# Exercise: Lists Advanced

Problems for exercise and homework for the [Python Fundamentals Course @SoftUni](https://softuni.bg/trainings/2442/python-fundamentals-september-2019). Submit your solutions in the SoftUni judge system at <https://judge.softuni.bg/Contests/1731>

## Which Are In?

Given **two lists** of strings print a **new list** of the strings that contains **words** from the **first list** which are **substrings** of **any of the strings** in the **second** list (**only unique** values)

### Input

There will be **2 lines** of input: the **two lists** separated by **", "**

### Output

Print the resulting list on the console

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| arp, live, strong  lively, alive, harp, sharp, armstrong | ['arp', 'live', 'strong'] |
| tarp mice bull  lively alive harp sharp armstrong | [] |

## Big Numbers Lover

*You really like big numbers, so you always find a way to form one from numbers given to you*

You will receive a single line containing numbers separated by a single space. Form the biggest number possible from them

### Example

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comment** |
| 3 30 34 5 9 | 9534303 | The numbers sorted are 9 5 34 30 3 |
| 1 2 3 | 321 |  |

### Hint

* Search in the internet how to **sort list** of **string** in python
* Search in the internet how to sort in **reversed order**

## Next Version

*You're fed up about changing the version of your software manually. Instead, you will create a little script that will make it for you.*

You will be given a **version** as in this example: **"1.3.4"**. You have to find the **next version** and **print it** (**"1.3.5"** from the example). The only **rule** is that the numbers cannot be **greater than 9**. If that happens, set the **current number to 0** and **increase the number before it**. For more clarification, see the examples. ***Note: there will be no case where the first number will get greater than 9***

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1.2.3 | 1.2.4 |
| 1.3.9 | 1.4.0 |
| 3.9.9 | 4.0.0 |

## Office Chairs

*So you've found a meeting room - phew! You arrive there ready to present, and find that someone has taken one or more of the chairs!! You need to find some quick.... check all the other meeting rooms to see if all of the chairs are in use.*

You will be given a number **n** representing how **many rooms** there are. On the next **n lines** for each room you will get how many **chairs** there are and how many of them **will be taken**. The chairs will be represented by **"X"**s, then there will be a space **" "** and a **number** representing the **taken places**. ***Example:*** **"XXXXX 4"** (**5 chairs** and **1** of them is **left free**). **Keep track of the free chairs**, you will need them later. However if you get to a room where there are **more people than chairs**, print the following message: **"{needed\_chairs\_in\_room} more chairs needed in room {number\_of\_room}"**. If there is **enough chairs in each room** print: **"Game On, {total\_free\_chairs} free chairs left"**

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| 4  XXXX 4  XX 1  XXXXXX 3  XXX 3 | Game On, 4 free chairs left |
| 3  XXXXXXX 5  XXXX 5  XXXXXX 8 | 1 more chairs needed in room 2  2 more chairs needed in room 3 |

## Electron Distribution

*You are a mad scientist and you decided to play with electron distribution among atom's shells. You know that basic idea of electron distribution is that electrons should fill a shell until it's holding the maximum number of electrons.*

The **rules** for electron distribution are as follows:

* Maximum number of electrons in a shell is distributed with a rule of **2n^2** (**n** being **position** of a **shell** a.k.a. the list **index + 1**).
* For example, maximum number of electrons in **3rd** shield is **2\*3^2 = 18**.
* Electrons should fill the **lowest level** shell **first**.
* If the electrons have **completely filled** the **lowest level** shell, the other **unoccupied electrons** will fill the **higher level** shell and so on.

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| 10 | [2, 8] |
| 44 | [2, 8, 18, 16] |

## Group of 10's

Write a program that receives a **list of numbers** (string containing **integers** separated by **", "**) and **prints lists** with the numbers them into lists of **10's**.

