**B351: Introduction to Artificial Intelligence**

**Assignment 0**

**Due: Wednesday, 08/30/2017**

NOTE:​​ This ​​assignment​​ is ​​meant​​ to ​​serve​ ​as ​​a ​​diagnostic​ ​for ​​your​ ​abilities ​​with ​​Python programming, ​​probability and​ ​logical​​ reasoning.​ ​If ​​this ​​first ​​assignment​ ​gives ​​you​ ​a ​​lot ​​of trouble,​​ be​​ prepared ​​to ​​spend​ ​some​​ time​​ working​ ​on​ ​your ​​Python ​​skills,​​ as ​​the​ ​demands​ ​will ​​only increase ​​with ​​each​ ​assignment

**Section 1: Programming (50 pts)**

An automated checker will run your code against test cases, every programming question has a clearly specified input and output structure, please adhere to those.

Your program must compile with the given input format and must return an output in the specified format.

You will not be awarded points in the following cases

1. Your program fails to compile with the given input format
2. Your program generates an incorrect output
3. Your program returns the correct output but in an incorrect data structure, [assertions in python are tightly checked, hence an incorrect data structure too will return in an error]

assignment0.py contains a skeleton code, to test your programs, there is a simulation of the automated checker provided in the main function of assignment0.py

You have to return a file named assignment0.py with your implementation of the following functions

1. name\_number
2. remove\_dup
3. substring
4. diag\_add

Please fill in your name and 10-digit student ID in the name\_number function.

Question 1.

Remove duplicates from a list, you are not allowed to use the inbuilt ‘set’ function to achieve this.

Example:

Input l = [‘a’,’b’,’a’]

Returned output = [‘b’,’a’] or [‘a’,’b’].

The output can be unordered.

Example:

Input l = [10, 100, 10000, 10, 100, 10]

Returned output = [10, 100, 10000] or any combination of the three.

Question 2.

For ​​any ​​provided​​ element,​​ index and​ ​list, ​​insert​ ​the ​​element​ ​into ​​the​ ​list ​​at​​ the​​ given index.​ ​If ​​the ​provided​​ index​​ is ​​greater ​​than ​​the ​​length ​​of ​​the ​​list, ​​simply ​​put​​ the​​ element​​ at the​​ end​ ​of ​​the ​​list.

The output of this problem is a list.

Example:

Input (‘a’, 2, [‘c’, ’d’, ’b’])

Output: [‘c’, ’d’, ’a’, ’b’]

Note: Remember ordering starts from 0 in python.

Example:

Input (‘d’, 10, [‘a’, ‘b’, ‘c’])

Output: [‘a’, ‘b’, ‘c’, ‘d’]

Question 3.

Find the sum of the leading and trailing diagonal of a square matrix

The input to this problem will an integer followed by a list (list of lists). The integer indicates the dimensions of the square matrix and the list indicates matrix elements. You, will return a tuple of values, first value in the tuple will indicate sum of the leading diagonal, second value will indicate sum of the trailing diagonal.

Note: You have to return a tuple and not a list. In Python, tuples and lists are two different data structures.

Example:

|  |  |
| --- | --- |
| 1 | 2 |
| 3 | 5 |

Input (2, [1, 2, 3, 5])

Corresponding matrix:

Returned Output: (6, 5).

Example:

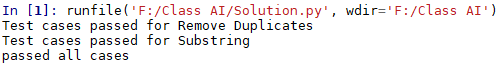
Input (3, [1, 2, 3, 10, 12, 15, 20, 22, 25])

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 10 | 12 | 15 |
| 20 | 22 | 25 |

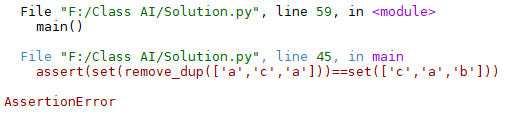
Corresponding Matrix:

Output: (38, 35)

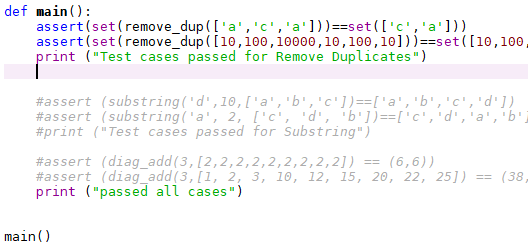
The main function has a simulation of the automated checker, if your code runs error free, you should have an output similar to this



Otherwise you should see an assertion error such as this



Note: If you want to unit test any of the individual functions you can always comment out the rest of the functions using ‘#’





**Section 2: Probability (30 pts)**

Dice:

​​If​ ​two ​​6-sided ​​dice ​​are ​​rolled, ​​what ​​are ​​the ​​odds ​​that:

1. 7 ​​is​ ​thrown (Sum of both the dice)?

