Assignment 1

1. Convert the decimal number 250.5 to base 3, base 4, base 7, and base 8, base 16

   - $(250.5)_{10} = 100021.111111_3$
     $250/3 = 83$;$a_0 = 1$
     $83/3 = 27$;$a_1 = 2$
     $27/3 = 9$;$a_2 = 0$
     $9/3 = 3$;$a_3 = 0$
     $3/3 = 1$;$a_4 = 0$
     $1/3 = 0$;$a_5 = 1$

     $0.5 \times 3 = 1.5$;$a_0 = 1$
     $0.5 \times 3 = 1.5$;$a_1 = 1$
     $0.5 \times 3 = 1.5$;$a_2 = 1$

   - $(250.5)_{10} = (3322.2)_3$
     $250/4 = 62$;$a_0 = 2$
     $62/4 = 15$;$a_1 = 2$
     $15/4 = 3$;$a_2 = 3$
     $3/4 = 0$;$a_3 = 3$

     $0.5 \times 4 = 2.0$;$a_0 = 2$

   - $(250.5)_{10} = (505.33333)_7$
     $250/7 = 35$;$a_0 = 5$
     $35/7 = 5$;$a_1 = 0$
     $5/7 = 0$;$a_2 = 5$

     $0.5 \times 7 = 3.5$;$a_0 = 3$
     $0.5 \times 7 = 3.5$;$a_1 = 3$
     $0.5 \times 7 = 3.5$;$a_2 = 3$

   - $(250.5)_{10} = (372.4)_8$
     $250/8 = 31$;$a_0 = 2$
     $31/8 = 3$;$a_1 = 7$
     $3/8 = 0$;$a_2 = 3$

     $0.5 \times 8 = 4.0$;$a_0 = 4$

- $(250.5)_{10} = (FA.8)_{16}$
  $250/16 = 15$;$a_0 = 10$
  $15/16 = 0$;$a_1 = 15$

  $0.5 \times 16 = 8$;$a_0 = 8$

2. Convert the following decimal to binary 12.0625, 104, 673.23 and 198

   - $(12.0625)_{10} = (1100.101)_2$
     $12/2 = 6$;$a_0 = 0$
     $6/2 = 3$;$a_1 = 0$
     $3/2 = 1$;$a_3 = 1$
     $1/2 = 0$;$a_4 = 1$

     $0.0625 \times 2 = 1.25$;$a_0 = 1$
     $0.25 \times 2 = 0.5$;$a_1 = 0$
     $0.5 \times 2 = 1.0$;$a_2 = 1$
   - $(104)_{10} = (1101000)_2$
     $104/2 = 52$;$a_0 = 0$
     $52/2 = 26$;$a_1 = 0$
     $26/2 = 13$;$a_2 = 0$
     $13/2 = 6$;$a_3 = 1$
     $6/2 = 3$;$a_0 = 0$
     $3/2 = 1$;$a_0 = 1$
     $1/2 = 0$;$a_0 = 1$
   - $(673.23)_{10} = (1010100001.00111010111)_2$

3. Convert the following binary numbers to decimal 10.10001, 101110.0101, 11100101.110, 1101101.111

   - $(10.10001)_2 = 1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 0 \times 2^{-4} + 1 \times 2^{-5}$
     $= (2.53125)_{10}$
   - $(101110.0101)_2 = 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 0 \times 2^{-1} +$
     $1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4}$
     $= (46.3125)_{10}$
   - $(11100101.110)_2 = 1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 +$
     $1 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} + 0 \times 2^{-3}$
     $= (229.75)_{10}$
   - $(1101101.111)_2 = 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
     $= (109.875)_{10}$

Assignment 2

Convert the following numbers from the given base to the bases indicated:

1. Decimal 225.225 to binary, octal and hexadecimal
   - $(225.225)_{10} = (1110001.00111)_2$
   - $(225.225)_{10} = (341.16)_8$
   - $(225.225)_{10} = (1E.39)_{16}$
2. Binary 11010111.110 to decimal, octal and hexadecimal
   - $(11010111.110)_2 = (215.75)_{10}$
   - $(11010111.110)_2 = (347.6)_8$
   - $(11010111.110)_2 = (D7.C)_{16}$
3. Octal 62377 to decimal binary and hexadecimal
   - $(62377)_8 = (25855)_{10}$
   - $(62377)_8 = (1011010011111111)_2$
   - $(62377)_8 = (64FF)_{16}$
4. Hexadecimal 2AC5.D to decimal, octal and binary
   - $(2AC5)_{16} = (10949.6875)_{10}$
   - $(2AC5)_{16} = (25425.54)_8$
   - $(2AC5)_{16} = (10101011000111.1011)_2$
5. Convert the following numbers to decimal:
   (i) $(1001001.011)_2 = (72.375)_{10}$
   (ii) $(12121)_3 = (151)_{10}$
   (iii) $(1032.2)_4 = (78.5)_{10}$
   (iv) $(4310)_5 = (580)_{10}$

Applications

- A CD-ROM stores 650 megabytes of digital data. How many bits of data is this?
  We have: $650 \times 1024768 \times 8 = 5328793600$ bits

- Determine the odd parity bit required for each of the following 7 bit ASCII codes:
  1001010:0
  0101101:1
  0110101:1

- Determine the even parity bit required for each 7 bit ASCII code listed above.
  1001010:1
  0101101:0
  0110101:0