



### Question 1 – Arrays, Dictionaries and Files [24]

Examine the `Q1.py` module listed at the end of the test and answer the following questions.

(i) From this module, give an example of a:

A. variable that is of type `'list'` [1]

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B. variable that is of type `'dict'` [1]

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C. dictionary key [1]

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(ii) Describe briefly, and in clear English, what the function `out(arr)` does when called. Your answer must explain what happens with input parameter `arr` of different types. [5]

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(iii) Write down the exact output when `Q1.py` is run in the Python3 interpreter. [6]

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[10]

[illegible]

## Question 2 - Recursion [16]

Examine the `test3_Q2_2016.py` module listed on the last sheet of the test and answer the following questions.

- (i) Write down the **exact output** when this module is executed (e.g. when the user presses the “Run” button in Wing101)? [2]

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- (ii) In terms of recursion, what purpose do lines 3-4 and 5-6 serve? [2]

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- (iii) Consider the effect of replacing line 6 with:

```
return s[-1]+s[0]+someRec(s)
```

What would happen, in practice, if this new program was run in Wing101? [2]

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(iv) Write an iterative version of `test3_Q2_2016.py`.

[7]

```
def someIt(s):
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(v) Which version of this program (recursive or iterative) do you think is better and why?

[1]

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(vi) What does the recursive function listed below do? For which inputs will this function fail? [2]

```
def enigmaRec(x, n):  
    if n == 1:  
        return x  
    else:  
        return x * enigmaRec(x, n-1)
```

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## Code examples for the test – you may detach this sheet.

### Question 1

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```
# Module Q1.py
#Q1.py
formats = {"tri": [1, 2, 3],
           "dmnd": [1, 2, 4, 2, 1],
           "sqr": [3, 3, 3]}

def out(arr2):
    f=open("pattern.txt", 'w')
    if type(arr2)==type([]):
        for row in arr2:
            if type(row)==type([]):
                for col in row:
                    print(col, file=f, end=' ')
                print(file=f)
    f.close()

def arrFrmt(val, frmt):
    result=[]
    if frmt in formats:
        lengths=formats[frmt]
        for l in lengths:
            row=[val]*l
            result.append(row)
    return result

def countWords(filename, word):
    """Function to count the number of time a given word
    appears in a file. Case and punctuation sensitive."""
    #fill in code

x=arrFrmt(0, "tri")
print(x)
y=arrFrmt('bob', "sqr")
print(y)
y=arrFrmt('x', "hrglss")
print(y)
```

## Question 2

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```
1  #Module test3_Q2_2016.py
2  def someRec(s):
3      if len(s) <= 1:
4          return s
5      else:
6          return s[-1]+s[0]+someRec(s[1:-1])
7
8  print(someRec('swizzle'))
9  print(someRec('X'))
```