Test 2: Compsci 101

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Name: ____

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Honor code acknowledgment (signature) ______________________________________

	value	grade
Problem 1	29 pts.	
Problem 2	12 pts.	
Problem 3	13 pts.	
Problem 4	20 pts.	
TOTAL:	74 pts.	

This test has 12 pages be sure your test has them all. Do NOT spend too much time on one question — remember that this class lasts 75 minutes.

In writing code you do not need to worry about specifying the proper `import statements`. Don't worry about getting function or method names exactly right. Assume that all libraries and packages we've discussed are imported in any code you write.

Be sure your name and net-id are legible on this page and that your net-id appears at the top of every page.

There is one blank pages page at the end of the test for extra work-space.

PROBLEM 1 : (***What will Python display? (29 points)***)

Part A (20 points)

Write the output for each `print` statement. **Write the output in the right-column under OUTPUT.**

CODE	OUTPUT
`lst = [x for x in range(5) if x >= 3]` `print(lst)` `lst = [x+3 for x in range(5) if x % 2 == 0]` `print(lst)`	
`lst = ['a', 'b']` `lst.append( ['c', 'd'] )` `print(lst)`	
`lst = [1, 2]` `lst = lst + [3, 4]` `print(lst)`	
`lst = [('sedan', 'car'),` `('dumpster', 'truck'),` `('hatchback', 'car'),` `('cruiser', 'motorcycle')]` `lst = sorted(lst)` `print(lst[0])` `lst = sorted(lst, key = operator.itemgetter(1))` `print(lst[0])`	
`s1 = set([1, 2, 2, 3, 3, 3])` `print(sorted(s1))` `s2 = set([2, 3, 4, 5, 5])` `print(sorted(s1 | s2))` `print(sorted(s1.intersection(s2)))` `print(sorted(s2 - s1))`	
`d = {'bi': 2, 'di': 2, 'tetra': 4, 'hepta': 7}` `d['septa'] = 7` `print(sorted(d.keys()))` `setKey = set(d.keys())` `setVal = set(d.values())` `print(len(setKey) == len(setVal))` `print(7 in d)`	

Part B (9 points)

What is the output of each of the `print` statements below? **Write the output after each `print` statement.**

```
desserts = 'candy donut apple pie jelly beans bonbon brownie cupcake'
d = {}
for dessert in desserts.split():
    first = dessert[0]
    if first not in d:
        d[first] = []
    d[first].append(dessert)

tmp = [(len(v), k, v) for k,v in d.items()]
tmp = sorted(tmp, reverse=True)

print(sorted(d.keys()))
```

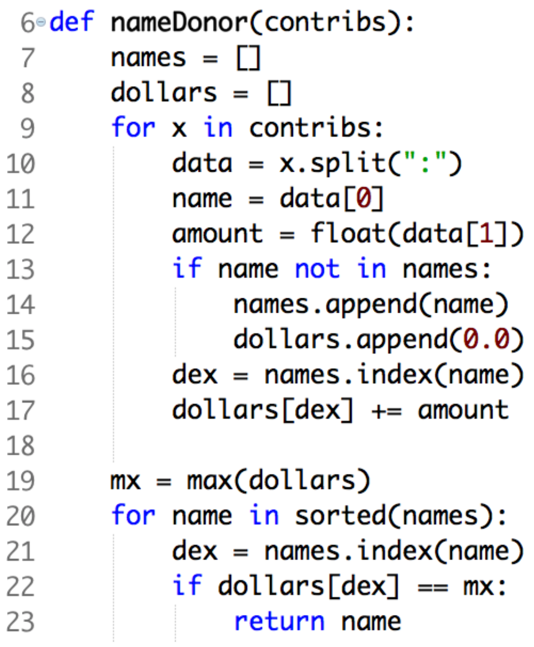
```
print(d['c'])
```

```
print(tmp[0])
```

PROBLEM 2 : (***Patience and Charity (12 points)***)

