Lab 6: Python - Sets and Dictionaries

E1. Consider we have two sets *A* and *B*. The following code can be used to find the set-union.

```
A=[2, 4, 7, 53, 11, 1]
B=[23, 17, 4, 35, 11, 99, 2]
C=A
for i in range(len(B)):
    if (B[i] not in A):
        C.append(B[i])
print  "A=",  A
print "B=", B
print "Union of A & B=", C
```

Update the above program and find (i) Set union A ∪ B, (ii) Set intersection A ∩ B, (iii) Set difference A - B, and B - A

Chapter I: Sets

Python also includes a data type for *sets*. A set is an unordered collection with no duplicate elements.

Try the following commands

```
>>> basket=['apple','orange','apple','pear','orange',kiwi']
>>> fruit = set(basket)  → create a set without duplicates
>>> fruit
>>> 'orange' in fruit    → membership check
>>> 'crabgrass' in fruit
>>> mylist=[2,3,3,3,4,5,2,6,7,7,7]
>>> s=set(mylist)
>>> print(s)
```

The following commands demonstrate set operations on unique letters from two words.

```
>>> T = set('TaareZameenPar')
>>>  S = set('StanleyKaDabba')
>>>  print T
>>>  print S
>>>  T-S   →letters in set T but not in set S
>>>  T|S   → letters either in T or in S, Union of T and S
>>>  T&S   → letters in T and S, Intersection of T and S
>>>  T^S   → letters in set T or set S but not both
```

E2. Redo question **E1** using the set functions.

Chapter II: Dictionaries

A **dictionary** is like a list, but more general. In a list, the indices have to be integers; in a dictionary they can be (almost) any type. You can think of a dictionary as a mapping between a set of indices (which are called **keys**) and a set of **values**. Each key maps to a value. The association of a key and a value is called a key-value pair or sometimes an item.

1. Creating a Dictionary

To create a dictionary, we need to have a (key, value) pair.

```
>>> deptcode=dict()          → Initialise the dictionary
>>> deptcode['IEOR']=19
>>> deptcode['CSE']=5
>>> deptcode['CIVIL']=4
>>> deptcode['MATH']=9
>>> print deptcode
```

Note: Here 'IEOR', 'CSE', etc are known as keys and the data on the right hand side is the value. The keys are unique. The values can be repeated. Try the following and observe.

```
>>> deptcode['MyDept']=19
>>> print deptcode
>>> deptcode['MyDept']=17        → Overwrites the value of MyDept
>>> print deptcode
>>> del deptcode['MATH']    → Delete the key and corresponding value
>>> print deptcode
>>> type(deptcode)      → Shows the type as 'dict'
```

Dictionaries can be created directly with the key-value pairs

```
>>> mydict1 = dict([('IITB', 700),('IITM', 800),('IITD',900)])
>>> print mydict1
>>> mydict2 = dict(IITB=700, IITM=800, IITK=500)
>>> print mydict2
```

Write a program to create your own dictionary of N key-value pairs. Accept N, key-value pairs as inputs and print the dictionary at the end.

E3. Create a dictionary for your batch with the roll numbers as keys and the names as values. For example:

```
students[20i190001]='Ram'
students[20i190002]='Laxman'
students[20i190003]='Sita'
```

Write a program to accept the roll number as an input and print the name using this dictionary.

E4. Write a program that takes as input from the user one of the letter grades: 'AA', 'AB', 'BB', 'BC', 'CC', 'CD', 'DD', 'FR', and gives the corresponding output as follows:

AA : Excellent AB : Very Good BB : Good BC : Average
CC : Satisfactory CD : Pass DD : Just Pass FR : Fail

2. Accessing the fields

The keys and values of a dictionary variable can be accessed separately. Try the following:

```
>>> deptcode.keys()
>>> deptcode.values()
>>> 'IEOR' in deptcode.values()
>>> 'IEOR' in deptcode.keys()
>>> 'IEOR' in deptcode
```

→ This is same as the above one

Example 1: Find the number of 'a', and 'b' in a given string.

```
mystr = raw_input('Enter a string ')
mydict= dict()
mydict['a'] = 0
mydict['b'] = 0
for i in range(len(mystr)):
    if mystr[i]=='a':
        mydict['a'] = mydict['a'] +1
    elif mystr[i]=='b':
        mydict['b'] = mydict['b'] +1
print mydict
```

E5. Update the above program and find the number of occurrences of each letter in a given string.

Now you have learned about **lists, sets and dictionaries**. It is important to know when to use a particular data type.

- Use a dictionary when you have a set of unique keys that map to values.
- Use a list if you have an ordered collection of items.

- Use a set to store an unordered set of items.

E6. There are eight runners, who race every day. Their names are

SS: Sriram Singh JA: Joseph G. Abraham RM: Renjith Maheshwary
BP: Bahadur Prasad TL: Tintu Luka PS: Preeja Sreedharan
PU: P. T. Usha MS: Milkha Singh

Winners of first 20 days are [MS, MS, PU, MS, SS, PS, SS, RM, BP, MS, SS, RM, MS, MS, PU, BP, PS, BP, PS, MS]

Write a program to

i) Store the results and print it in a full sentence like

```
Milkha Singh won the race on 1st day
```

ii) Accept a 'day' as an input from the user and output the result in a full sentence.

iii) Print the name of all runners who won the race at least once

iv) Find the name of all runners who could not win at least one race

v) Print the name of all runners and their number of wins