

Week 3 Practice Programming Assignment

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Problem 1

A **doubly linked list** is a linked data structure that consists of two header nodes that point to the first and last position in a sequence of linked records. Each node in the sequence contains three fields: One data field and two link fields (references to the previous and to the next node in the sequence of nodes) and. So, it can be traversed in both directions.

For the given class **doubly_linked_list**, create two methods:

- **insert_end(data)**: that accepts an integer `data` and inserts it into the list at the last position.
- **delete_end()**: Delete one element of the list from the last position.

Note- Use given linked list structure to implementation. Write both operations (`insert_end` and `delete_end`) with **O(1)** time.

```
1 class Node:
2     def __init__(self, data):
3         self.data = data # Stores data
4         self.next = None # Contains the reference of next node
5         self.prev = None # Contains the reference of previous node
6 class doubly_linked_list:
7     def __init__(self):
8         self.head = None # Contains the reference of first node of the list
9         self.last = None # Contains the reference of the last node of the
    list
```

Example



Sample Input

```
1 [1,3,5,7,9] # Elements for insert in list one by one, start from 1
2 2 # Perform delete_end operation two times
```

Output

```
1 1,3,5 # Traversed list from head to last after deleting two elements
2 5,3,1 # Traversed list from last to head after deleting two elements
```

Solution

Prefix code(visible)

```
1 class Node:
2     def __init__(self, data):
3         self.data = data
4         self.next = None
5         self.prev = None
6 class doubly_linked_list:
7     def __init__(self):
8         self.head = None
9         self.last = None
```

Solution code

```
1     def insert_end(self, data):
2         newnode = Node(data)
3         newnode.prev = self.last
4         if self.head == None:
5             self.head = newnode
6             self.last = newnode
7         else:
8             self.last.next = newnode
9             self.last = newnode
10
11     def delete_end(self):
12         if(self.head != None):
13             if self.head == self.last:
14                 self.head = None
15                 self.last = None
16             else:
17                 self.last = self.last.prev
18                 self.last.next = None
```

Suffix code(visible)

```
1     def traverse(self):
2         temp = self.head
3         while temp != None:
4             if temp.next != None:
5                 print(temp.data, end=',')
6             else:
7                 print(temp.data)
8             temp = temp.next
9
10    def traverse_rev(self):
11        temp = self.last
12        while temp != None:
13            if temp.prev != None:
14                print(temp.data, end=',')
15            else:
16                print(temp.data)
17            temp = temp.prev
```

```

18
19 ins = eval(input())
20 delt = int(input())
21 A = doubly_linked_list()
22 for i in ins:
23     A.insert_end(i)
24 for j in range(delt):
25     A.delete_end()
26 A.traverse()
27 A.traverse_rev()

```

Public Test Cases

Input 1

```

1 [1,3,5,7,9]
2 2

```

Output

```

1 1,3,5
2 5,3,1

```

Input 2

```

1 [1,2,3,4,5,6,7,8,9,10]
2 5

```

Output

```

1 1,2,3,4,5
2 5,4,3,2,1

```

Input 3

```

1 [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,
  21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39,
  40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58,
  59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77,
  78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96,
  97, 98, 99]
2 60

```

Output

```

1 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,
  29,30,31,32,33,34,35,36,37,38,39
2 39,38,37,36,35,34,33,32,31,30,29,28,27,26,25,24,23,22,21,20,19,18,17,16,15,14,
  13,12,11,10,9,8,7,6,5,4,3,2,1,0

```

Private Test Cases

Input 1

1	[1,2,1,2,1,2,1,2,1,2,1,2,1,2,1,2,1,2]
2	8

Output

1	1,2,1,2,1,2,1,2,1,2,1,2
2	2,1,2,1,2,1,2,1,2,1,2,1

Input 2

1	[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99]
2	50

Output

1	0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49
2	49,48,47,46,45,44,43,42,41,40,39,38,37,36,35,34,33,32,31,30,29,28,27,26,25,24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,0

