Exercises: Iterators And Comparators

Problems for exercises and homework for the "C# Advanced" course @ Software University.

You can check your solutions here: Iterators and Comparators Exercise

Problem 1. ListyIterator

Create a **generic** class **ListyIterator**. The collection, which it will iterate through, should be received in the **constructor**. You should **store** the elements in a **List**. The class should have **three** main functions:

- **Move** - should move an internal index position to the next index in the list. The method should return **true**, if it had successfully moved the index and **false** if there is **no next index**.
- **HasNext** - should return true, if there is a next index and false, if the index is already at the last element of the list.
- **Print** - should **print** the **element** at the **current** internal **index**. Calling **Print** on a collection without elements should **throw** an appropriate **exception** with the message "**Invalid Operation!**".

By default, the internal index should be pointing to the **0th index** of the **List**. Your program should support the following commands:

Command	Return Type	Description
Create {e1 e2 ...}	void	Creates a ListyIterator from the specified collection. In case of a Create command without any elements, you should create a ListyIterator with an empty collection.
Move	boolean	This command should move the internal index to the next index.
Print	void	This command should print the element at the current internal index.
HasNext	boolean	Returns whether the collection has a next element.
END	void	Stops the input.

Your program should **catch** any **exceptions** thrown because of the described validations - calling **Print** on an **empty collection** - and **print their messages** instead.

Input

- Input will come from the console as **lines** of **commands**.
- The first line will always be the **Create** command in the input.

- The last command received will always be the **END** command.

Output

- For every command from the input (with the exception of the **END** and **Create** commands), print the result of that command on the console, each on a new line.
- In case of **Move** or **HasNext** commands, print the return value of the methods.
- In case of a **Print** command you don't have to do anything additional as the method itself should already print on the console.

Constraints

- There will always be only **one Create** command and it will always be the first command passed.
- The number of commands received will be between **[1…100]**.
- The last command will always be the only **END** command.

Examples

Input	Output
Create Print END	Invalid Operation!
Create Stefcho Goshky HasNext Print Move Print END	True Stefcho True Goshky
Create 1 2 3 HasNext Move HasNext HasNext Move HasNext END	True True True True True False

Problem 2. Collection

Using the **ListyIterator** from the last problem, extend it by **implementing** the **IEnumerable<T>** interface, implement all methods desired by the interface manually. Use **yield return** for the **GetEnumerator()** method. Add a new command **PrintAll** that should **foreach** the collection and **print all of the elements** on a **single line separated by a space**. Your program should catch any **exceptions thrown** because of **validations** and print their **messages** instead.

Input

- Input will come from the console as lines of commands.
- The first line will always be the **Create** command in the input.
- The last command received will always be the **END** command.

Output

- For every command from the input (with the exception of the **END** and **Create** commands), print the result of that command on the console, each on a new line.
- In case of **Move** or **HasNext** commands print the return value of the method
- In case of a **Print** command you don't have to do anything additional as the method itself should already print on the console.
- In case of a **PrintAll** command you should print all of the elements on a single line separated by spaces.

Constraints

- **Do NOT use the GetEnumerator() method from the base class. Use your own implementation using "yield return".**
- There will always be only one **Create** command and it will always be the **first** command passed.
- The number of commands received will be between **[1…100]**.
- The **last** command will always be the only **END** command.

Examples

Input	Output
Create 1 2 3 4 5 Move PrintAll END	True 1 2 3 4 5
Create Stefcho Goshky Peshu PrintAll Move Move Print HasNext END	Stefcho Goshky Peshu True True Peshu False

Problem 3. Stack

Create your **custom stack**. You are aware of the **Stack's structure**. There is a collection to store the elements and **two functions** (not from the functional programming) - to **push** an **element** and to **pop** it. Keep in mind that the **first element**, which is popped **is the last** in the collection. The **Push** method **adds an element** at the **top** of the collection and the **Pop** method returns the **top element** and **removes** it. Push and Pop will be the only commands and they will come in the following format:

"Push {element1}, {element2}, … {elementN}

Pop

… "

Write your custom implementation of **Stack<T>** and implement **IEnumerable<T>** interface. Your implementation of the **GetEnumerator()** method should follow the rules of the Abstract Data Type – **Stack** (return the elements in reverse order of adding them to the stack).

Input

- The input will come from the console as lines of commands.
- **Push** and **pop** will be the only possible commands, followed by integers for the **push** command and no another input for the **pop** command.

Output

- When you receive **END**, the input is over. Foreach the stack **twice** and print all elements each on new line.

Constraints

- The elements in the push command will be valid integers between **[2^{-31}…2^{31}-1]**.
- The commands will always be valid (always be either **Push, Pop** or **END**).
- If Pop command could not be executed as expected (e.g. no elements in the stack), print on the console: "**No elements**".