6 different ways to get a sum of 7: 1+6, 6+1, 2+5, 5+2, 3+4, 4+3; Each die has 1/6 probability of landing on that number. 1/36 of landing on those two numbers -> 6/36 = 1/6

1. 9​​ is ​​thrown (Sum of both the dice)?

4 different ways to get a sum of 9: 5+4, 4+5, 3+6, 6+3; Each die has 1/6 probability of landing on that number. 1/36 probability of landing on those two numbers -> 4/36 = 1/9.

Deck ​​of ​​Cards:

​​If ​​you​ ​start​​ drawing​​ from​ ​a ​​standard​ ​deck ​​of ​​52​ ​cards, ​​without​ ​returning​​ cards ​​to the​​ deck ​​once​​ drawn,​ ​then

1. What​ ​is ​​the​ ​probability ​​of ​​drawing​​ a​ ​Queen ​​in ​​the ​​first ​​draw?

4 queens / 52 cards = 4/52 = 1/13

1. If ​​you ​​just​ ​drew​​ the​​ Queen​​ of​​ Diamonds​​ (and ​​did​ ​not ​​return ​​it ​​to ​​the ​​deck), ​​what ​​are​ ​the odds ​​of ​​drawing​ ​another ​​Queen?

1 queen and card are now gone, therefore 3 Queens remain in 51 cards remaining = 3/51 = 1/17

1. If​​ you​​ have​ ​now​​ drawn​​ the​ ​Queen​ ​of ​​Diamonds ​​and ​​the​​ Eight​ ​of ​​Spades ​​(and ​​both ​​are un-returned),​​ what​ ​are​ ​the​​ odds​ ​that​​ a ​​black ​​card​ ​is ​​drawn?

50 cards remain, 1 less red and 1 less black, 25/50 = ½

**Section 3: Logic (20 pts)**

For​ ​clarification,​ ​a​ ​note​ ​about​ ​the​ ​word​ ​​*if* in​ ​logic:

When​ ​we​ ​have​ ​the​ ​sentence​ ​​*if p then q*,​ ​then​ ​we​ ​DO​ ​NOT​ ​have,​ ​necessarily,​ ​​*if q then p*. However,​ ​when​ ​we​ ​have​ ​the​ ​sentence​ ​​*p if and only if q*.​ ​Then​ ​we​ ​have​ ​​*if p then q*,​ ​as​ ​well​ ​as​ *​​if q then p*,​ ​as​ ​well​ ​as​ ​​*q if and only if p*.

Assume​ ​the​ ​following​ ​facts​ ​are​ ​true:

If​ ​it’s​ ​rainy,​ ​then​ ​it’s​ ​cloudy.

If​ ​it’s​ ​cloudy,​ ​then​ ​it’s​ ​not​ ​sunny.

If​ ​it’s​ ​sunny,​ ​then​ ​Alice​ ​will​ ​play​ ​tennis.

If​ ​it’s​ ​rainy,​ ​then​ ​Alice​ ​will​ ​not​ ​play​ ​tennis.

If​ ​it​ ​rains​ ​one​ ​day,​ ​then​ ​it​ ​will​ ​be​ ​sunny​ ​the​ ​next​ ​day.

It​ ​was​ ​cloudy​ ​on​ ​Sunday.

It​ ​wasn’t​ ​rainy​ ​on​ ​Monday​ ​nor​ ​on​ ​Friday.

It​ ​rained​ ​on​ ​Wednesday.

Alice​ ​plays​ ​tennis​ ​on​ ​Tuesday​ ​if​ ​and​ ​only​ ​if​ ​she​ ​plays​ ​on​ ​Thursday.

Alice​ ​played​ ​tennis​ ​this​ ​week.

The​ ​question​ ​is:​ ​On​ ​which​ ​day(s)​ ​did​ ​Alice​ ​definitely​ ​play​ ​tennis?

**Tuesday and Thursday**

Sun. Mon. Tues. Wed. Thurs. Fri. Sat.

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**Submission: You are required to upload the following 2 files to canvas.**

assignment0.py: Containing your implementation of the functions

assignment0.pdf: Containing your solution to Section 2 and Section 3. [You are required to show your working for Section 2 and Section 3]