**Homework week 2**

**Basic data structures**

\*Note: Two consecutive numbers in the same line must be separated by only **one** space.

1. Given a list A of n integer numbers, your task is to write a program to count the number of pairs (i,j) that A[i]=A[j].

Input:

* The first line contains an integer number *n*
* The second line contains *n* integer numbers separated by spaces.

Output: Write to the screen an integer number (i.e., the number of pairs (i,j) that A[i]=A[j])

**Example**

|  |  |
| --- | --- |
| Keyboard | Screen |
| 6  5 2 4 2 2 5 | 4 |

*Tips: for each element a[i], count the number of elements a[j] satifying that i<j and a[i]=a[j].*

1. The linked list structure has two following operations:

* insert (p, x): insert an integer number x at position p, elements from p are moved backward one position.
* delete (p): delete element at position p, elements after p are moved forward one position.

Start from an empty list, your task is to implement a linked list, perform operations read from the keyboard.

Input:

* The first line contains an integer number n which is the number of operations.
* The next n lines contain the operation description. One operation is in one line in either format:
  + insert p x
  + delete p

where p is the position and x is the number.

Output: Write the resulting linked list to the screen in one line. Numbers are separated by spaces.

**Example**

|  |  |
| --- | --- |
| Keyboard | Screen |
| 5  insert 0 1  insert 1 3  insert 1 4  insert 2 2  delete 1 | 1 2 3 |

*Tips: read carefully the representation of a list using linked list and operations on linked list in the lecture 2.*

1. Given a list of integer numbers, your task is to read these numbers into a doubly linked list, and implement function count\_triplets() to count all positions p such that the sum of elements at positions p-1, p, and p+1 is zero.

Input:

* The first line contains an integer number n which is the number of numbers.
* The second line contains n integer numbers to read into count\_triplets function

Output: Write to the screen an integer number that is the result of function count\_triplets().

**Example**

|  |  |
| --- | --- |
| Keyboard | Screen |
| 6  5 -3 -2 2 9 -11 | 2 |

*Tips: read carefully the representation of a list using doubly linked list and operations on linked list in the lecture 2.*

1. The Queue structure has two following operations:

* enqueue (x): insert integer number x at the tail the queue.
* dequeue (): remove the element at the head of the queue.

Start from an empty queue, your task is to implement a queue, perform operations from the keyboard and write the resulting queue to the screen.

Input:

* The first line contains an integer number n which is the number of operations
* The next n lines contain the operation description. One operation is in one line in either format:
  + enqueue x
  + dequeue

where x is the number to enqueue

Output: Write the resulting queue to the screen. Numbers are separated by spaces.

**Example**

|  |  |
| --- | --- |
| Keyboard | Screen |
| 7  enqueue 1  enqueue 2  enqueue 3  enqueue 4  dequeue  dequeue  enqueue 5 | 3 4 5 |

*Tips: Using array or linked list to implement a queue structure.*

1. The Stack structure has two following operations:

* push (x): insert integer number x to the top of the stack
* pop (): remove the element at the top of the stack

Start from an empty stack, your task is to implement a stack, perform operations from the keyboard and write the resulting stack to the screen

Input:

* The first line contains an integer number n which is the number of operations
* The next n lines contain the operation description. One operation is in one line in either format:
  + push x
  + pop

where x is the number to push to the stack.

Output: Write the resulting stack to the screen. Numbers are separated by spaces.

**Example**

|  |  |
| --- | --- |
| Keyboard | Screen |
| 7  push 1  push 2  push 3  push 4  pop  pop  push 5 | 1 2 5 |