Input 3

1	[1,2]
2	1

Output

1	1
2	1

Input 4

1 [18, 11, 9, 10, 8, 5, 7, 7, 1, 1, 14, 18, 10, 19, 16, 4, 1, 12, 18, 11, 5, 17, 3, 5, 15, 17, 9, 11, 18, 2, 2, 13, 10, 19, 5, 1, 18, 20, 11, 4, 13, 10, 1, 7, 11, 11, 2, 18, 3, 12, 14, 7, 7, 10, 2, 7, 3, 5, 5, 6, 16, 5, 8, 9, 11, 4, 12, 20, 5, 6, 10, 6, 4, 13, 5, 4, 12, 18, 13, 16, 16, 6, 19, 4, 19, 10, 10, 9, 2, 11, 18, 9, 9, 19, 9, 1, 18, 17, 8, 20, 8, 8, 15, 1, 13, 13, 1, 10, 18, 17, 20, 9, 20, 18, 13, 20, 3, 6, 1, 5, 2, 9, 8, 8, 3, 1, 14, 15, 1, 11, 18, 7, 15, 4, 13, 13, 19, 5, 17, 3, 3, 8, 17, 1, 20, 18, 15, 20, 15, 4, 7, 1, 14, 18, 5, 8, 18, 20, 5, 9, 12, 15, 12, 11, 12, 5, 13, 7, 5, 14, 1, 11, 18, 8, 9, 20, 16, 2, 16, 7, 3, 14, 16, 4, 12, 4, 2, 11, 16, 9, 3, 13, 10, 2, 14, 12, 6, 17, 7, 3, 11, 2, 4, 6, 5, 5, 20, 18, 9, 6, 2, 17, 1, 16, 12, 11, 3, 11, 1, 10, 9, 16, 16, 10, 15, 8, 18, 5, 10, 17, 6, 18, 4, 2, 11, 20, 10, 2, 14, 17, 3, 9, 11, 20, 3, 18, 4, 4, 12, 15, 2, 7, 15, 13, 10, 7, 18, 12, 5, 11, 6, 20, 12, 5, 20, 19, 13, 17, 9, 8, 6, 19, 13, 18, 20, 12, 12, 6, 16, 18, 12, 15, 7, 10, 4, 3, 6, 12, 7, 20, 2, 11, 19, 12, 11, 9, 7, 14, 9, 14, 15, 4, 20, 20, 15, 2, 2, 17, 10, 7, 10, 17, 9, 7, 10, 14, 7, 20, 20, 11, 6, 5, 7, 20, 5, 4, 14, 13, 15, 10, 18, 5, 19, 19, 17, 5, 13, 13, 11, 5, 3, 16, 5, 4, 9, 11, 5, 10, 18, 15, 17, 11, 20, 5, 6, 18, 13, 16, 12, 15, 5, 10, 1, 16, 16, 1, 14, 11, 3, 5, 15, 12, 4, 16, 15, 12, 14, 3, 5, 18, 7, 17, 11, 17, 13, 18, 15, 5, 18, 12, 15, 20, 9, 16, 13, 5, 4, 7, 20, 3, 18, 6, 2, 15, 18, 2, 