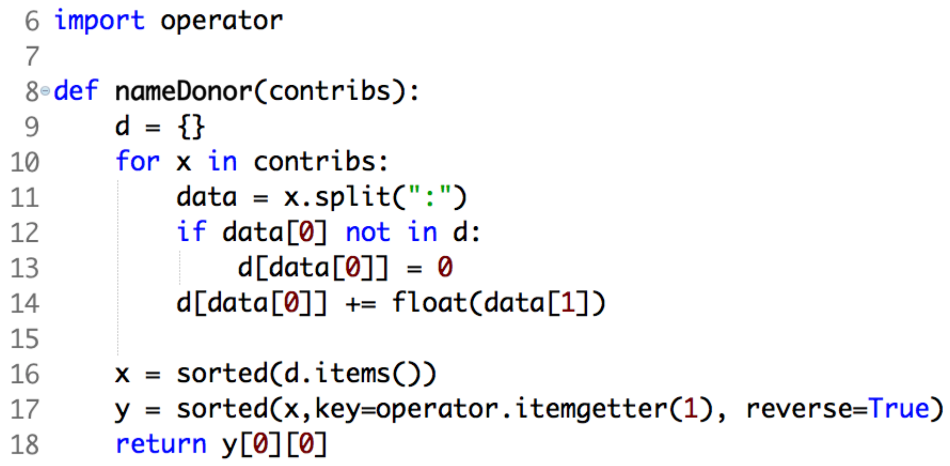
The *CharityDonor* APT problem statement is with the exam reference sheet. Two all green solutions are shown below. You'll be asked questions about these solutions.

Solution A



```
 6 def nameDonor(contribs):
 7     names = []
 8     dollars = []
 9     for x in contribs:
10         data = x.split(":")
11         name = data[0]
12         amount = float(data[1])
13         if name not in names:
14             names.append(name)
15             dollars.append(0.0)
16         dex = names.index(name)
17         dollars[dex] += amount
18 
19     mx = max(dollars)
20     for name in sorted(names):
21         dex = names.index(name)
22         if dollars[dex] == mx:
23             return name
```

Solution B



```
 6 import operator
 7 
 8 def nameDonor(contribs):
 9     d = {}
10     for x in contribs:
11         data = x.split(":")
12         if data[0] not in d:
13             d[data[0]] = 0
14         d[data[0]] += float(data[1])
15 
16     x = sorted(d.items())
17     y = sorted(x,key=operator.itemgetter(1), reverse=True)
18     return y[0][0]
```

(problems on next page)

Part A (3 points)

The problem statement says that if more than one donor gives the maximal amount that ties should be broken alphabetically. For **Solution A**, explain how the code in lines 19-23 ensures that ties for the maximal donor will be broken automatically. Make reference to the code by line number in your explanation.

Part B (3 points)

The problem statement says that if more than one donor gives the maximal amount that ties should be broken alphabetically. For **Solution B**, explain how the code in lines 16-18 ensures that ties for the maximal donor will be broken automatically. Make reference to the code by line number in your explanation.

Part C (3 points)

Explain the purpose of each of lines 13, 14, and 15 in **Solution A** as they relate to solving the problem.

Part D (3 points)

Explain the purpose of each of lines 12 and 13 in **Solution B** as they relate to solving the problem.

PROBLEM 3 : (***Miriam Webster (13 points)***)

In this problem, you will be asked to write code that uses the dictionary variable `calories` below. The keys for this dictionary are strings, which are the names of a food. Each key's corresponding value is the number of calories for that food. For example, a *bagel* has 320 calories and *strawberries* have 50 calories. *You can write one or many lines of code for each question below.*

```
calories = {'bagel': 320, 'brie': 85, 'frappuccino': 280, 'graham cracker': 140,
            'large egg': 70,  'small egg': 60, 'apple': 81,
            'avocado': 250, 'strawberries': 50}
```

For example, the list comprehension

```
   [cc for cc in calories.values() if cc < 100]
```

evaluates to the list `[85, 70, 60, 81, 50]`.

