# Lab: Sets and Dictionaries

You can check your solutions here: <https://judge.softuni.bg/Contests/3178/Additional-Exercises>.

## Dictionaries

Problems with dictionaries, multi-dictionaries, and nested dictionaries.

### Count Real Numbers

Read a **list of integers** and **print them in ascending order,** along with their **number of occurrences**.

#### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| 8 2 2 8 2 | 2 -> 3  8 -> 2 | 1 5 1 3 | 1 -> 2  3 -> 1  5 -> 1 | -2 0 0 2 | -2 -> 1  0 -> 2  2 -> 1 |

#### Hints

Read an array of doubles:

Graphical user interface, text

Description automatically generated

Use SortedDictionary<double, int> named counts.



Pass through each of the numbers and increase their count - counts[num], if num exists in the dictionary, or assign counts[num] = 1, if the number does not exist in the dictionary. We are assigning it that value, beacause it is its first occurance. The count represents the occurances.

Graphical user interface, text, application

Description automatically generated

Pass through all of the numbers in the dictionary and print the number num and its count of occurrences.

Text

Description automatically generated with low confidence

### Odd Occurrences

Write a program that extracts all elements from a given sequence of words that are present in it an **odd number of times** (case-insensitive).

* Words are given on a single line, space separated.
* Print the result elements in lowercase, in their order of appearance.

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Java C# PHP PHP JAVA C java | java c# c |
| 3 5 5 hi pi HO Hi 5 ho 3 hi pi | 5 hi |
| a a A SQL xx a xx a A a XX c | a sql xx c |

#### Hints

Read a line from the console and split it by a space



Use a **dictionary** (string 🡪 int) to count the occurrences of each word



Pass through each of the elements in the array and count each word.

Graphical user interface, text, application

Description automatically generated

Pass through the dictionary and print words that occur odd times.

Text

Description automatically generated

### Word Synonyms

Write a program, which keeps a dictionary with synonyms. The **key** of the dictionary will be the **word**. The **value** will be a **list of all the synonyms of that word**. You will be given a number **n – the count of the words**. After each word, you will be given a synonym, so the count of lines you have to read from the console is **2 \* n. You will be receiving** a **word** and a **synonym** each on a separate line like this:

* {**word**}
* {**synonym**}

If you get the same word twice, just add the new synonym to the list.

Print the words in the following format:

**{word} - {synonym1, synonym2… synonymN}**

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  cute  adorable  cute  charming  smart  clever | cute - adorable, charming  smart - clever |
| 2  task  problem  task  assignment | task – problem, assignment |

#### Hints

* Use a **dictionary (string -> List<string>)** to keep all of the synonyms.

****

* **Read n \* 2 lines**
* **Add the word in the dictionary if it is not present**

Text

Description automatically generated with low confidence

* **Add the synonym as a value to the given word**

****

* **Print each word with the synonyms in the required format**

### Count Same Values in Array

Write a program that counts in a given array of double values the number of occurrences of each value.

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| -2.5 4 3 -2.5 -5.5 4 3 3 -2.5 3 | -2.5 - 3 times  4 - 2 times  3 - 4 times  -5.5 - 1 times |
| 2 4 4 5 5 2 3 3 4 4 3 3 4 3 5 3 2 5 4 3 | 2 - 3 times  4 - 6 times  5 - 4 times  3 - 7 times |

### Average Student Grades

Write a program, which reads a **name** of a student and his/her **grades** and **adds** them to the **student record**, then **prints** **the** student's **names** with their **grades** and their **average grade**.

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 7  Ivancho 5.20  Mariika 5.50  Ivancho 3.20  Mariika 2.50  Stamat 2.00  Mariika 3.46  Stamat 3.00 | Ivancho -> 5.20 3.20 (avg: 4.20)  Mariika -> 5.50 2.50 3.46 (avg: 3.82)  Stamat -> 2.00 3.00 (avg: 2.50) |
| 4  Vladimir 4.50  Petko 3.00  Vladimir 5.00  Petko 3.66 | Vladimir -> 4.50 5.00 (avg: 4.75)  Petko -> 3.00 3.66 (avg: 3.33) |
| 5  Gosho 6.00  Gosho 5.50  Gosho 6.00  Ivan 4.40  Petko 3.30 | Gosho -> 6.00 5.50 6.00 (avg: 5.83)  Ivan -> 4.40 (avg: 4.40)  Petko -> 3.30 (avg: 3.30) |

#### Hints

* Use a **dictionary** (string 🡪 List<decimal>)
* Check if the name **exists** before adding the grade. If it doesn’t, add it to the dictionary.
* Pass through all **key-value pairs** in the dictionary and print the results. You can use the .Average() method to quickly calculate the average value from a list.

### Product Shop

Write a program that prints information about **food shops** in Sofia and the **products** they **store**. Until the "Revision" command is received, you will be receiving input in the format: "{shop}, {product}, {price}". Keep in mind that if you receive a **shop** you already **have** **received**, you must **collect** its **product** **information**.