17, 15, 13, 9, 4, 20, 3, 19, 18, 6, 18, 17, 14, 12, 10, 2, 1, 9, 4, 18, 4, 11, 12, 9, 5, 6, 14, 13, 2, 3, 6, 19, 4, 1, 12, 9, 16, 7, 8, 6, 9, 4, 10, 10, 15, 19, 14, 19, 1, 11, 16, 17, 10, 12, 7, 14, 12, 17, 12, 12, 3, 3, 6, 6, 5, 19, 17, 20, 11, 2, 9, 9, 15, 2, 1, 8, 17, 10, 6, 10, 6, 11, 18, 10, 20, 17, 11, 20, 4, 16, 7, 4, 8, 3, 16, 6, 18, 9, 10, 12, 15, 1, 19, 9, 8, 10, 11, 19, 8, 1, 2, 11, 17, 1, 15, 6, 12, 19, 18, 1, 6, 15, 12, 12, 4, 16, 10, 6, 10, 7, 1, 12, 5, 6, 13, 4, 16, 16, 15, 12, 11, 8, 16, 19, 9, 13, 8, 1, 4, 13, 19, 13, 15, 17, 9, 2, 17, 17, 18, 10, 3, 15, 17, 18, 14, 1, 5, 8, 16, 3, 15, 5, 5, 10, 2, 16, 1, 19, 13, 2, 16, 7, 11, 7, 12, 2, 3, 5, 16, 5, 11, 14, 14, 13, 17, 19, 2, 15, 9, 5, 2, 2, 16, 8, 9, 9, 18, 20, 6, 11, 1, 18, 17, 7, 1, 6, 20, 17, 13, 19, 20, 13, 19, 10, 1, 11, 8, 9, 1, 15, 10, 1, 16, 14, 16, 7, 9, 4, 19, 18, 1, 9, 4, 18, 11, 11, 16, 4, 7, 1, 15, 11, 1, 6, 17, 19, 13, 19, 8, 5, 12, 16, 6, 11, 12, 5, 12, 9, 5, 12, 7, 1, 5, 18, 12, 20, 14, 11, 14, 11, 12, 2, 15, 13, 19, 5, 12, 11, 3, 11, 1, 1, 2, 8, 16, 16, 16, 14, 17, 11, 14, 17, 8, 19, 17, 7, 17, 7, 16, 1, 15, 16, 7, 8, 1, 14, 14, 8, 6, 3, 20, 18, 19, 9, 4, 11, 19, 5, 14, 20, 4, 17, 1, 3, 5, 12, 1, 8, 8, 20, 4, 16, 3, 14, 13, 15, 6, 18, 13, 17, 18, 11, 16, 13, 15, 12, 2, 17, 4, 20, 15, 19, 14, 6, 19, 5, 20, 5, 18, 15, 1, 6, 15, 15, 8, 17, 19, 9, 4, 7, 4, 9, 20, 8, 18, 8, 11, 18, 20, 10, 20, 14, 10, 3, 9, 1, 2, 8, 3, 13, 12, 7, 17, 13, 16, 2, 20, 7, 8, 14, 19, 1, 19, 10, 5, 9, 7, 9, 18, 17, 