THE UNIVERSITY OF AUCKLAND

SECOND SEMESTER, 2015
Campus: City

COMPUTER SCIENCE

Principles of Programming

(Time Allowed: TWO hours)

NOTE:
You must answer **all** questions in this exam.
No calculators are permitted
Answer in the space provided in this booklet.
There is space at the back for answers which overflow the allotted space.

Surname	
Forenames	
Student ID	
Login (UPI)	

Q1 (/24)	**Q4** (/7)	**Q7** (/8)
Q2 (/24)	**Q5** (/9)	**Q8** (/6)
Q3 (/8)	**Q6** (/14)	**TOTAL** (/100)

ID: ....

Question 1 (24 marks)

a) Complete the output produced by the following code.

```
result = 2 * 3 ** 2 - 3 // 2 * 2
print("Result:", result)
```

```
Result: 16
```

(2 marks)

b) Complete the output produced by the following code.

```
result = str(2 * 3) * 4 + "s"
print("Result:", result)
```

```
Result: 6666s
```

(2 marks)

c) Complete the output produced by the following code.

```
value1 = 24 % 10
value2 = 5 % 10
value3 = 10 % 10
print("value1:",value1,"value2:",value2,"value3:",value3)
```

```
value1:   4    value2:   5   value3:  0
```

(2 marks)

ID: ....

d) Complete the output produced by the following code.

```
a = 4
b = a
c = b
a = a - 1
c = c + a
b = c + b
print("a:", a, "b:", b, "c:", c)
```

```
a:   3    b:    11    c:  7
```

(2 marks)

e) Complete the output produced by the following code.

```
saying = "C'est la vie!"
result = saying.find("st") + saying.rfind("al")
print("Result: ", result)
```

```
Result:  2
```

(2 marks)

f) Complete the output produced by the following code.

```
saying = "Leave room for magic"
say_little = saying[7: 9] + saying[-3:]
print("say_little:", say_little)
```

```
say_little:  oogic
```

(2 marks)

ID: ....

g) Complete the output produced by the following code if the user enters 5 at the prompt.

```
user_input = input("Enter number: ")
result = int(user_input * 3) + 1
print("Result: ", result)
```

```
Enter number: 5

Result:  556
```

(2 marks)

h) What is the largest possible number which can be printed by the following code? You can assume that the random module has been imported.

```
value = random.randrange(3, 20, 3)
print(value)
```

```
18
```

(2 marks)

i) Given the following code (the right hand side of the first two statements is not shown but you can assume the code executes without error):

```
num1 = ...
num2 = ...
value1 = not (num1 > num2)
value2 = 34 / 2 + 1
```

what is the type of the two Python objects `value1` and `value2`?

`value1` is an object of type: **bool**

`value2` is an object of type: **float**

(2 marks)

ID: ....

j) Give the output produced by the following code.

```
sentence = "Life is understood backwards, but lived forwards."
words = sentence.split()
print(words[0], words[-2])
```

```
Life lived
```

(2 marks)

k) Given the following function:

```
def fiddle1(a_list):
     for index in range(len(a_list)):
         word = a_list[index]
         word = word + "s"
```

complete the output produced by the following section of code:

```
list1 = ["one ", "two"]
fiddle1(list1)
print("list1:", list1)
```

```
list1: [ 'one', 'two'  ]
```

(2 marks)

ID: ....

l) Given the following function:

```
def fiddle2(list1, list2):
     position = 1
     for number in list2:
        if position < len(list1):
           list1[position] = list1[position] + number
           position = position + 1
```

complete the output produced by the following section of code:

```
list1 = [4, 2, 5]
list2 = [1, 3, 5, 6]
fiddle2(list1, list2)
print("list1:", list1)
```

```
list1:  [  4, 3, 8   ]
```

(2 marks)

ID: ....

Question 2 (24 marks)

a) Complete the `for…in` loop so that the output is:

```
12 18 24 30
```

```
for value in range(4, 11, 2):
        num = value * 3
        print(num, end = " ")
```

(3 marks)

b) Complete the `for…in` loop so that the output is:

```
35 30 25 20 15 10 5 0
```

```
for num in range(35, -1, -5):

        print(num, end = " ")
```

(3 marks)

c) Complete the following `if` statement which prints `"YES"` if the parameter, `num`, is either a positive even number or a negative odd number. Consider zero to be a positive number.

```
def print_result(num):

    if (num >= 0 and num % 2 == 0) or
                      (num < 0 and num % 2 == 1):

        print("YES")
```

(3 marks)

ID: ....

