



COMPSCI 101

Principles of Programming

Lecture 29 - Test2 Revision
Exercises



2020 S1 Test2

- ▶ Worth 25% of your final mark for CompSci 101
- ▶ No calculators

Look over labs, assignments, code runner exercises, lecture exercises, the test.



Topics

- ▶ Bits and pieces: slicing lists, tuples and strings, evaluating an arithmetic expression, `len()`, `min()`, `max()`, `round()`, `sum()`, `int()`, `float()`, `str()`, `input()`, mutable objects, `in`, `and`, `or`, `not`, tuples, object types, passing objects as parameters,
- ▶ `if ... elif ... else` statements, `while` loops, `for ... in range(...)` and `for ... in ...` loops, `range(start, end, step)`
- ▶ Process a string, string methods: `rfind()`, `find()`, `split()`, manipulate and reassemble a string, slicing a string
- ▶ Some questions on lists, define a function which manipulates list objects
- ▶ Some questions on dictionary, define a function which creates a dictionary, and prints the dictionary
- ▶ Some questions on tuples, define a function which manipulates tuples
- ▶ Read text from a text file, process the text information, return result



Exercise 1: String manipulation

- ▶ Write a function called `print_title(word)` which takes a string as a parameter and prints the word in a series of lines. Each line of the word is shortened by removing the first and the last character until the word contains no more characters. The left indent is made up of an increasing number of '-' characters. The characters of the word are all in uppercase characters.

- ▶ `print_title('marvellous')`

MARVELLOUS

-ARVELLOU

--RVELLO

---VELL

----EL

- ▶ `print_title('fantastic')`

FANTASTIC

-ANTASTI

--NTAST

---TAS

----A



Algorithm

▶ Parameter: word

- ▶ marvellous
- ▶ Length of the word: 10
- ▶ Number of rows = 5
- ▶ 1st row: zero '-'
- ▶ 2nd row: 1 * '-' and 8 letters, index: 1 to 9 (i.e. 10-1)
- ▶ 3rd row: 2 * '-' and 6 letters, index: 2 to 8 (i.e. 10-2)
- ▶ 4th row: 3 * '-' and 4 letters, index: 3 to 7 (i.e. 10-3)
- ▶ 5th row: 4 * '-' and 2 letters

MARVELLOUS
-ARVELLOU
--RVELLO
---VELL
----EL

Length of the word: 9

Number of rows = 5

1st row: zero '-'

2nd row: 1 '-' and 7 letters

3rd row: 2 '-' and 5 letters

4th row: 3 '-' and 3 letters

5th row: 4 '-' and 1 letter

FANTASTIC
-ANTASTI
--NTAST
---TAS
----A



Exercise 2: Python Lists

- ▶ Complete the `convert_first_letter()` function which is passed a list of names as a parameter. The function changes the first letter of each name in the list to uppercase, leaving the rest of the name unchanged. You can assume that each element of the list contains at least one character.

```
1. names: 2. names: ['karl', 'Orlando',  
'carlo', 'zAC']  
['Karl', 'Orlando', 'Carlo', 'ZAC']
```

- ▶ Common mistake: for-each loop <- DO NOT USE
`for word in names_list:`
`word = word[0].upper() + word[1:]`





Exercise 3: Python Lists

- ▶ write a function called `sum_over(a_list_of_lists, target)` which takes a list of integer lists and an integer as parameters, and returns the sum of all entries in the parameter list of lists which are greater than a specified amount, target.

```
the_list = [[2, 4, 16, 80, 27], [1, 4, 120, 18, 7],  
            [20, 14, 70, 8, 130]]
```

```
print(sum_over(the_list, 50))
```

400

(i.e. $80 + 120 + 70 + 130$)

```
print(sum_over(the_list, 100))
```

250

(i.e. $120 + 130$)



Algorithm

- ▶ Parameter: list_of_lists

result = 0

for each list in the list of lists

for each item in the list

if item is bigger than the target

Add item to the result



Exercise 4: Python Tuples -

- ▶ Write a function **called `get_left_most_x(points)`** which takes a list of tuples as a parameter and returns the smallest left-most position of any tuple in the list. You can assume that
 - ▶ every element of the list contains more than 1-element tuple
 - ▶ the size of the list is at least one, and
 - ▶ Values are all ≥ 0

```
points = [(100,5), (20, 100), (140, 200), (70, 100), (25, 0)]
```

```
print("Smallest x value:", get_left_most_x(points))
```

- ▶ Steps:

- ▶ Set a min value
- ▶ for each tuple in the list of tuples

```
Smallest x value: 20
```



Exercise 5: Python dictionaries

- ▶ Complete the `merge(dict1, dict2)` function which is passed two dict objects as parameters, `dict1` and `dict2`. Both parameter dictionaries have a single character as the keys and a list of integers as the corresponding values.
 - ▶ The function looks at the lists corresponding to the **same** key in both dictionaries.
 - ▶ For any key which is the same in both dictionaries, then any integer in the corresponding list of `dict2` which is **not** already in the corresponding list of `dict1` is added to the `dict1` corresponding list. All the corresponding lists of `dict1` are kept in sorted order.

```
dict1 = {"A": [1, 2, 3, 5], "B": [1, 2, 8], "X": [0, 9], "N": [8]}
```

```
dict2 = {"A": [5], "B": [2, 4, 7], "T": [5, 6], "N": [3, 8]}
```

```
A : [1, 2, 3, 5]
B : [1, 2, 4, 7, 8]
N : [3, 8]
X : [0, 9]
```



Algorithm

- ▶ Parameters: dict1, dict2

For key1 and list1 in dict1

- if key1 exists in dict2
 - Get the corresponding list from dict2
 - For all values in the list
 - If it is not exists in the list from dict1
 - append it to list1



Sort all values in the list1

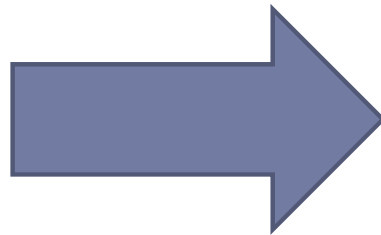


Exercise 6: File Reading

- ▶ Complete the `get_lines_from_file(filename)` function. This function takes a filename as a parameter, open and reads the contents of the file specified in the parameter. This file contains several webpages and links. The file contents should then be converted into a list of strings.

- ▶ Input:

home:news
home:calendar
home:enrolments
our_people:staff
...



['home:news', 'home:calendar',
'home:enrolments', ...]



Exercise 7: Print pyramid

- ▶ Write a function called `print_pyramid(number)` to produce a triangle of empty spaces surrounded by "+"s.

- ▶ If the parameter is 4, the function should produce:

```
+++++++
++++  +++
+++   +++
++    ++
+     +
+++++++
```

- ▶ If the parameter is 1, the method should produce:

```
+++
+ +
+++
```



Check the Pattern

```
+++++++
++++  +++
+++   +++
++    ++
+     +
+++++++
```

- ▶ number = 4
 - ▶ Total 6 lines
 - ▶ 1st and the last line: 9 "+" => number * 2 + 1
 - ▶ 4 rows:
 - ▶ 1st row: 4 "+" and 1 space and 4 "+"
 - ▶ 2nd row: 3 "+" and 3 spaces and 3 "+"
 - ▶ 3rd row: 2 "+" and 5 spaces and 2 "+"
 - ▶ 4th row: 1 "+" and 7 spaces and 1 "+"
 - ▶ i.e. _____ "+" and $i*2 + 1$ spaces and _____ "+"
 - ▶ Use nested for loops