**Examples**:

* The numbers **2 8 4 3** fall into the group under **10**
* The numbers **13 19 14 15** fall into the group under **20**

For more details, see the examples below

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| 8, 12, 38, 3, 17, 19, 25, 35, 50 | Group of 10's: [8, 3]  Group of 20's: [12, 17, 19]  Group of 30's: [25]  Group of 40's: [38, 35]  Group of 50's: [50] |
| 1, 3, 3, 4, 34, 35, 25, 21, 33 | Group of 10's: [1, 3, 3, 4]  Group of 20's: []  Group of 30's: [25, 21]  Group of 40's: [34, 35, 33] |

### Hints

* **Keep track of the group** using a variable to store it's **max value**
* Create a **loop** and **filter the elements** that are less than the group boundary and **remove** them from the **original list**
* **Increase** the **boundary by 10**
* **Loop until** the given **list is empty**

## Decipher This!

You are given a **secret message** you need to **decipher**. Here are the things you need to know to decipher it:

For **each word**:

* the **second** and the **last letter** are **switched** (e.g. Hello becomes Holle)
* the **first letter** is **replaced** by its **character code** (e.g. H becomes 72)

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| 72olle 103doo 100ya | Hello good day |
| 82yade 115te 103o | Ready set go |

## \*\* Feed the Animals

*The sanctuary needs to provide food for the animals and feed them, so your task is to help with the process*

Create a program that organizes the **daily feeding** of **animals**. You need to keep information about **animals**, their **daily food limit** and the **areas** of the Wildlife Refuge **they** **live** **in**. You will be receiving **lines** with commands until you receive the **"Last Info"** message. There are two **possible** commands:

* **"Add:{animalName}:{dailyFoodLimit}:{area}":**
  + **Add** the **animal** and **its** **daily food limit** to your records. It is guaranteed that the **names** of the animals are **unique** and there will **never** be animals with the **same** name. **If** it already **exists**, just increase the value of the **daily** **food** **limit** with the **current** one that is **given**.
* **"Feed:{animalName}:{food}:{area}":**
  + **Check** if the animal **exists** and if **it does**, **reduce** its daily **food limit** with the given **food** **for** **feeding**. If its **limit** reaches **0** or **less**, the **animal** is considered **successfully fed** and you need to **remove** it from your **records** and **print** the following **message**:
    - **"{animalName} was successfully fed"**

You need to know **the count of** **hungry** **animals** there are left in **each area** in the end. If an animal has daily food **limit above 0**, it is considered **hungry**.

In the end, you have to **print each animal** with its **daily** food **limit** sorted in **descending order** by the **daily food limit** and **then by** its **name** in **ascending** order in the following format:

**Animals:**

**{animalName} -> {dailyFoodLimit}g**

**{animalName} -> {dailyFoodLimit}g**

Afterwards, **print** the **areas** with the **count of animals**, which are **not** **fed** in **descending** order by the **count** of **animals.** If an **area** has **0** **hungry animals** in it, **don't** print it. The **output** must be in the following **format**:

**Areas with hungry animals:**

**{areaName} : {countOfUnfedAnimals}**

**{areaName} : {countOfUnfedAnimals}**

### Input / Consrtaints

* You will be receiving linesuntil you receive the **"Last Info"** command.
* The **food** comes in **grams** and is an **integer** number in the range [1...100000].
* The input will **always** be **valid**.
* There will never be a case, in which an animal is in two or more areas at the same time.