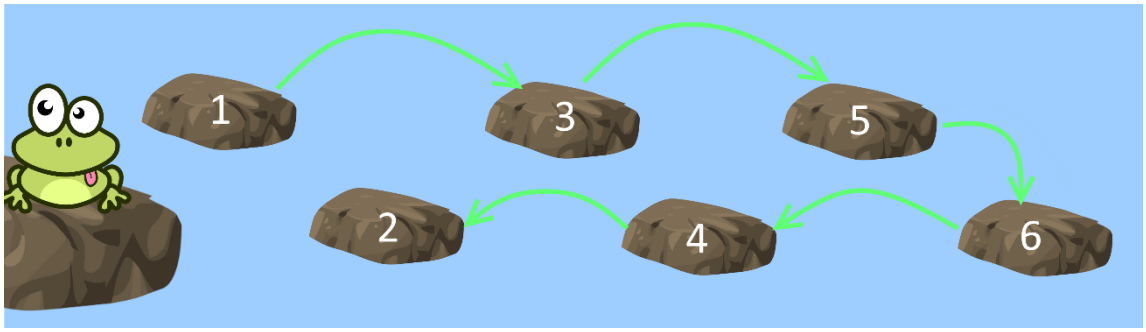
Examples

Input	Output
Push 1, 2, 3, 4 Pop Pop END	2 1 2 1
Push 1, 2, 3, 4 Pop Push 1 END	1 3 2 1 1 3 2 1
Push 1, 2, 3, 4 Pop Pop Pop	No elements

Pop Pop END	

Problem 4. Froggy

Let's play a game. You have a tiny little **Frog**, and a **Lake** that has a path of stones in it. Every **stone has a number**. Our frog must **cross the lake** along that path and **then return**. But there are some rules. First, the frog must **jump on all the stones, which are in even positions** in ascending order and **then on all the odd ones,** but in **reversed order**. The **order** of the **stones** and their **numbers** will be given on the **first line** of input. Then you must **print the order of stones in which our frog jumped** from one to another.



Try to achieve this functionality by creating a **class Lake** (it will hold **all stone numbers in order**) that implements the **IEnumerable<int>** interface and overrides its **GetEnumerator()** methods.

Examples

Input	Output
1, 2, 3, 4, 5, 6, 7, 8	1, 3, 5, 7, 8, 6, 4, 2
1, 2, 3, 4, 5	1, 3, 5, 4, 2
13, 23, 1, -8, 4, 9	13, 1, 4, 9, -8, 23

Problem 5. Comparing Objects

Create a **class Person**. Each person should have a **name**, an **age** and a **town**. You should implement the interface – **IComparable<T>** and implement the **CompareTo** method. When you compare two people, first you should **compare their names**, after that – **their age** and finally – **their towns**. You will be receiving input with information about the people, until you receive the "**END**" command in the following format:

"{name} {age} {town}"

After that, you will receive n – the n'th person from your collection, starting from 1. You should bring statistics, how many people are equal to him, how many people are not equal to him and the total people in your collection in the following format:

"{count of matches} {number of not equal people} {total number of people}"

If there are no equal people print: **"No matches".**

Input

- You will be receiving lines in the format described above, until the "END" command.
- After the "END" command, you will receive the position of the person you should compare the others to.
  Note: Start counting the people in your collection from 1.

Output

- Print a single line of output in the format described above.

Constraints

- Input names, ages and addresses will be valid.
- Input number will always be a valid integer in range **[2…100]**

Examples

Input	Output
Pesho 22 Vraca Gogo 14 Sofeto END 2	No matches
Pesho 22 Vraca Gogo 22 Vraca Gogo 22 Vraca END 2	2 1 3

Problem 6. *Equality Logic

Create a **class Person** holding a **name** and an **age**. A person with the **same name** and **age** should be **considered** the **same**. Override **any methods** needed to enforce this logic. Your class should work with both **standard** and **hashed** collections. Create a **SortedSet** and a **HashSet** of type **Person**. You will receive **n** – the number of input lines. On each of them, you will receive info about the people in the following format:

"<name> <age>"

You should **add** the **people** to **both** the sets. In the end, you should print **the size** of the **sorted set** and then **the size** of the **hashset**.

Input

- On the first line of input you will receive a number **n**.
- On each of the next **n** lines you will receive information about people in the described format.

Output

- The output should consist of exactly two lines.
- On the first one, you should print the size of the sorted set
- On the second - the size of the hashset.

Constraints

- A person's name will be a string that contains only alphanumerical characters with a length between **[1…50]** symbols.
- A person's age will be a positive integer between **[1…100]**.
- The number of people **N** will be a positive integer between **[0…100]**.

Examples

Input	Output
4 Pesho 20 Peshp 20 Joro 15 Pesho 21	4 4
7 Ivan 17 ivan 17 Stoqn 25 Ivan 18 Ivan 17 Stopn 25 Stoqn 25	5 5

Hint

You should override both the **Equals** and **GetHashCode** methods. You can check online for an implementation of **GetHashCode** – it doesn't have to be perfect, but it should be good enough to produce the same hash code for objects with the same name and age, and different enough hash codes for objects with different name and/or age.

Problem 7. Custom Linked List

Extend your custom linked list, which is already generic, and implement the needed interfaces to make it foreach-able. Upload your solutions in a zip file without the bin and obj folders in Judge.