5, 16, 4, 13, 4, 6, 14, 13, 19, 2, 8, 12, 17, 12, 4, 5, 16, 3, 10, 11, 11, 6, 14, 15, 14, 12, 1, 20, 8, 6, 7, 15, 9, 7, 10, 2, 10, 20, 20, 20, 5, 13, 10, 20, 10, 13, 18, 3, 1, 14, 15, 10, 2, 17, 12, 9, 9, 10, 11, 19, 6, 11, 3, 10, 18, 19, 7, 2, 19, 18, 7, 17, 9, 15, 18, 13, 2, 13, 10, 19, 1, 13, 17, 13, 16, 7, 1, 2, 3, 14, 19, 8, 14, 19, 6, 1, 12, 6, 11, 3, 7, 2, 6, 19, 12, 15, 7, 13, 15, 6, 17, 11, 7, 16, 1, 11, 18, 12, 11, 18, 12, 13, 13, 11, 12, 3, 8, 19, 17, 16, 1, 16, 10, 13, 13, 5, 8, 5, 11, 6, 7, 3, 5, 1, 15, 15, 9, 11, 20, 18, 9, 17, 10, 1, 10, 7, 5, 18, 17, 8, 4, 19, 11, 18, 14, 6, 3, 5, 18, 12, 2, 18, 8, 11, 3, 17, 15, 14, 8, 12, 7, 9, 20, 12, 17, 18, 8, 20, 3, 15, 7, 10, 14, 5, 9, 18, 17, 10, 1, 8, 18, 16, 11, 3, 7, 15, 6, 16, 16, 2, 10, 8, 20, 13, 13, 4, 7, 20, 19, 13, 19, 18, 14, 8, 20, 15, 9, 5, 16, 8, 13, 19, 11, 12, 5, 8, 18, 10, 11, 6, 1, 20, 11, 12, 2, 15, 1, 4, 18, 11, 7, 10, 18, 4, 13, 9, 20, 5, 4, 11, 3, 17, 3, 19, 4, 10, 12, 17, 7, 20, 15, 18, 12, 18, 1, 7, 2, 13, 16, 16, 1, 4, 2, 20, 4, 11, 16, 4, 14, 4, 18, 8, 14, 15, 18, 4, 18, 13, 20, 10, 5, 17, 19, 9, 16, 3, 9, 6, 19, 16, 16, 2, 1, 19, 7, 9, 20, 3, 20, 6, 13, 14, 7, 1, 11, 5, 18, 17, 8, 12, 4, 8, 7, 8, 10, 8, 18, 16, 8, 15, 2, 19, 4, 1, 18, 13, 4, 11, 3, 20, 14, 1, 18, 9, 15, 19, 3, 19, 11, 3, 9, 6, 18, 4, 8, 5, 14, 4, 10, 3, 7, 15, 15, 11, 3, 11, 13, 7, 6, 8, 11, 4, 2, 9, 18, 7, 1, 4, 19, 2, 10, 15, 4, 18, 9, 14, 14, 7, 20, 12, 18, 6, 5, 18, 8, 7, 3, 18, 6, 15, 17, 17, 19, 5, 2, 13, 8, 7, 9,