### Output

* Print the appropriate message after the **"Feed"** command, **if** an **animal** is **fed**.
* Print the animals with their **daily food limit** in the **format** described above.
* Print the **areas** with the **count of unfed** **animals** in them in the **format** described above.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Add:Maya:7600:WaterfallArea  Add:Bobbie:6570:DeepWoodsArea  Add:Adam:4500:ByTheCreek  Add:Jamie:1290:RiverArea  Add:Gem:8730:WaterfallArea  Add:Maya:1230:WaterfallArea  Add:Jamie:560:RiverArea  Feed:Bobbie:6300:DeepWoodsArea  Feed:Adam:4650:ByTheCreek  Feed:Jamie:2000:RiverArea  Last Info | Adam was successfully fed  Jamie was successfully fed  Animals:  Maya -> 8830g  Gem -> 8730g  Bobbie -> 270g  Areas with hungry animals:  WaterfallArea : 2  DeepWoodsArea : 1 |
| **Comments** | |
| First, we receive the "**Add**" command, so we **add** "**Maya**" to our **records** and we keep her **daily food limit** - **7600**. We know that she is in **WaterfallArea**. We keep adding the new animals until we receive "**Maya**" **again** and we have to **increase** her food **limit** with **1230**, so it becomes **8830**. After that we receive "**Jamie**" and we need to **increase** his daily food **limit** with **560**, after which it **becomes** **1850**. Then we start receiving "**Feed**" commands. First, we must **decrease** **Bobbie's** food **limit** with **6300**, so it becomes **270**. Then, we need to decrease **Adam's** food **limit** with **4650**. It **becomes** **less than zero** and we **remove** **him** from the collection – he is **considered fed**, respectively that is **one less hungry** **animal** in the **area** that he is in – **ByTheCreek**. Then we "**Feed**" **Jamie** with **2000** and his **limit** becomes **less than zero**, so we print "**Jamie was successfully fed**" and we **remove** him from our records and note that there is **one** **less** **hungry animal** in his area – **RiverArea**. In the end, we **print the animals** we still have in our collection, with their daily food **limits** in **descending order** by the food **limits**. Afterwards we print only the **areas** in which there are **remaining** **hungry** **animals** and their **count** in **descending** order. | |
|  | |
| Add:Bonie:3490:RiverArea  Add:Sam:5430:DeepWoodsArea  Add:Bonie:200:RiverArea  Add:Maya:4560:ByTheCreek  Feed:Maya:2390:ByTheCreek  Feed:Bonie:3500:RiverArea  Feed:Johny:3400:WaterFall  Feed:Sam:5500:DeepWoodsArea  Last Info | Sam was succesfully fed  Animals:  Maya -> 2170g  Bonie -> 190g  Areas with hungry animals:  RiverArea : 1  ByTheCreek : 1 |

## \*\* On the Way to Annapurna

*You’ve hired a Sherpa and he has a list of supplies you both need to go on the way. He has passed you some notes and you have to order them correctly in a diary before you start circling around the town’s stores.*



Create a program, that lists **stores** and the **items** that can be found in them. You are going to be receiving **commands** with the information you need until you get the "**End**" command. There are **three possible commands**:

* "**Add**->{Store}->{Item}"
  + **Add** the **store** and the **item** in your diary. If the store already **exists**, add just the item.
* **"Add**->{Store}->{Item},{Item1}…,{ItemN}"
  + **Add the store and the items to** your notes. **If the store already exists** in the diary – **add just the items** to it.
* "**Remove**->{Store}"
  + **Remove the store** and its items from your diary, **if it exists**.

In the end, print the collection **sorted by the count of the items** in **descending order** and **then by the names of the stores**, again, **in descending order** in the following format:

**Stores list:**

**{Store}**

**<<{Item}>>**

**<<{Item}>>**

**<<{Item}>>**

### Input / Constraints

* You will be receiving information until the “**END**” command is given.
* There will always be **at least one** store in the diary.
* Input will always be **valid**, there is no need to check it explicitly.