Part A (4 points)

Write code to store in **list** variable `lowcal` the *food names* (the keys in dictionary in `calories`) that have strictly fewer than 90 calories. In the dictionary above that would be `['brie', 'large egg', 'small egg', 'apple', 'strawberries']`, but the code you write should work with any dictionary in the format described.

Part B (3 points)

Write the value of the list variable `ab` after the list comprehension assigns a value to `ab`.

```
ab = [k for k in calories.keys() if len(k.split()) > 1]
```

The dictionary `calories` is reproduced below.

```
calories = {'bagel': 320, 'brie': 85, 'frappuccino': 280, 'graham cracker': 140,
            'large egg': 70,  'small egg': 60, 'apple': 81,
            'avocado': 250, 'strawberries': 50}
```

Part C (6 points)

Write code to create a dictionary `dd` in which keys are integer values representing calories in the range [0-99], [100-199], [200-299] and so on where the key 0 represents [0-99], 1 represents [100-199], and in general the integer value k represents $[k \times 100, k \times 100 + 99]$. For the dictionary above the code you write should store in `dd` a dictionary equivalent to the one shown below, but the order of the keys doesn't matter and may be different from what's shown. Your code should work for any values in `calories`.

```
{3: ['bagel'],
 0: ['brie', 'large egg', 'small egg', 'apple', 'strawberries'],
 2: ['frappuccino', 'avocado'],
 1: ['graham cracker']}
```

```
dd = {}
```

PROBLEM 4 : (***Order in the Court (20 points)***)

Consider the list of world capitals and their latitudes stored as strings as follows.

```
data = ["Paris:48.5", "Berlin:52.3", "Canberra:-35.15", "Reykjavik:64.1", "Nairobi:-1.17"]
```

For example, Paris is at latitude 48.5 North and Canberra is at Latitude 35.15 South. Southern latitudes are stored as negative numbers as part of each string in list `data`.

Part A (4 points)

Write function `list2tuple` that returns a list of tuples in the format `(string,float)` where the string is the name of a capital and the float is the capital's latitude. The value returned by the call `list2tuple(data)` should be:

```
[("Paris", 48.5), ("Berlin", 52.3), ("Canberra", -35.15),
 ("Reykjavik", 64.1), ("Nairobi", -1.17)]
```

Complete the function below. As shown above, the order of the tuples in the returned list is the same as the order of the corresponding strings in parameter `data`.

```
def list2tuple(data):
    """
    data is a list of strings in format "capital:latitude"
    returns list of tuples (string,float) as described
    """
```

Part B (4 points)

Write function `north2south` whose parameter is a list of tuples in the format returned by `list2tuple`. The function should return a list in which the same tuples are sorted from north to south, that is in order from the northern most (or largest) latitude to the southern most (or least) latitude.

The list returned by `north2south(list2tuple(data))` should be

```
[("Reykjavik", 64.1), ("Berlin", 52.3), ("Paris", 48.5),
 ("Nairobi", -1.17), ("Canberra", -35.15)]
```

Complete the function below.

```
def north2south(data):
    """
    data is a list of tuples in format (string,float)
    returns a sorted list of the same tuples ordered from
    northern most/greatest float to southern most/least float
    """
```

Part C (12 points)

Write the function `closest` whose parameter is a list of tuples such as that returned by `list2tuple`. It returns a list of the *names* of the cities in the parameter `tups` that are closest in latitude. For the list `data` shown at the beginning of this problem the call `closest(list2tuples(data))` should return either `[Berlin,Paris]` or `[Paris,Berlin]` (order of capital cities doesn't matter).

```
def closest(tups):
    """
    tups is a list of tuples in the format (capital,latitude)
    returns a 2-element list of the capitals that are closest
    """
```

PROBLEM 5 : (***Blank Pages***)