3, 14, 7, 11, 3, 10, 9, 5, 13, 14, 5, 16, 7, 7, 14, 15, 6, 17, 9, 6, 11, 13, 13, 16, 16, 5, 18, 1, 11, 3, 8, 20, 8, 1, 13, 2, 15, 14, 17, 9, 17, 15, 7, 19, 20, 2, 5, 13, 6, 8, 11, 11, 10, 4, 7, 19, 17, 4, 6, 8, 15, 5, 4, 18, 15, 18, 18, 18, 17, 20, 11, 14, 8, 8, 12, 2, 19, 11, 13, 9, 4, 1, 10, 4, 14, 17, 6, 12, 14, 19, 3, 13, 14, 6, 19, 18, 15, 15, 15, 13, 6, 11, 3, 13, 19, 13, 16, 15, 5, 3, 4, 14, 6, 9, 6, 9, 3, 4, 10, 1, 10, 3, 12, 17, 19, 15, 4, 16, 17, 20, 3, 2, 1, 8, 19, 12, 12, 2, 17, 3, 5, 6, 17, 5, 11, 16, 1, 20, 11, 10, 4, 8, 15, 9, 5, 3, 7, 6, 13, 18, 12, 16, 8, 9, 17, 9, 17, 15, 13, 18, 5, 10, 8, 15, 19, 8, 5, 9, 1, 6, 13, 5, 13, 19, 9, 20, 13, 8, 9, 13, 15, 11, 16, 6, 18, 15, 10, 19, 16, 17, 9, 10, 19, 4, 7, 11, 12, 18, 19, 2, 5, 5, 18, 10, 16, 20, 16, 13, 10, 10, 18, 12, 13, 16, 8, 17, 15, 10, 18, 10, 2, 1, 2, 14, 11, 2, 18, 15, 7, 11, 19, 3, 1, 9, 11, 3, 9, 9, 14, 10, 6, 1, 8, 17, 13, 11, 1, 1, 13, 3, 9, 18, 1, 6, 6, 8, 20, 11, 9, 14, 7, 9, 17, 11, 16, 3, 17, 17, 2, 19, 9, 20, 17, 8, 7, 14, 14, 16, 13, 9, 2, 9, 2, 9, 3, 10, 11, 17, 13, 19, 9, 15, 8, 18, 2, 15, 4, 9, 14, 16, 2, 18, 6, 6, 18, 5, 2, 20, 8, 2, 17, 15, 1, 10, 12, 1, 4, 16, 7, 1, 2, 12, 9, 7, 4, 5, 9, 7, 10, 10, 6, 20, 11, 14, 15, 16, 12, 14, 14, 17, 11, 17, 11, 14, 2, 8, 20, 15, 5, 14, 14, 12, 11, 6, 2, 11, 14, 20, 3, 1, 7, 17, 8, 15, 7, 19, 16, 17, 19, 1, 1, 10, 19, 20, 11, 2, 4, 17, 11, 5, 1, 8, 4, 15, 14, 8, 9, 18, 13, 18, 19, 7, 19, 10, 5, 16, 14, 7, 18, 18, 5, 10, 18, 9, 9, 7, 7, 8, 5, 5, 12, 2, 5, 7, 20, 1, 18, 11, 6, 5, 19, 6, 9, 15, 10, 5, 17, 2, 16, 11, 19, 16, 8, 10, 11, 11, 10, 7, 3, 13, 9, 6, 9, 2, 1, 7, 2, 17, 3, 18, 8, 6, 14, 18, 6, 13, 11, 18, 13, 10, 14, 5, 14, 6, 1, 15, 14, 14, 16, 17, 8, 2, 12, 15, 12, 4, 18, 3, 2, 2, 15, 18, 1, 8, 1, 19, 4, 19, 7, 3, 19, 14, 8, 12, 9, 7, 10, 2, 15, 17, 5, 10, 10, 12, 9, 11, 18, 8, 1, 2, 5, 13, 6, 13, 1, 15, 7, 19, 19, 10, 6, 14, 15, 7, 4, 13, 15, 5, 15, 17, 3, 7, 5, 16, 5, 2, 8, 18, 14, 2, 15, 16, 14, 8, 6, 6, 6, 1, 16, 15, 17, 19, 5, 15, 4, 14, 5, 17, 4, 1, 5, 17, 9, 17, 10, 6, 6, 6, 11, 20, 16, 6, 10, 11, 10, 13, 17, 5, 7, 6, 8, 16, 16, 14, 9, 1, 16, 9, 9, 20, 5, 7, 15, 7, 5, 9, 6, 10, 8, 8, 1, 17, 2, 19, 7, 12, 6, 19, 12, 15, 20, 3, 8, 20, 12, 19, 10, 1, 7, 