Part d) and Part e) refer to the following function:

```
def if_function(num1, num2, num3):
    if num1 < num2 and num3 > num2:
        print("A")
        if num1 + num2 > 100:
            print("B")
        print("C")
    elif num3 < num1:
        if num1 + num2 > 200:
            print("D")
        else:
            print("E")
        print("F")
    else:
        if num2 > num1:
            print("G")
        elif num3 < num2:
            print("H")
        else:
            print("I")
    print("J")
```

d) Give the output produced by the following function call:

```
if_function(32, 150, 100)
```

```
G
J
```

(3 marks)

ID: ....

e) Give the output produced by the following function call:

```
if_function(10, 200, 5)
```

```
D
F
J
```

(3 marks)

f) The `get_value()` function contains a docstring. In the docstring add **one** doctest for the function. Your doctest should not give any errors.

```
def get_value(a_list):
    """Gets a value from the parameter list.
```

```
>>> get_value([4, 3, 5, 7, 6])
7
```

(3 marks)

```
    """
    value = a_list[0]
    for number in a_list:
         if number > value:
              value = number
    return value

import doctest
doctest.testmod()
```

ID: ....

g) Complete the following code which prints a random name from the list, `names_list`. Note that the full list is not shown here. You can assume that the `random` module has been imported.

```
 names_list = ['Dorothy', 'Thomas',
...,'Susan', 'Joseph']

 random_name_position =random.randrange(0,
                                len(list_of_names))

 random_name =
           list_of_names[random_name_position]

 print(random_name)
```

(3 marks)

h) Give the output produced by the following code:

```
previous = 14
num = previous + 10

while num < 50:
      digits = str(previous) + str(num)
      print(digits, end = " ")
      previous = num
      num = num + 10
```

```
1424 2434 3444
```

(3 marks)

ID: ....

Question 3 (8 marks)

Part a) and Part b) below refer to the following function:

```
def is_a_mystery(word1, word2, letter1, letter2):
    pos1 = word1.find(letter1)
    pos2 = word2.find(letter2)
    if pos1 == -1 or pos2 == -1:
        return "A"
    elif pos1 > pos2:
        return "B"
    return "C"
```

a) Complete the following code so that the output produced is `"A"`.

```
letter = is_a_mystery("welcome", "valid", 'x', "d")
print(letter)
```

(2 marks)

b) Complete the following code so that the output produced is `"B"`.

```
letter = is_a_mystery("welcome", "valid", 'm', "a")
print(letter)
```

(2 marks)

ID: ....

c) Complete the `get_new_text()` function which is passed three parameters:

`text`	- the original text
`to_add`	- the text to be inserted into the original text
`position`	- the position in the original text before which the text is to be inserted.

The function returns the new string containing the inserted text, e.g., the following code:

```
print(get_new_text(get_new_text("1234", "abc", 0))
print(get_new_text("I feel marvellous", "always ", 2))
print(get_new_text("Rose", "mary", 4))
```

prints:

```
abc1234
I always feel marvellous
Rosemary
```

```
def get_new_text(text, to_add, position):
    part1 = text[0: position]
    part2 = text[position:]
    return part1 + to_add + part2
```

(4 marks)

ID: ....

Question 4 (7 marks)

a) Complete the output produced by the following program.

```
def process_dict(list1, list2):
    a_dict = {}

    for index in range(len(list1)):
        key = list1[index]
        if key in a_dict:
            a_dict[key].append(list2[index])
        else:
            a_dict[key] = [list2[index]]

    return a_dict

def main():
    names = ["Ava", "Lee", "Lee", "Ava", "Kim", "Lee", "Tom", "Kim"]
    grades = ["A", "B", "C", "B", "A", "B", "A", "A"]

    a_dict = process_dict(names, grades)

    print("Ava:", a_dict["Ava"])
    print("Lee:", a_dict["Lee"])

main()
```

```
Ava:  ['A', 'B']

Lee: ['B', 'C', 'B']
```

(3 marks)

ID: ....

b) Complete the `print_if_over_bar()` function which is passed two parameters:

`a_dict`	- a Python `dict` object
`bar`	- a number

The function prints all the key:value pairs in the dictionary which have a value greater than the `bar` parameter, e.g., the following code:

```
a_dict = {"0034":9, "0056":32, "0045":17, "0033":21}
print_if_over_bar(a_dict, 15)
print()
print_if_over_bar(a_dict, 20)
```

prints:

```
0056 32
0045 17
0033 21

0056 32
0033 21
```

```
def print_if_over_bar(a_dict, bar):
```

```
for key in a_dict:
   if a_dict[key] > bar:
      print(key, a_dict[key])
```

(4 marks)

ID: ....

