Exercises: Functional Programming

This document defines the **exercise assignments** for the ["CSharp Advanced" course @ Software University](https://softuni.bg/trainings/1633/csharp-advanced-may-2017). Please submit your solutions (source code) of all below described problems in [Judge](https://judge.softuni.bg/Contests/199/Functional-Programming-Exercises).

## Action Print

Write a program that reads a collection of strings from the console and then prints them onto the console. Each name should be printed on a new line. Use **Action<T>**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Pesho Gosho Adasha | Pesho  Gosho  Adasha |

## Knights of Honor

Write a program that reads a collection of names as strings from the console then appends “Sir” in front of every name and prints it back onto the console. Use **Action<T>**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Pesho Gosho Adasha StanleyRoyce | Sir Pesho  Sir Gosho  Sir Adasha  Sir StanleyRoyce |

## Custom Min Function

Write a simple program that reads from the console a set of numbers and prints back onto the console the smallest number from the collection. Use **Func<T, T>**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 4 3 2 1 7 13 | 1 |

## Find Evens or Odds

You are given a lower and an upper bound for a range of integer numbers. Then a command specifies if you need to list all even or odd numbers in the given range. Use **Predicate<T>**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 10  odd | 1 3 5 7 9 |
| 20 30  even | 20 22 24 26 28 30 |

## Applied Arithmetics

Write a program that executes some mathematical operations on a given collection. On the **first line** you are given **a list of numbers**. On the **next lines** you are passed **different commands** that you need to **apply to all numbers** in the list: "add" -> add 1 to each number; "multiply" -> multiply each number by 2; "subtract" -> subtract 1 from each number; “print” -> print the collection. The input will end with an "**end**" command. Use functions.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 3 4 5  add  add  print  end | 3 4 5 6 7 |
| 5 10  multiply  subtract  print  end | 9 19 |

## Reverse and exclude

Write a program that reverses a collection and removes elements that are divisible by a given integer **n**. Use predicates/functions.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 3 4 5 6  2 | 5 3 1 |
| 20 10 40 30 60 50  3 | 50 40 10 20 |

## Predicate for names

Write a program that filters a list of names according to their length. On the first line you will be given integer **n** representing name length. On the second line you will be given some names as strings separated by space. Write a function that prints only the names whose length is **less than or equal** to **n**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 4  Kurnelia Qnaki Geo Muk Ivan | Geo  Muk  Ivan |
| 4  Karaman Asen Kiril Yordan | Asen |

## Custom Comparator

Write a custom comparator that sorts all even numbers before all odd ones in ascending order. Pass it to an Array.Sort() function and print the result. Use functions.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 2 3 4 5 6 | 2 4 6 1 3 5 |
| -3 2 | 2 -3 |

## List of Predicates

Find all numbers in the range 1...N that are divisible by the numbers of a given sequence. On the first line you will be given an integer **N** – which is the end of the range. On the second line you will be given a sequence of integers which are the dividers. Use predicates/functions.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 10  1 1 1 2 | 2 4 6 8 10 |
| 100  2 5 10 20 | 20 40 60 80 100 |

## Predicate Party!

Ivancho’s parents are on a vacation for the holidays and he is planning an epic party at home. Unfortunately, his organizational skills are next to non-existent so you are given the task to help him with the reservations.

On the **first line** you get a **list with all the people** that are coming. On the **next lines**, until you get the **"Party!" command**, you may be asked to **double** or **remove** **all the people** that apply to given **criteria**. There are **three different** **criteria**: 1. everyone that has his **name** **starting** with a **given string**; 2. everyone that has a **name** **ending** with a **given string**; 3. everyone that has a **name** with a **given length**.

Finally **print all the guests** who are going to the party **separated by** “,” and then **add the ending** “are going to the party!”. If there are **no guests** going to the party print “Nobody is going to the party!”. See the examples below:

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Pesho Misho Stefan  Remove StartsWith P  Double Length 5  Party! | Misho, Misho, Stefan are going to the party! |
| Pesho  Double StartsWith Pesh  Double EndsWith esho  Party! | Pesho, Pesho, Pesho, Pesho are going to the party! |
| Pesho  Remove StartsWith P  Party! | Nobody is going to the party! |

## Party Reservation Filter Module

You need to implement a filtering module to a party reservation software. First, to the Party Reservation Filter Module (PRFM for short) is **passed a list** with invitations. Next the PRFM receives a **sequence of commands** that specify whether you need to add or remove a given filter.

Each PRFM command is in the given format **{command;filter type;filter parameter}**

You can receive the following PRFM commands: "**Add filter**", "**Remove filter**" or "**Print**". The possible PRFM filter types are: "**Starts with**", "**Ends with**", "**Length**" and "**Contains**". All PRFM filter parameters will be a string (or an integer only for the “**Length”** filter). Each command will be valid e.g. you won’t be asked to remove a non-existent filter.

The input will **end** with a "**Print**" command after which you should print all the party-goers that are left after the filtration. See the examples below:

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Pesho Misho Slav  Add filter;Starts with;P  Add filter;Starts with;M  Print | Slav |
| Pesho Misho Jica  Add filter;Starts with;P  Add filter;Starts with;M  Remove filter;Starts with;M  Print | Misho Jica |

## Inferno III

On the **first line** you are given **a sequence of numbers**. Each number is a gem and the **value** represents its **power**. On the next lines, until you receive the "**Forge**" command, you will be receiving commands in the following format: **{command;filter type;filter parameter}**

**Commands** can be: "**Exclude**", "**Reverse**" or "**Forge**". The possible filter types are: "**Sum Left**", "**Sum Right**" and "**Sum Left** **Right**". All filter **parameters** will be **an integer**.

"**Exclude**" marks a gem for **exclusion** from the set if it meets a **given condition**. "**Reverse**" **deletes** a previous **exclusion**.

"**Sum Left**" tests if a gems **power** **added** to the gem standing to **its** **left** gives a **certain value**. "**Sum Right**" is the same but looks to a gems **right peer**. "**Sum Left Right**" sums the gems power with **both** its **left** and **right** neighbors. If a gem has **no neighbor** to its right or to its left (first or last element), then simply **add 0** to the gem.

Note that **changes** to the sequence **are applied** only **after forging**. This means that the gems are fixed at their positions and **every function** occurs on the **original set**, so every gems power is considered, no matter if it is marked to be excluded or not. To better understand the problem, see the examples below:

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| 1 2 3 4 5  Exclude;Sum Left;1  Exclude;Sum Left Right;9  Forge | 2 4 | 1. Marks for exclusion all gems for which the sum with neighbors to their left equals 1, e.g. 0 + **1** = 1  2. Marks for exclusion all gems for which the sum with neighbors to their left and their right equals 9, e.g.  2 + **3** + 4 = 9  4 + **5** + 0 = 9 |
| 1 2 3 4 5  Exclude;Sum Left;1  Reverse;Sum Left;1  Forge | 1 2 3 4 5 | 1. Marks for exclusion all gems for which the sum with their gem peers to the left equals 1, e.g. 0 + 1 = 1  2. Reverses the previous exclusion. |

## TriFunction

Write a program that traverses a collection of names and returns the **first name** whose sum of characters is **equal** to or **larger** than a given number **N,** which will be given on the first line. Use a function that **accepts another function** as one of its parameters. Start off by building a regular function to hold the basic logic of the program. Something along the lines of **Func<string, int, bool>**. Afterwards create your main function which should accept the first function as one of its parameters.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 800  Qvor Qnaki Petromir Sadam | Petromir |