12, 1, 15, 11, 8, 15, 7, 15, 1, 9, 11, 18, 6, 12, 13, 8, 2, 14, 10, 8, 16, 13, 12, 16, 15, 6, 20, 9, 4, 17, 6, 5, 15, 20, 3, 11, 1, 17, 11, 17, 18, 12, 4, 1, 1, 11, 9, 10, 8, 19, 13, 7, 10, 2, 16, 9, 1, 13, 16, 13, 8, 13, 18, 17, 1, 16, 8, 17, 12, 3, 8, 2, 9, 3, 12, 7, 19, 3, 11, 9, 14, 8, 1, 3, 15, 18, 3, 11, 5, 15, 16, 16, 11, 2, 3, 2, 20, 7, 6, 15, 1, 6, 13, 18, 5, 11, 18, 17, 16, 9, 20, 18, 5, 7, 8, 5, 12, 19, 14, 15, 15, 17, 6, 13, 16, 15, 4, 20, 12, 14, 18, 7, 10, 6, 6, 9, 10, 7, 13, 1, 19, 13, 7, 1, 18, 13, 20, 5, 15, 2, 6, 7, 17, 18, 17, 19, 20, 13, 2, 13, 1, 3, 10, 1, 5, 10, 20, 20, 17, 9, 14, 17, 1, 9, 8, 3, 15, 13, 18, 5, 9, 12, 4, 7, 6, 7, 12, 5, 1, 15, 2, 20, 20, 19, 9, 12, 14, 3, 20, 5, 15, 19, 7, 5, 1, 18, 5, 20, 9, 6, 5, 10, 13, 9, 18, 13, 8, 13, 18, 14, 4, 3, 16, 17, 5, 20, 11, 4, 9, 2, 15, 17, 20, 13, 7, 17, 4, 4, 15, 6, 14, 3, 3, 2, 13, 16, 20, 19, 20, 11, 7, 13, 10, 5, 3, 20, 3, 16, 16, 18, 16, 7, 16, 5, 14, 1, 1, 13, 7, 3, 10, 7, 5, 19, 16, 11, 12, 7, 20, 13, 18, 13, 16, 14, 7, 4, 16, 3, 8, 16, 11, 20, 19, 17, 3, 13, 9, 16, 2, 7, 19, 12, 19, 6, 19, 20, 20, 1, 19, 18, 17, 19, 9, 18, 14, 5, 16, 5, 10, 17, 5, 11, 10, 2, 5, 16, 17, 13, 7, 20, 10, 3, 11, 12, 17, 17, 19, 4, 11, 15, 12, 7, 5, 16, 9, 14, 14, 1, 9, 7, 4, 17, 18, 13, 12, 9, 11, 10, 5, 5, 2, 15, 8, 3, 20, 19, 14, 20, 11, 17, 17, 20, 13, 2, 18, 9, 11, 14, 1, 2, 18, 4, 3, 11, 4, 20, 9, 4, 18, 13, 4, 11, 4, 16, 17, 17, 12, 16, 8, 12, 18, 8, 8, 15, 7, 5, 1, 3, 17, 16, 4, 13, 4, 5, 12, 2, 2, 17, 4, 3, 5, 7, 1, 9, 17, 1, 3, 11, 6, 3, 18, 7, 3, 12, 16, 19, 12, 1, 7, 6, 11, 4, 20, 18, 7, 1, 16, 8, 18, 19, 6, 1, 18, 4, 7, 6, 9, 18, 15, 13, 20, 14, 10, 11, 7, 20, 17, 14, 18, 13, 3, 5, 9, 11, 19, 20, 13, 20, 1, 10, 6, 1, 12, 14, 3, 18, 10, 19, 6, 1, 2, 6, 5, 12, 17, 7, 1, 13, 18, 1, 20, 20, 4, 10, 9, 10, 7, 2, 4, 18, 11, 20, 13, 12, 20, 20, 5, 14, 1, 1, 12, 5, 14, 5, 1, 14, 17, 16, 4, 12, 13, 16, 9, 5, 3, 3, 16, 17, 16, 19, 6, 16, 7, 14, 3, 12, 12, 16, 18, 17, 6, 3, 14, 20, 1, 12, 17, 3, 8, 20, 4, 11, 6, 11, 17, 4, 7, 10, 16, 8, 8, 8, 14, 3, 14, 2, 6, 2, 4, 14, 4, 3, 17, 6, 1, 7, 16, 13, 17, 19, 20, 9, 3, 17, 18, 16, 6, 13, 7, 11, 10, 4, 11, 7, 1, 4, 6, 15, 13, 19, 13, 16, 6, 18, 4, 17, 7, 6, 17, 7, 2, 19, 11, 7, 14, 14, 5,

