

# THE UNIVERSITY OF AUCKLAND

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Semester One, 2017  
Campus: City

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## TEST

### COMPUTER SCIENCE

#### Principles of Programming

(Time Allowed: 75 Minutes)

- NOTE:**
- You must answer **all** questions in this test
  - Calculators are **NOT** permitted.
  - Answer all questions in the space provided in this booklet
  - There is space at the back for answers that overflow the allotted space.

<b>Surname</b>	
<b>Forenames</b>	
<b>Student ID</b>	
<b>Username</b>	
<b>Lab Time</b>	

Question	Mark	Out Of
<b>1</b>		<b>20</b>
<b>2</b>		<b>20</b>
<b>3</b>		<b>20</b>
<b>4</b>		<b>20</b>
<b>5</b>		<b>20</b>
<b>Total</b>		<b>100</b>

**Question 1:**

a) What is the output of the following code?

```
var1 = 3
var2 = 5
var3 = var1 * 2 + var2 * 3
var2 = var3 - 2 * var1
var1 = var3 + var2
print("Var1:", var1, "\nVar2:", var2, "\nVar3:", var3)
```

```
Var1: 36
Var2: 15
Var3: 21
```

(2 marks)

b) What is the output of the following code?

```
result = 7 + 3 ** 3 % 5 * 4 // 6 / 1
print(result)
```

```
8.0
```

(2 marks)

c) What is the output of the following code?

```
import random
import math
var1 = math.sqrt(81)
var2 = random.randrange(-5, 11, 3)
var3 = round(11.269, 3)
print(max(var1, var2, var3))
```

```
11.269
```

(2 marks)

d) The area of a circle is given by the formula:

$$A = \pi r^2$$

Complete the following program that calculates the area of a circle to 3 decimal places. The program will prompt the user to enter an integer value for the radius. You can assume that the user always enters a positive integer value. The program will produce the following output when the user enters 10 for the radius:

Radius: **10**  
Area: 314.159

```
import math

radius = int(input("Radius: "))
area_of_circle = round(math.pi * radius ** 2,3)
print("Area",area_of_circle)
```

(6 marks)

- e) Complete the following program so that it displays the number of days, hours, and minutes in 6536 minutes. The program should produce the output shown below:

6536 minutes = 4 days, 12 hours, and 56 minutes.

```
minutes = 6536
minutes_in_hour = 60
hours_in_day = 24
minutes_in_day = minutes_in_hour * hours_in_day
days = minutes // minutes_in_day
minutes_left = minutes % minutes_in_day
hours = minutes_left // minutes_in_hour
minutes_left = minutes_left % minutes_in_hour
print(minutes,"minutes =",days,"days,",hours,\
      "hours, and",minutes_left,"minutes.")
```

(8 marks)

**Question 2:**

- a) What is the output of the following code?

```
sentence = "Grackles eat worms"  
substring = sentence[:2] + sentence[-9:-2] + sentence[4]  
print(substring)
```

Great work

(2 marks)

- b) What is the output of the following code?

```
word = "b" + "o" * 2 + "k" * 2 + "e" * 2 + "pers"  
print(word)
```

bookkeepers

(2 marks)

- c) What is the output of the following code?

```
print("", "Midterm Test", "", sep = "#" + "#" * 2)
```

###Midterm Test###

(2 marks)

- d) Complete the following program so that it asks the user to enter their name. A user will always enter a name with three parts – their first name, followed by their middle name, followed by their last name. There will always be a single space between the first and middle names and between the middle and last names. The program will then print the first letters of the first and middle names each followed by a full stop, along with the last name.

The output of the program when the user enters the name Alan Mathison Turing is shown below:

```
Please enter your name: Alan Mathison Turing  
A. M. Turing
```

```
name = input("Please enter your name: ")
first_space = name.find(" ")
second_space = name.rfind(" ")
first_name = name[:first_space]
middle_name = name[first_space + 1:second_space]
last_name = name[second_space + 1:]
display_name = first_name[0] + ". " + \
                middle_name[0] + ". " + \
                last_name
print(display_name)
```

(8 marks)

- e) Complete the following program so that it displays a slice of the string "television". The slice will always start at the beginning of the string and end at a random index. The minimum length of the slice should be **1**, while the maximum length of the slice should be **1 less than the length of the string**. Two examples of output from the completed program are shown below:

```
television -slice-> televisio
television -slice-> televi
```

```
import random

word = "television"
random_index = random.randrange(1, len(word))
word_slice = word[:random_index]
print(word, "-slice->", word_slice)
```

(6 marks)

**Question 3:**

a) What is the output of the following code?

```
def function3(word):  
    first = word[0]  
    last = word[-1]  
    combined = last + first  
    return combined.upper()  
  
def main():  
    print("1.", function3("Crudivore"))  
    print("2.", function3("Ornery"))  
    print("3.", function3("Brouhaha"))  
  
main()
```

```
1. EC  
2. YO  
3. AB
```

(3 marks)

b) What is output of the following code?

```
def display_welcome(name):  
    message = "Welcome **" + name + "**"  
    print(message)  
  
def main():  
    message = "**Sam**"  
    display_welcome(message)  
    print(message)  
  
main()
```

```
Welcome ****Sam****  
**Sam**
```