Question 5 (9 marks)

a) Complete the output produced by the following program:

```
def unknown(words):
    count = 0
    for word in words:
        if len(word) > 1 and word[0] == word[-1]:
            count += 1
    return count

def main():
    print("1:", unknown(['aba', 'xyz', '123', 'bbb']))
    print("2:", unknown(['qpq', 'xy', 'xyx', 'xx']))
    print("3:", unknown(['aaa', 'e', 'abc', 'hello']))
    print("4:", unknown(['', '123', 'e', 'hello']))
```

```
1: 2

2: 3

3: 1

4: 0
```

(4 marks)

ID: ....

b) Complete the `get_even()` function which takes a tuple as a parameter and returns a new tuple containing all the even numbers from the parameter tuple. For example, the following code:

```
new_tuple = get_even((1, 8, 6, 12, 4, 67))
print(new_tuple)
```

prints: `(8, 6, 12, 4)`

```
def get_even(a_tuple):
    new_list = []

    for num in a_tuple:
       if num % 2 == 0:
            new_list.append(num)

    return tuple(new_list)
```

(5 marks)

ID: ....

Question 6 (14 marks)

a) Complete the output produced by the following code.

```
list1 = [1, 2]
list2 = list1 * 2
list3 = list1 + list2
list4 = list1 + [2]
list5 = list2[2: len(list2)]
list6 = list2[2: 0: -1]

print("1:", list1)
print("2:", list2)
print("3:", list3)
print("4:", list4)
print("5:", list5)
print("6:", list6)
print("7:", list1 == list5)
print("8:", list1 is list5)
print("9:", list1 == list6)
print("10:", list2 == list4)
```

```
1: [1, 2]

2: [1, 2, 1, 2]

3: [1, 2, 1, 2, 1, 2]

4: [1, 2, 2]

5: [1, 2]

6: [1, 2]

7: True

8: False

9: True

10: False
```

(5 marks)

ID: ....

b) Complete the output produced by the following code.

```
list1 = [1, 2, 3, 4, 5]
list1.append(100)
print("1:", list1)

list1.insert(2, 6)

print("2:", list1)
print("3:", list1.pop(0))
print("4:", list1)
```

```
1: [1, 2, 3, 4, 5, 100]

2: [1, 2, 6, 3, 4, 5, 100]

3: 1

4: [2, 6, 3, 4, 5, 100]
```

(4 marks)

ID: ....

c) Complete the `reverse_append_pop()` function which takes a list as a parameter and returns a new list containing the elements from the parameter list in reverse order. Your function must **ONLY USE** the Python list `append()` and the Python list `pop()` methods.

Your function should continue removing the last element of the parameter list and appending it to the end of the new list until the parameter list is empty. For example, the following code:

```
new_list = reverse_append_pop([1, 2, 3, 4, 5])
print(new_list)
```

prints: `[5, 4, 3, 2, 1]`

```
def reverse_append_pop(a_list):
    new_list = []

    while len(a_list) > 0:
        new_list.append(a_list.pop())

    return new_list
```

(5 marks)

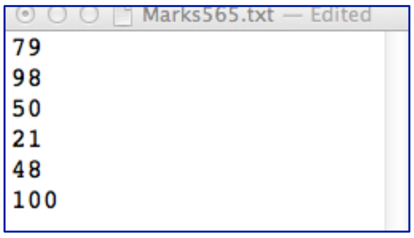
ID: ....

Question 7 (8 marks)

Complete the `process_marks()` function which is passed three parameters:

`infilename`	- the name of a text file containing a list of marks (one mark per student) which is to be read into the program,
`outfilename`	- the name of the output file where the summary is to be written,
`course_name`	- the name of the course.

