

# Programming and Scripting

## Lab Topic 05-Data Structures

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### 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.

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)