CSE220 Assignment 1

Deadline: 18th November, 2020

Assignment Guidelines:

- **Submission Instructions:**
  - **The assignment can be hand-written or typed.**
  - **Submission Format: PDF (one single file).**
  - **File naming convention: CSE220_SectionNum_StudentID_StudentName (Example: CSE220_2_18102541_BillGates)**
  - **Write down only the methods that are required; testers are not required.**
- **Late Policy: Late assignments receive no grade, so please start early.**
- **Policy on Academic Honesty:**

  Whenever you submit a piece of academic work and sign your name to it, you are verifying that this work is the result of your own intellectual efforts; it is Plagiarism to submit work solely under your own name in which:

  ➢ **You collaborated with another student in solving the homework problems;**
  ➢ **You copied the solution from a book, web site, or the work of another student; or**
  ➢ **You got significant help in solving the problem, but do not acknowledge this in your solution.**

  In this course, you are not allowed to submit any joint work, although in other courses and in other contexts you may be permitted to do this. In general, you must always provide proper attribution of authorship by naming all persons, books, or resources that provided intellectual content towards the final result. In some cases, you will need to describe the extent of the contribution, particularly when literally copying the words or artistic artifacts of another. To fail to provide proper attribution is plagiarism. Plagiarism demeans the seriousness of what we do in class, and does not allow you as a student to obtain a fair grade for the results you worked hard for.

Assignment Tasks:

1. Suppose you have been hired to develop a musical chair game. In this game there will be 7 participants and all of them will be moving clockwise around a set of 7 chairs organized in a circular manner while a music will be played in the background. You will control the music using random numbers between 0-3.If the generated random number is 1, you will stop the music and if the number of participants who are still in the game is n, the participant at position (n/2) will be eliminated. Each time a participant is eliminated, a chair will be removed and you have to print the player names who are still in the game. The game will end when there will be only one participant left. At the end of the game, display the name of the winner.

   [Hint: You will need to invoke a method to generate a random number between 0 (inclusive) to 3 (inclusive)]

2. Draw a **singly linked list** where each node contains a letter of your full name without considering any space. **[You must show proper locations and indexes.]**
   Do the following operations (stepwise):

   a. Reverse the list (**in-place** – draw all the steps)
   b. Insert ‘P’ in the first position
   c. Insert ‘A’ in position 2
   d. Left rotate the list 4 times
   e. Delete the second element of the list
   f. Insert ‘G’ in the last position
   g. Right rotate the list 3 times
   h. Right shift the list 2 times
   i. Sort the list in alphabetical order (show all the steps)

3. Write a method which takes as input a **singly linked list** and print the first duplicate number.

```
public void printDuplicate
(Node head){
   //to do
}
```

```
def printDuplicate (head):
      pass
```

Sample Input	Sample Output
5 → 4 → 15 →2 → 3 → 4	4
6 → 6 → 10 →10 → 1 →1 → 10 → 6	6

4. Complete the method below that takes the reference of a **non-dummy headed singly linear linked list** and removes all the nodes containing multiples of 5 from the list.

   remove_multiple_of_five(head)

Sample Input	Sample Output
5 → 6 → 35 → 10 → 12 → 90	6 →12
11 → 21 → 3 → 43 → 51	11 → 21 → 3 → 43 → 51
10 → 20 → 30 → 40 → 50	null

5. You are given two **dummy-headed singly-linked** lists, write a method to sum the integers represented in two different lists. The input lists will have single digits in each node. The digits in each node concat to form an integer.

Sample Input	Sample Output
List 1 : x → 4 → 5 → 3 List 2 : x → 9 → 5 → 2	x → 1 → 4 → 0 → 5

   Explanation: List 1 represents the integer 453. List 2 represents the integer 952. 453+952=1405. Hence, List 3 contains 1 → 4 → 0 → 5.

6. Given a **non-dummy headed circular list**, write down a method for inserting an element into the list.

7. Write down the insertBefore method which inserts a new element in the list before the node containing the given element.The method takes as parameters a **dummy headed doubly linked circular list**, the element existing in the list and new element to be added.

```
public void insertBefore (Node head, Object elem, Object
newElement){
  //to do
}
```

   OR

```
def insertBefore (head, elem, newElement):
      pass
```

   insertBefore (head, 3, 50)

Sample Input	Sample Output
↻1 ⇄ 2 ⇄ 3 ⇄ 4 ↺	↻ 1 ⇄ 2 ⇄ 50 ⇄ 3 ⇄ 4 ↺