to $2^k - 1$; Signed: -2^{k-1} to $2^{k-1} - 1$