

# University of Cape Town ~~ Department of Computer Science

## Computer Science 1015F ~~ 2015

### Supplementary Class Test 3

Enter the following details AND shade in the corresponding blocks to the right with your Student Number.

Faculty (please tick one):

Science	Engineering	Commerce	Humanities	Other:
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Student Number :

\_\_\_\_\_

Name (optional) :

\_\_\_\_\_

**Marks : 50**

**Time : 45 minutes**

**Instructions:**

- Answer all questions.
- Write your answers in PEN in the spaces provided.
- Show all calculations where applicable.

A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2
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E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
F	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5
G	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6
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J	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9
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**FOR  
OFFICIAL  
USE  
ONLY:**

Question		1	2	3	4	5	6	7	8
Max		30	20						
Marks	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Marker									

### Question 1 – Arrays and Dictionaries [30]

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 variable that contains:

A. A one-dimensional array [1]

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B. A two-dimensional array [1]

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C. A dictionary [1]

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ii. Assume that this module has been imported into the Python3 interpreter. For each of the function calls below, write down the value returned, or indicate if an error occurs.

A. `temp[-1]` [1]      F. `len(temp)` [1]

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B. `temp.index(1)` [1]      G. `shape(temp)` [3]

---

C. `len(temp)` [1]      H. `shape([])` [2]

---

D. `mapping(semester1)` [3]      I. `mapping(shape([]))` [2]

---

E. `x.values()` [1]      J. `len(y[2])` [2]

---

iii. Describe briefly, and in clear English, what the function `shape` does. [3]

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- ```
>>> SumArr([2,4],[6,1],[3])
16
```

SumArr (arr2D) :

[illegible]

## Question 2 – Recursion [20]

i. Examine the Python3 `Q2.py` module listed at the end of the test and answer the following questions.

ii. What is the base case of the recursive function `MystRec(n)`? [1]

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iii. What is the recursive step of the recursive function `MystRec(n)`? [1]

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iv. Describe briefly, and in clear English, what the recursive function `MystRec(n)` does. [2]

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v. Write down the exact output of the `Q2.py` module if the user runs the module. [8]

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vi. Explain clearly what the following function call will return and why.

`MystRec([])` [2]

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---

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vii. Now write the code for a recursive function `Pattern(n)` that works as follows.

```
>>>Pattern(1)
```

#

—

```
>>>Pattern(2)
```

#

---

##

---

```
>>>Pattern(3)
```

#

---

##

---

###

—

```
>>>Pattern(4)
```

#

—

##

—

###

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## ## ## ##

---

This function **must be recursive** – no marks will be given for an iterative (non-recursive) solution. For numbers less than or equal to zero, your function should display nothing. Complete the code below: [6]

```
def Pattern(n):
```

[illegible]

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

### Question 1

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```
# Module Q1.py
temp=[2,3,1]
semester1=['February','March','April','May']

def mapping(values):
    map={}
    counter=0
    for i in values:
        map[i]=counter
        counter+=1
    return map

def shape(template):
    lst=[]
    for i in template:
        row=[]
        for j in range(i):
            row.append(j)
        lst.append(row)
    return lst

x=mapping(semester1)
y=shape(temp)
```

### Question 2

---

```
# Module Q2.py

def MystRec(l):
    if l:
        newL=MystRec(l[:-1])
        newL.append(l[-1]*len(l))
        return newL
    return []

print(MystRec(['a','b','c']))
print(MystRec([1,2,3]))
print(MystRec(MystRec([1,'a',3])))
print(MystRec(0))
```