Your output must be **ordered** by shop **name** and must be in the format:

{shop}->

Product: {product}, Price: {price}

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| lidl, juice, 2.30  fantastico, apple, 1.20  kaufland, banana, 1.10  fantastico, grape, 2.20  Revision | fantastico->  Product: apple, Price: 1.2  Product: grape, Price: 2.2  kaufland->  Product: banana, Price: 1.1  lidl->  Product: juice, Price: 2.3 |
| tmarket, peanuts, 2.20  GoGrill, meatballs, 3.30  GoGrill, HotDog, 1.40  tmarket, sweets, 2.20  Revision | GoGrill->  Product: meatballs, Price: 3.3  Product: HotDog, Price: 1.4  tmarket->  Product: peanuts, Price: 2.2  Product: sweets, Price: 2.2 |

### Cities by Continent and Country

Write a program that reads **continents**, **countries** and their **cities**, puts them in a **nested dictionary** and **prints** them.

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 9  Europe Bulgaria Sofia  Asia China Beijing  Asia Japan Tokyo  Europe Poland Warsaw  Europe Germany Berlin  Europe Poland Poznan  Europe Bulgaria Plovdiv  Africa Nigeria Abuja  Asia China Shanghai | Europe:  Bulgaria -> Sofia, Plovdiv  Poland -> Warsaw, Poznan  Germany -> Berlin  Asia:  China -> Beijing, Shanghai  Japan -> Tokyo  Africa:  Nigeria -> Abuja |
| 3  Europe Germany Berlin  Europe Bulgaria Varna  Africa Egypt Cairo | Europe:  Germany -> Berlin  Bulgaria -> Varna  Africa:  Egypt -> Cairo |
| 8  Africa Somalia Mogadishu  Asia India Mumbai  Asia India Delhi  Europe France Paris  Asia India Nagpur  Europe Germany Hamburg  Europe Poland Gdansk  Europe Germany Danzig | Africa:  Somalia -> Mogadishu  Asia:  India -> Mumbai, Delhi, Nagpur  Europe:  France -> Paris  Germany -> Hamburg, Danzig  Poland -> Gdansk |

#### Hints

* Use a **nested** **dictionary** (string 🡪 (Dictionary 🡪 List<string>))
* Check if the continent exists before adding the country. If it doesn’t, add it to the dictionary.
* Check if the country exists, before adding the city. If it doesn’t, add it to the dictionary.
* Pass through all **key-value pairs** in the dictionary and the values’ key-value pairs and print the results.

## Sets

Problems about sets and sorted sets.

### Parking Lot

Write a program that:

* Records a **car number** for every car that enters the **parking lot**
* Removes a **car number** when the car leaves the **parking lot**

The input will be a string in the format: **[direction, carNumber]**. You will be receiving commands, until the **"END"** commandisgiven.

Print the car numbers of the cars, which are still in the parking lot:

#### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| IN, CA2844AA  IN, CA1234TA  OUT, CA2844AA  IN, CA9999TT  IN, CA2866HI  OUT, CA1234TA  IN, CA2844AA  OUT, CA2866HI  IN, CA9876HH  IN, CA2822UU  END | CA9999TT  CA2844AA  CA9876HH  CA2822UU |
| IN, CA2844AA  IN, CA1234TA  OUT, CA2844AA  OUT, CA1234TA  END | Parking Lot is Empty |

#### Hints

* Car numbers are **unique**
* Before printing, **first** **check** if the set has any elements

#### Solution

You can help yourself with the code below:

Graphical user interface, text, application

Description automatically generated

### Record Unique Names

Write a program, which will take a list of **names** and print **only** the **unique** names in the list.

#### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| 8  Ivan  Pesho  Ivan  Stamat  Pesho  Alice  Peter  Pesho | Ivan  Pesho  Stamat  Alice  Peter |  | 7  Lyle  Bruce  Alice  Easton  Shawn  Alice  Shawn  Peter | Lyle  Bruce  Alice  Easton  Shawn |  | 6  Roki  Roki  Roki Roki  Roki  Roki | Roki |

#### Hints

You can store the names in a HashSet<string> to extract only the unique ones.

### SoftUni Party

There is a Party in SoftUni. Many Guests Are Invited and There Are Two Types of Them: VIP and Regular. When a Guest Comes, Check If He/she Exists in Any of the Two Reservation Lists.

All reservation numbers will be with the length of 8 chars.

All VIP numbers start with a digit.

First, you will be receiving the reservation numbers of the guests. You can also receive 2 possible commands:

* "PARTY" – After this command you will begin receiving the reservation numbers of the people, who actually came to the party.
* "END" –The party is over and you have to stop the program and print the appropriate output.

In the end, print the count of the quests who didn't come to the party and afterwards, print their reservation numbers. the VIP guests must be first.

#### Examples

|  |  |  |  |
| --- | --- | --- | --- |
| **Input** | **Output** | **Input** | **Output** |
| 7IK9Yo0h  9NoBUajQ  Ce8vwPmE  SVQXQCbc  tSzE5t0p  PARTY  9NoBUajQ  Ce8vwPmE  SVQXQCbc  END | 2  7IK9Yo0h  tSzE5t0p | m8rfQBvl  fc1oZCE0  UgffRkOn  7ugX7bm0  9CQBGUeJ  2FQZT3uC  dziNz78I  mdSGyQCJ  LjcVpmDL  fPXNHpm1  HTTbwRmM  B5yTkMQi  8N0FThqG  xys2FYzn  MDzcM9ZK  PARTY  2FQZT3uC  dziNz78I  mdSGyQCJ  LjcVpmDL  fPXNHpm1  HTTbwRmM  B5yTkMQi  8N0FThqG  m8rfQBvl  fc1oZCE0  UgffRkOn  7ugX7bm0  9CQBGUeJ  END | 2  xys2FYzn  MDzcM9ZK |