### Output

* Print the list of stores in the format given above.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Add->PeakSports->Map,Navigation,Compass  Add->Paragon->Sunscreen  Add->Groceries->Dried-fruit,Nuts  Add->Groceries->Nuts  Add->Paragon->Tent  Remove->Paragon  Add->Pharmacy->Pain-killers  END | Stores list:  PeakSports  <<Map>>  <<Navigation>>  <<Compass>>  Groceries  <<Dried-fruit>>  <<Nuts>>  <<Nuts>>  Pharmacy  <<Pain-killers>> |
| **Comments** | |
| First, we receive the "**Add**" command with a couple of items and we have to add the store and the items to. We keep doing that for each line of input and when we receive the "**Remove**" command, we delete the store and its items from our records. In the end we print the stores sorted by the **count** of their **items** and **then by** their **names**. | |
|  | |
| Add->Peak->Waterproof,Umbrella  Add->Groceries->Water,Juice,Food  Add->Peak->Tent  Add->Peak->Sleeping-Bag  Add->Peak->Jacket  Add->Groceries->Lighter  Remove->Groceries  Remove->Store  END | Stores list:  Peak  <<Waterproof>>  <<Umbrella>>  <<Tent>>  <<Sleeping-Bag>>  <<Jacket>> |

## \*\* Practice Sessions

*The racers must practice for the race. Your job is to keep the records of the roads and the time for each lap. The track with the best time will be the chosen one for the finals.*



Write a program, that keeps information about **roads** and **the racers** who practice on them. When the practice begins, you’re going to start receiving data until you get the "**END**" message. There are three possible commands:

* "Add->{road}->{racer}"
  + Add the **road** if it **doesn't exist** in your collection and add the **racer** to it.
* "Move->{currentRoad}->{racer}->{nextRoad}"
  + Find the **racer** on the **current road** and move him to the **next one,** only if he **exists** in the **current road.** Both roads will always be **valid** and will **already exist**.
* "Close->{road}"
  + Find the **road** and **remove** it from the sessions, **along** **with** the **racers** on it **if it exists**.

In the end, print all of the **roads** with the **racers** who have practiced and **ordered by the count of the racers in descending order**, **then by** the **roads** in **ascending** order. The output must be in the following format:

**Practice sessions:**

**{road}**

**++{racer}**

**++{racer}**

**++{racer}**

………………………..

### Input / Constraints

* You will be receiving lines of information in the format described above, until you receive the **"END"** command.
* The input will always be in the right format.
* Both **roads** from the "**Move**" command will always be **valid** and you don't need to check them explicitly.

### Output

* Print the **roads** withtheir **racers** in the **format described above**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Add->Glencrutchery Road->Giacomo Agostini  Add->Braddan->Geoff Duke  Add->Peel road->Mike Hailwood  Add->Glencrutchery Road->Guy Martin  Move->Glencrutchery Road->Giacomo Agostini->Peel road  Close->Braddan  END | Practice sessions:  Peel road  ++Mike Hailwood  ++Giacomo Agostini  Glencrutchery Road  ++Guy Martin |
| **Comments** | |
| We add racers to the roads they are racing on. When we receive the "**Move**" command, we **check** if **Giacomo Agostini** is on **Glencrutchery Road** and if he is, we **remove** him from it and **add** him to the next one - **Peel road**.  When we receive the "**Close**" command, we **remove** Brandon road and **remove** all its records. In the end we print the **roads** **sorted** by the **count** of **racers** on them and **then by** the **names** of the **roads** in **ascending order**. | |
|  | |
| Add->Glen Vine->Steve Hislop  Add->Ramsey road->John McGuinness  Add->Glen Vine->Ian Hutchinson  Add->Ramsey road->Dave Molyneux  Move->Ramsey road->Hugh Earnsson->Glen Vine  Add->A18 Snaefell mountain road->Mike Hailwood  Add->Braddan->Geoff Duke  Move->A18 Snaefell mountain road->Mike Hailwood->Braddan  Move->Braddan->John McGuinness->Glen Vine  Close->A18 Snaefell mountain road  END | Practice sessions:  Braddan  ++Geoff Duke  ++Mike Hailwood  Glen Vine  ++Steve Hislop  ++Ian Hutchinson  Ramsey road  ++John McGuinness  ++Dave Molyneux |