

Final Exam

2020.01.07 (Tuesday) 09:10 – 12:00

1. **[Python Basics]** In each of the following questions, you are asked to show what will be printed out. If there is an error, please explain why it is an error. (11%)

(a)	<pre>s = 'good' s[0] = 'f' print(s)</pre>
(b)	<pre>_a, _b, _c = 2, 7, 5 x, y, z = _a*_b, _b*_c, _c*_a print(x, y, z)</pre>
(c)	<pre>s = "i-love-stat" print(s[-1], s[:-1], s[::-1])</pre>
(d)	<pre>s = "Do you love math? No, I love Python." print(s[s.find("love")*2:])</pre>
(e)	<pre>a, b = 63, 144 while b: a, b = b, a % b print(a)</pre>
(f)	<pre>n = [0] n.append(0) n.append([0]) n.extend([0]) n.extend(n) print(n)</pre>
(g)	<pre>v = [6, 4, 8, 7] p = v p[2] = 5 print(p) print(v)</pre>
(h)	<pre>x = [5, 3, 2, 6, 1] x.remove(6) x.pop() x.sort() x.insert(2, 0) print(x)</pre>
V (i)	<pre>days = [['Mon', 'Oct', 28], ['Wed', 'Nov', 13], ['Fri', 'Dec', 6]] print(days[1:], days[1][1:], days[1][1][1:])</pre>

(j)	<pre> x, a, out, y = 84, 2, "", 1 while x >= 2: if x % a != 0: a += 1 else: out += " * " + str(a) x //= a y *= a print(out[3:], "=", y) </pre>
V(k)	<pre> s = "1 3 5 2 4 6" n = s.split() print(n[-1].join(n[2:4]) * 2) </pre>
<p>2. [Loops & Files] In each of the following questions, you are asked to show what will be printed out. If there is an error, please explain why it is an error. (16%)</p>	
V(a)	<pre> friends = ['Sunny', 'Penny', 'Ginny'] for f in friends: print("Happy New Year:", f) </pre>
V(b)	<pre> smallest_so_far = -1 for v in [6, 2, -2, 1, 5, -1]: if v < smallest_so_far: smallest_so_far = v print(smallest_so_far) </pre>
V(c)	<pre> values = [2, 0, 2, 0] for v in values: v = 2 * v print(values) </pre>
V(d)	<pre> l = ['c', 'a', 't'] for i in range(len(l)): for j in range(i, len(l)): print(l[i:j+1]) </pre>
V(e)	<pre> a, b = 20, 48 small = a if a > b else b cf, pf = [], 1 while pf <= small: if a % pf == 0 and b % pf == 0: cf.append(pf) pf += 1 print(cf) </pre>

(f)	<pre> file_name = "go.txt" f = open(file_name, "r") t1 = f.readlines() f.close() print(t1) </pre>	<div style="border: 1px solid black; padding: 5px;"> <p><u>go.txt</u> contains three lines:</p> <p>Merry Christmas</p> <p>New Year</p> <p>Winter Vacation</p> </div>
(g)	<pre> file_name = "go.txt" f = open(file_name, "r") t1 = f.read() print(t1) f.seek(0) t2 = f.readline() f.close() print(t2) </pre>	
(h)	<pre> mylist = [] with open("go.txt", "r") as f: for line in f: mylist.append(line.strip()) print(mylist) </pre>	

3. [Function & Dictionary] In each of the following questions, you are asked to show what will be printed out. If there is an error, please explain why it is an error. (16%)

V (a)	<pre> x = "1450" print("sleepy") def play_music(): print("la la la ~~~") print("happy") </pre>
V (b)	<pre> h, w = 1.7, 50 def computeBMI(h, w): bmi = w / (h**2) return bmi print("his BMI: %.3f" % (computeBMI(h,w))) </pre>
V (c)	<pre> foo = {1:'1', 2:'2', 3:'3'} del foo[2] foo[2] = '10' del foo[3] foo[5] = 'go vote' print(foo) </pre>

V (d)	<pre>def myfunc(x): x = 15 return x + 2 print(myfunc)</pre>
V (e)	<pre>def sumup(n): tot = n*(n-1) // 2 return tot def num2sum(x, mylist): for i in range(x): mylist.append(sumup(i)) return mylist print(num2sum(5, []))</pre>
V (f)	<pre>x = [] x.append({2: "third"}) x.append({2: "three"}) x.append({2: "there"}) print(x[2][2][2:])</pre>
V (g)	<pre>def equal(d1, d2): for k in d1: if (d1[k] != d2[k]) or (not (k in d2)): return False return True print(equal({1:'1', 2:'2'}, {1:'1', 2:'2', 3:'3'}))</pre>
V (h)	<pre>def sum_lists(d): dsl = {} for key in d: sum = 0 for val in d[key]: if val < 0: continue sum = sum + val dsl[key] = sum return dsl d = {0:[1,2,3], 3:[1,2,3,0], -1:[-1,2,4]} print(sum_lists(d))</pre>

