Assignment 1

Problem Statement: Create a base 15 numbering system

1) **Define a Base 15 Numbering System**

   Symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, R, O, C, X, Z

2) **Two digit number rows**

0 01 02 03 04 05 06 07 08 09 0R 0O 0C 0X 0Z

10 11 12 13 14 15 16 17 18 19 1R 1O 1C 1X 1Z

20 21 22 23 24 25 26 27 28 29 2R 2O 2C 2X 2Z

30 31 32 33 34 35 36 37 38 39 3R 3O 3C 3X 3Z

40 41 42 43 44 45 46 47 48 49 4R 4O 4C 4X 4Z

50 51 52 53 54 55 56 57 58 59 5R 5O 5C 5X 5Z

60 61 62 63 64 65 66 67 68 69 6R 6O 6C 6X 6Z

70 71 72 73 74 75 76 77 78 79 7R 7O 7C 7X 7Z

80 81 82 83 84 85 86 87 88 89 8R 8O 8C 8X 8Z

90 91 92 93 94 95 96 97 98 99 9R 9O 9C 9X 9Z

3) **Demo: Addition and Subtraction**

- **Addition Examples:**
  - 8 + 5 = X (base 15)
  - R + 6 = 11 (base 15) → 11
- **Subtraction Examples:**
  - C - 4 = 8
  - Z - 7 = 7 (base 15)

4) **Demo: Double Digit Addition and Subtraction**

- **Addition Examples:**
  - 2X + 3C = 6R
  - R7 + 4O = 103
- **Subtraction Examples:**
  - 4X - 3R = 13
  - C5 - 8R = 3R

5) **Table 1 to 10**

×	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**R**
1	1	2	3	4	5	6	7	8	9	R
2	2	4	6	8	R	C	10	12	14	16
3	3	6	9	C	11	14	17	1R	1X	22
4	4	8	C	12	16	1R	20	24	28	2C
5	5	R	11	16	1O	22	27	2C	33	38
6	6	C	14	1R	22	28	30	36	3C	44
7	7	10	17	20	27	30	37	40	47	50
8	8	12	1R	24	2C	36	40	48	52	5R
9	9	14	1X	28	33	3C	47	52	5B	66
R	R	16	22	2C	38	44	50	5R	66	72

6) **Demo: Multiplication for Single and Double Digits**

- **Single Digit:**
  - 5 x 7 = 23
  - O × 4 = 2Z
- **Double Digit:**
  - 1C x 3 = 56
  - 3O x 4 = ZZ

7) Conversion formula

- From Base 15 to Base 10 : Base-10 value =∑(i=0,n−1) di*(15^i)
- From base 10 to Base 15 : $N = d0 + d1 \times 15 + d2 \times 15^2 + \ldots$

Where $d0, d1, d2, \ldots$ are the digits of the base-15 representation of N, and $0 \leq di < 15$0≤*di*<15.

Given a base-10 number *N* to convert to base-15:

a. Initialize an empty list to store the remainders.
b. While *N* is greater than 0, do the following:
    i. Compute the remainder of *N* divided by 15.
    ii. Append this remainder to the list.
    iii. Update *N* to be the integer division of *N* by 15.
c. Reverse the list of remainders to obtain the base-15 representation of the number.

0 1 2 3 4 5 6 7 8 9 R O C X Z

(10=R, 11=O, 12=C, 13=X, 14=Z)