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12, 1, 4, 16, 19, 10, 18, 14, 1, 1, 7, 7, 5, 8, 10, 9, 11, 18

Problem 2

Quadratic probing is an open addressing scheme in computer programming for resolving hash collisions in hash tables. Quadratic probing operates by taking the original hash index and adding successive values of an arbitrary quadratic polynomial until an open or empty slot is found.

An example of a sequence using quadratic probing is:

$$h, h + 1, h + 4, h + 9 \dots h + i^2$$

Quadratic function

Let $h(k) = k \bmod m$ be a hash function that maps an element k to an integer in $[0, m-1]$, where m is the size of the table. Let the i^{th} probe position for a value k be given by the function

$$h(k, i) = (h(k) + c_1i + c_2i^2) \bmod m$$

where c_1 and c_2 are positive integers. The value of $i = 0, 1, \dots, m - 1$. So we start from $i = 0$, and increase this until we get one free slot in hash table.

For a given class **Hashing**, create two methods:

- **store_data(data):** That accepts a positive integer `data` and generate an index value (0 to $m-1$) using given quadratic function and stores `data` in `hashtable` list on corresponding index generated by quadratic function. `hashtable` can contain only m data items. So, if all are already filled, then print `Hash table is full`.
- **display_hashtable():** That returns `hashtable`.

Sample input

```
1 1 #c1
2 1 #c2
3 11 #m
4 [22,44,35,54,36,27] # data for store one by one, start from 22
```

Output

```
1 [22, None, 44, 36, 35, 27, None, None, None, None, 54]
2 #index for 22 is 0
3 #index for 44 is 2
4 #index for 35 is 4
5 #index for 54 is 10
6 #index for 36 is 3
7 #index for 27 is 5
```

Solution

Prefix code(visible)

```

1 class Hashing:
2     def __init__(self,c1,c2,m):
3         self.hashtable = []
4         for i in range(m):
5             self.hashtable.append(None)
6         self.c1 = c1
7         self.c2 = c2
8         self.m = m

```

Solution code

```

1     def hashfunction(self,data):
2         i = 0
3         key = (data % self.m + self.c1*i + self.c2*(i**2)) % self.m
4         while self.hashtable[key] != None and i < self.m:
5             key = (data % self.m + self.c1*i + self.c2*(i**2)) % self.m
6             i = i + 1
7         return key
8
9     def store_data(self,data):
10        if self.hashtable.count(None) != 0:
11            key = self.hashfunction(data)
12            self.hashtable[key]=data
13        else:
14            print('Hash table is full')
15
16    def display_hashtable(self):
17        return self.hashtable

```

Suffix code(visible)

```

1 c1 = int(input())
2 c2 = int(input())
3 m = int(input())
4 data=eval(input())
5 A = Hashing(c1,c2,m)
6 for i in data:
7     A.store_data(i)
8 print(A.display_hashtable())

```

Public Test Cases

Input 1

```

1 1
2 1
3 11
4 [22,44,35,54,36,27]

```

Output

```

1 [22, None, 44, 36, 35, 27, None, None, None, None, 54]

```

Input 2

```
1 | 1
2 | 1
3 | 11
4 | [23,243,44,55,66]
```

Output

```
1 | [44, 23, 55, 243, None, None, 66, None, None, None, None]
```

Input 3

```
1 | 1
2 | 2
3 | 11
4 | [10,11,12,13,14,15,16,17,18,19,20,21]
```

Output

```
1 | Hash table is full
2 | [11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 10]
```

Private Test Cases

Input 1

```
1 | 1
2 | 1
3 | 11
4 | [10,11,12,13,14,15,16,17,18,19,20]
```

Output

```
1 | [11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 10]
```

Input 2

```
1 | 1
2 | 2
3 | 10
4 | [25,35,45,65,85,78]
```

Output

```
1 | [85, 65, None, None, None, 25, 45, None, 35, 78]
```

Input 3

```
1 | 3
2 | 4
3 | 21
4 | [25,154,354,758,652,32,25]
```

Output

```
1 | [None, 652, 758, None, 25, 25, None, 154, None, None, None, 32, None, None,
   | None, None, None, None, 354, None, None]
```

Input 4

```
1 | 3
2 | 4
3 | 11
4 | [22,22,22,22]
```

Output

```
1 | [22, 22, None, None, None, None, None, 22, None, None, 22]
```

Input 5

```
1 | 3
2 | 4
3 | 6
4 | [1,2,3,4,5,6,7,8,9]
```

Output

```
1 | Hash table is full
2 | Hash table is full
3 | Hash table is full
4 | [6, 1, 2, 3, 4, 5]
```