- ✓ 4. Please read the following code, and answer what will be printed. (8%)

```
def minDist(w1, w2):
    l1, l2 = len(w1) + 1, len(w2) + 1
    dp = []
    for i in range(l1):
        dp.append([0] * l2)
    for i in range(l1):
        dp[i][0] = i
    for j in range(l2):
        dp[0][j] = j
    for i in range(1, l1):
        for j in range(1, l2):
            dp[i][j] = min(dp[i-1][j] + 1, dp[i][j-1] + 1,
                           dp[i-1][j-1] + (w1[i-1] != w2[j-1]))
    return dp[-1][-1]
```

Call minDist function	Printed?
print(minDist("cafe", "coffee"))	(1)
Print(minDist("intention", "execution"))	(2)

5. Given the following defined function `modify_collection(col)`, now suppose you aim to call `modify_collection` with each of the following five collections. Write down what will be printed after `modify_collection` is called. If the function throws an error for some reason, please explain the reason. (15%)

```
def modify_collection(col):
    for i in range(len(col)):
        col[i-1] = col[i-1] + col[i//2]
    print(col)
```

Call modify_collection function	Printed?
<code>modify_collection([1, 2, 3, 4])</code>	✓ (1)
<code>modify_collection(["a", "b", "c", "d"])</code>	✓ (2)
<code>modify_collection("abcd")</code>	✓ (3)
<code>modify_collection({-1:"z", 0:"a", 1:"b", 2:"c"})</code>	✓ (4)
<code>modify_collection({-1:[-1,0], 0:[0,1], 1:[1,2], 2:[2,3]})</code>	✓ (5)

- V 6. Given a matrix representing an image entered by a user, in which each $\langle i, j \rangle$ index pair indicates the pixel location in the image and is associated with a color value z . The user is also allowed to input a pair of targeted location $\langle x, y \rangle$ and a target color value k . Your task is to replace the color z of the given pixel $\langle x, y \rangle$ and all of its adjacent (**including diagonally adjacent**) same colored z pixels with the given target color k . Note that the index of the most left-top pixel is $\langle 0, 0 \rangle$. Note that in your program, the user is allowed to input rows of matrix until 'q' is entered. (9%) (Exactly the same as Quiz 2 Problem 2)

```
c:\Python37\worksp>python quiz2_p2.py
Enter index x, y, k (separated by whitespace): 2 1 7
Enter the matrix by multiple lines:
2 1 2 2
2 0 2 0
1 0 2 0
1 2 0 2
q
2 1 2 2
2 7 2 7
1 7 2 7
1 2 7 2
```

7. Given a sorted integer list, where the range of elements are **[lower, upper] inclusive**, write a program that can **return its missing ranges**. For example, given $[0, 1, 3, 50, 75]$, lower = 0 and upper = 99, return $["2", "4->49", "51->74", "76->99"]$. Sample input and output are illustrated as below. (10%) (Exactly the same as Midterm Problem 9, Quiz 2 Problem 3)

```
c:\workspace>python midterm9.py
Input list: 0 1 3 50 75
Input low: 0
Input high: 99
['2', '4->49', '51->74', '76->99']

c:\workspace>python midterm9.py
Input list: 0 33 66 88
Input low: 11
Input high: 77
['1->32', '34->65', '67->87']

c:\workspace>python midterm9.py
Input list: 5 6 7 21 22 23 24 25 52
Input low: -10
Input high: 66
['-10->4', '8->20', '26->51', '53->66']
```

8. Given a data file, **taiwan_popular_singer.csv**, which shows some basic information of 7 Taiwan popular singers, including their names, popularity (number of fans in millions), names of guests who had ever appeared in their concerts, and the debut year. Your task is to write a program to answer the following three questions. It is important that you need to write a function to answer each question. In addition, your code is required to use dictionary. The sample output is shown in the following. (15%)

- (1) Sort the singers whose debut year is after 2000 (included) according to their popularity.
- (2) Who is the singer that most frequently served as the guest in other singers' concerts?
- (3) List the pairs of singers who appear in each other's concerts.

taiwan_popular_singer.csv

```
singer,popularity(millions),guests,debut
Jay Chou,105,Jolin Tsai|Jam Hsiao|Mayday|A-mei,2000
Jam Hsiao,101,Mayday|A-mei|Jay Chou|JJ Lin,2007
JJ Lin,99,Jam Hsiao|Jolin Tsai|Jay Chou|A-mei,2003
Mayday,150,Jam Hsiao|A-mei|Hebe Tien|JJ Lin,1999
A-mei,135,Jay Chou|Jam Hsiao|Mayday,1996
Jolin Tsai,90,JJ Lin|Jam Hsiao|Jay Chou,1999
Hebe Tien,140,Jam Hsiao|Jay Chou|Jolin Hsai|Mayday,2001
```

```
c:\Python37\workspace>python finalexam9.py
(1) popular singers after 2000:
Hebe Tien: 140
Jay Chou: 105
Jam Hsiao: 101
JJ Lin: 99

(2) frequently-appeared guest:
Jam Hsiao: 6

(3) list of co-guest singer pairs:
Jay Chou = Jolin Tsai
Jay Chou = Jam Hsiao
Jay Chou = A-mei
Jam Hsiao = Mayday
Jam Hsiao = A-mei
Jam Hsiao = JJ Lin
JJ Lin = Jolin Tsai
Mayday = A-mei
Mayday = Hebe Tien
```