

# Programming and Scripting

## Lab Topic 05-Data Structures

---

### Introduction.

The first activity is a quiz, answers are at the end of this lab sheet.

For the programs in the other activities, I would suggest that you create a folder called labs and a subdirectory **Topic05-datastructures**, in the directory you push up to GitHub.

You can save the programs you create in this lab in there.

### Quiz:

1. look at this code and answer the questions below, answers at the end of the lab sheet

```
numberOfQuestions = 5
averageAge = 23.4
debugMode = True
name = "joe"
ages = []
months = ('Jan', 'Feb', 'Mar')
book = {}
stuff = [ 12 , 'Fred', False, {}]
someone = dict(firstname = "joe")
me = {
    "firstName" : "Andrew",
    "teaching" : [{
        "courseName" : "programming",
        "semester" : 1
    }, {
        "courseName" : "Data Representation",
        "semester" : 2
    }
    ]
}
```

### Questions

What are the variable types of the following variables in the code above

- a. numberOfQuestions
  - b. averageAge
  - c. debugMode
  - d. name
  - e. ages
  - f. months
  - g. months[1]
  - h. book
  - i. stuff
  - j. stuff[2]
  - k. someone
  - l. someone["firstname"]
  - m. me
  - n. me["teaching"]
  - o. me["teaching"][0]["semester"]
- p is a trick question look at it carefully
- p. me["teaching"][0]["coursename"]

2. Create a tuple that stores the months of the year, from that tuple create another tuple with just the summer months (May, June, July), print out the summer months one at a time.

```
May
June
july
```

Answer

```
months = ("January",
          "February",
          "March",
          "April",
          "May",
          "June",
          "july",
          "August",
          "September",
          "October",
          "November",
          "December")
summer = months[4:7]
for month in summer:
    print(month)
```

3. Create a program that puts 10 random numbers into a queue(list), the program should then output all the values in the queue, then take the numbers from the queue one at a time, print it and the current numbers still in the queue. (the command pop(0) takes the first element out of a list)

```
queue is [17, 73, 31, 89, 42, 19, 83, 86, 49, 62]
current Number is 17 and the queue is [73, 31, 89, 42, 19, 83, 86, 49, 62]
current Number is 73 and the queue is [31, 89, 42, 19, 83, 86, 49, 62]
current Number is 31 and the queue is [89, 42, 19, 83, 86, 49, 62]
current Number is 89 and the queue is [42, 19, 83, 86, 49, 62]
current Number is 42 and the queue is [19, 83, 86, 49, 62]
current Number is 19 and the queue is [83, 86, 49, 62]
current Number is 83 and the queue is [86, 49, 62]
current Number is 86 and the queue is [49, 62]
current Number is 49 and the queue is [62]
current Number is 62 and the queue is []
the queue is now empty
```

Answer

```
import random
queue = []
numberOfNumbers=10
rangeTo=100

for n in range(0,numberOfNumbers):
    queue.append(random.randint(0,rangeTo))

print ("queue is {}".format(queue))

while len(queue) != 0:

    currentNumber = queue.pop(0)
    print ("current Number is {} and the queue is {}".format(
currentNumber, queue))

print ("the queue is now empty")
```

4. Write a program that stores a student name and a list of her courses and grades in a dict, the program should then print out her data.  
The number of course she has could change.

We can hard code the values in this dict for this example

Student: Mary
Programming : 45
History : 99

Answer

```
student = {
    "name": "Mary",
    "modules": [
        {
            "courseName": "Programming",
            "grade": 45
        },
        {
            "courseName": "History",
            "grade": 99
        }
    ]
}
print ("Student: {}".format(student["name"]))
for module in student["modules"]:
    print("\t {} \t: {}".format(module["courseName"], module["grade"]))
```

## Answers to Question 1

- a. int
- b. float
- c. boolean
- d. str
- e. array
- f. tuple
- g. str
- h. dict
- i. array
- j. boolean (False)
- k. dict
- l. str
- m. dict
- n. array (is is nested in the dict)
- o. int
- p. undefined (the code has a capital N in courseName)