(3 marks)

c) Using the code trace technique taught in lectures, perform a code trace on the following program and show the output.

```
def first(a):
    b = 3
    print("1", a + b)
    return second(a * b) + second(a // b)

def second(a):
    print("2", a)
    return a % 5

def main():
    a = 3
    b = first(a)
    print("3", b - a)
```

main()

	Output
<pre>main a = 3 b = 5</pre>	
<pre>first a = 3 b = 3 4 + 1 = 5</pre>	1 6
<pre>second a = 9 9 % 5 = 4</pre>	2 9
<pre>second a = 1 1 % 5 = 1</pre>	2 1
	3 2

(8 marks)

d) Complete the following function `get_boxes()`, which is passed a total number of items to be packed and the maximum number of items that each box can hold. The function returns the total number of boxes required (any leftovers always require an extra box). For example, executing the following program with the correctly completed function, gives the output:

1. 35 items, 16 per box: 3
2. 28 items, 5 per box: 6
3. 456 items, 12 per box: 38

```
def get_boxes(total_items, items_per_box):
```

```
    number_of_boxes = total // item_per_box
    left_over = total % item_per_box
    if left_over > 0:
        number_of_boxes = number_of_boxes + 1
    return number_of_boxes
```

(6 marks)

```
def main():
    boxes_needed1 = get_boxes(35, 16)
    boxes_needed2 = get_boxes(28, 5)
    boxes_needed3 = get_boxes(456, 12)

    print("1.", "35 items, 16 per box:", boxes_needed1)
    print("2.", "28 items, 5 per box:", boxes_needed2)
    print("3.", "456 items, 12 per box:", boxes_needed3)

main()
```

**Question 4:**

a) What is the output of the following code?

```
def main():
    a = 38
    b = 27
    c = 78
    if a > b and a > c:
        print("One")

    if not (a > b and a > c):
        print("Two")

    if a > b or a > c and b < c:
        print("Three")

    if not a > b or a > c:
        print("Four")

main()
```

Two  
Three

(4 marks)

b) Write the following boolean expressions. Assume that the variable, `value`, has been initialized.

Checks that `value` is between 10 and 30 (inclusive) or equal to 40

```
value >= 10 and value <= 30 or value == 40
```

(2 marks)

Checks that `value` is less than 15 but not equal to 3

```
value < 15 and value != 3
```

(2 marks)

ID: .....

- c) Complete the following function `compare_nums()`, which is passed two integers and returns a string. The function compares the first number to the second number and returns one of the following three strings ("greater than", "equal to", or less than"). For example, the following `main()` function gives the output:

```
87 is greater than 45
27 is less than 55
36 is equal to 36
```

```
def main():
    print("87 is", compare_nums(87,45),"45")
    print("27 is", compare_nums(27,55),"55")
    print("36 is", compare_nums(36,36),"36")

def compare_nums(num1, num2):
```

```
    if num1 > num2:
        return "greater than"
    elif num1 < num2:
        return "less than"
    else:
        return "equal to"
```

```
main()
```

(6 marks)

d) What is the output of the following code?

```
def show_output(number):
    if number >= 30 and number < 60:
        print("A")
        number = number - 10
    else:
        print("B")
        number = number + 10

        if number % 9 == 0:
            print("C")
            number = number - 10
        else:
            print("D")
            number = number + 10
    print(number)

def main():
    show_output(62)

main()
```

B  
C  
62

(6 marks)

**Question 5:**

- a) Complete the following for ... in range() loop so that the output is:

```
52 42 32 22 12
```

```
for number in range(52, 2, -10):  
    print(number, end = " ")
```

(4 marks)

- b) Rewrite the following code using an equivalent while loop instead of the for ... in range() loop. Assume that the random module has been imported. **Note:** in your answer you **must** use the same variable names as those used in the code below.

```
total = 0  
too_big = 34  
  
for number in range(4, too_big, 3):  
    total = total + random.randrange(4)  
    print(number, end = " ")  
  
print(total)
```

```
total = 0  
too_big = 34  
number = 4  
while number < too_big:  
    total = total + random.randrange(4)  
    print(number, end=" ")  
    number = number + 3  
print(total)
```

(6 marks)

c) Give the output produced by the following code.

```
digits = ""
for number in range(6, 21, 5):
    digits = digits + str(number)
print(digits)
```

```
6
611
61116
```

(4 marks)

d) One execution of the following code:

```
total = 1
count = 0
while total % 2 > 0:
    number = int(input(" Number: "))
    if count % 2 == 0:
        total = total + number
    else:
        total = total - number
    count = count + 1

print("Total:", total, "Count:", count)
```

produces the output shown below. The user input is shown in a larger sized bold font.  
Complete the last line of output.

```
Number: 22
Number: 6
Number: 2
Number: 1
```

Total:

18

Count:

4

(6 marks)

**– Overflow Sheet 1 –**

**Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.**

**– Overflow Sheet 2 –**

**Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.**

**– Overflow Sheet 3 –**

**Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.**