The input file contains a list of marks (whole numbers), one mark per line. The function reads the list of marks from the input file, processes the marks by calculating the total number of marks (the number of students in the class) and the average mark, and finally, writes a summary to the outfile e.g., if the file, `"Marks565.txt"`, is the file shown on the right,

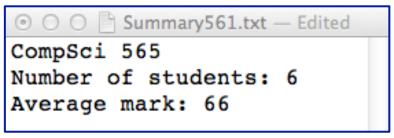


```
79
98
50
21
48
100
```

the following code:

```
process_marks("Marks565.txt", "Summary561.txt", "CompSci 565")
```

produces the file:



```
CompSci 565
Number of students: 6
Average mark: 66
```

The summary is made up of three lines of text: the course name, the number of students preceded by the string `"Number of students: "`, and the third line is the average mark which is rounded to the closest integer value preceded by the string `"Average mark: "`.

```
def process_marks(infilename, outfilename, course_name):
```

```
infile = open(infilename, "r")
outfile = open(outfilename, "w")
contents = infile.read()
infile.close()
marks_list = contents.split()
number_of_students = len(marks_list)
total = 0

for mark in marks_list:
     total = total + int(mark)

average = round(total / number_of_students)
outfile.write(course_name + "\n")

outfile.write("Number of students: " +
            str(number_of_students) + "\n")
```

ID: ....

```
outfile.write("Average mark: " +
                                str(average) + "\n")
outfile.close()
```

(8 marks)

ID: ....

Question 8 (6 marks)

Parts a) and b) of this question refer to the following program.

```
from tkinter import *

def draw_shapes(a_canvas):
    size = 10
    top = size
    left_hand_side = size

    for line_num in range(0, 3):
        left = left_hand_side
        if line_num == 0:
            show_circle = True
            show_rect = False
        elif line_num == 1:
            show_circle = True
            show_rect = True
        else:
            show_circle = False
            show_rect = True

        for shape_num in range(0, 6):
            rect = (left, top, left + size, top + size)
            if shape_num % 2 == 0:
                if show_rect:
                    a_canvas.create_rectangle(rect)
            else:
                if show_circle:
                    a_canvas.create_oval(rect)

            left = left + size          #Position A

        top = top + size

def main():
        root = Tk()
        root.title("A Canvas")
        root.geometry("100x60+10+20")
        a_canvas = Canvas(root)
        a_canvas.pack(fill=BOTH, expand = True)
        draw_shapes(a_canvas)
        root.mainloop()

main()
```

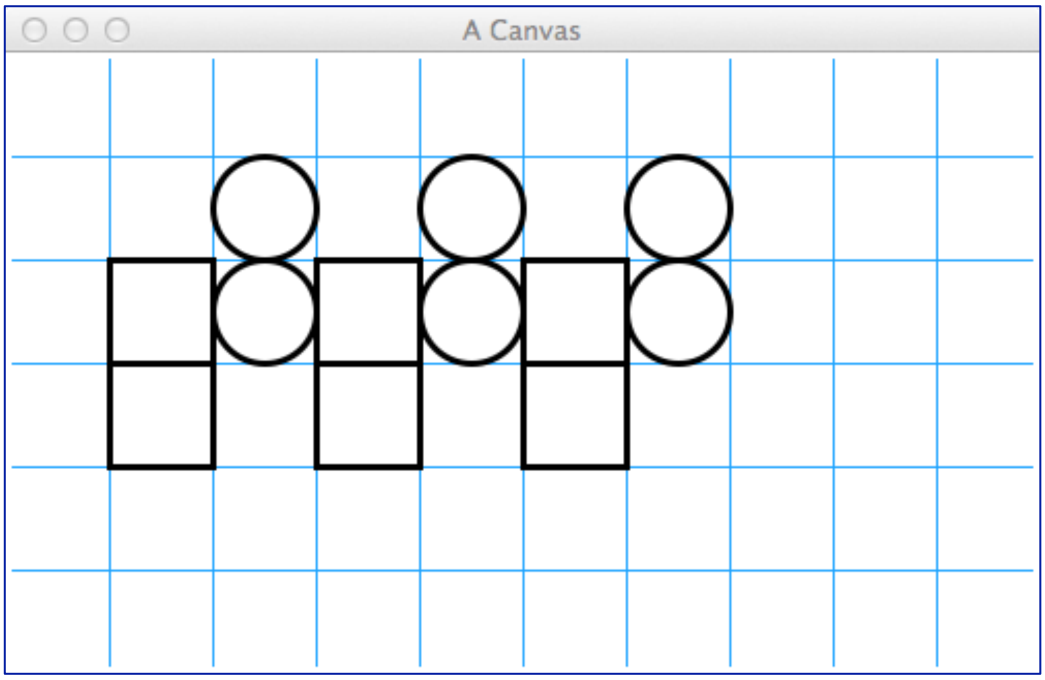
ID: ....

a) In total how many times is the statement marked **`Position A`** in the program above executed when the program executes?

18

(2 marks)

b) As accurately as possible, in the window below, show what is drawn by the above program. Grid lines have been drawn in the window to help you. The gap between adjacent gridlines is 10 pixels.



(4 marks)