COM4013 – Introduction to Software Development
Week 8 – More Questions, Classes, and Functions

*Always select "**Enable Editing**" if prompted by Microsoft Word*

Lab Exercises

Always refer to the lecture notes for examples and guidance.
Also look at your previous work, many exercises are similar.

There are two "stages" marked in the lab sheet. Stage 1 is the *absolute minimum* point you should reach. Hopefully, you can reach it in the lab session. Reaching stage 2 suggests you are on target for a top-class mark for the module. Set your goals sensibly - do not just aim for the minimum or you may struggle to pass the module.

I use the term integer, string and float, and Boolean to infer what the input/output looks like. Unlike many other languages Python does not expect a data type before the variable names.

So if I ask that you declare an integer num1 to 1, then do as follows:

```
num1 = 1
```

For declaring a string and assigning the value hello

```
greeting = "hello"
```

For floats we can declare it like this

```
Money = 2.50
```

For Booleans (bool) we can declare it like this

```
isHeavy = True
```
Exam - More Examples

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Here are some further questions. Attempt these questions now, they should take you around 15-25 minutes. Your tutor will give you the answers afterwards. Some of these questions are a harder than last week.

It is best to first try the exercises without looking at your lecture/lab notes. Then go back and check your answers against your notes and see where you need practice.

*Questions 1 to 8 are worth **1 mark** each.*

1. What is the value of `result` after executing this code?

```
time = 17.5
result = time > 12.5 && time < 25.0
```

(a) `false` (b) `5.0`

(c) `12.5` (d) `true`

2. You want to display the names of 180 students stored in an List of strings. Which kind of loop would be the most concise and readable for the task?

(a) A `do-while` loop (b) A `while` loop

(c) A `for` loop (d) A nested loop

3. Which of these is not a standard built-in type in Python?

(a) `double` (b) `complex` (c) `float` (d) `int`

4. What will be displayed on the output from the following code:

```
pairs = ["ab", "cd", "ef", "gh", "ij", "kl"]
for i in range(1, 5, 2):
    print(pairs[i], end="")
```

(a) `abcdefghij` (b) `cdefghij` (c) `abefij` (d) `cdgh`

5. Which of these is **not** a valid function signature in Python?

(a) `def MyFunction(a: int, b: float):`

(b) `def FirstLetter(word: char):`

(c) `def GetSize():`

(d) `def RemoveRecord(record: None):`

6. When does a `while` loop finish? Choose the most accurate description:

(a) When the condition in the `while` statement becomes true.

(b) When the condition in the `while` statement reaches its maximum value.

(c) When the condition in the `while` statement becomes false.

(d) When the condition in the `while` statement becomes invalid.

7. Which of these does not affect readability?

(a) Compiler (b) Comments

(c) Variable names (d) Indentation

8. Which of these is a **valid** variable declaration?

(a) `1stScore`

(b) `-Score = 2.5`

(c) `first_score = 25`

(d) `First Score`

Questions 9 & 10 carry different marks. See the right column.

9. Write a `for` loop that displays exactly this output:

```
2:5:8:11:
```

(3 marks)

10. Write code to input a `float` from the user in the range 10.0 to 20.0. The code should fully validate the input: if the user types a number outside the range, or types some text that is not a number, then an error message is displayed, and the user must input again. This should be repeated until a valid number is entered. Very minor syntax errors will not be penalised.

(5 marks)

Programming your Exam Written Answers

- Create a new Jupyter Notebook project called **Lab 8 Exercises**. Refer to Week 1's lecture/worksheet/video if you have forgotten how to create a new project/file/program or use the shell code.

- Now write your answers to questions 9 and 10 from the practice questions above as cells in Jupyter Notebook. Make sure your answers work. ALthough there is no exam in this module expect that you will be asked questons on your assignment submissions, so be sure to understand your answers in full.
    - Make sure you know how to change each program to output or validate different ranges of numbers etc.

Constants

- In a new cell add the method `DrawHorizontalLine` below. Make sure you put it in the correct place in your code. Refer to last week's lecture and lab if you've forgotten where (look at your own solutions).

```
def DrawHorizontalLine():
    for i in range(80):
        print("-")
```

- Call this method once at the start of your program. Edit the code to make it print a horizontal line across the page.

In the lecture notes we see that the 80 is a "magic number", which is undesirable. Anyone looking at this code would not know why 80 was chosen. It is in fact the width of the console window in characters.

- Update your program to use a variable for the console width, as shown on the lecture notes. This will make the meaning of the 80 much more clear.
    - NOTE: Python does not have constants, but it doesn't hurt to use SNAKE_CASE to help with code readability

Calculator Class

- Create a new cell and use the shell code. Read this entire task before beginning.
- Look at the calculator code from week 7 and implement a class for this.
    - If you have not completed this task, then rest assured that you can take a copy of my solution from the Week 7 – Session Practical Solutions file on Moodle.

- First declare two member variables for the numerical inputs for the class methods
- Next a constructor that allows the class to set the values for the member variables mentioned above.
    - Use type hints in all your methods to make your method definitions more readable.

- Write methods for addition, subtraction, multiplication, division, and modulus using the same logic as week 7 and week 4.
    - Instead use the member variables and return the results for each operation.

- Implement a new method that computes the result of raising the first member variable number to the power of the second member variable number.
    - i.e., $number1^{number2}$
- Implement another method to compute the result of raising the second member variable number to the power of the first member variable number.
    - i.e., $number1^{number2}$

- In Python the ** operator is used for exponentiation (or raising a number to a specific power). Use this in your methods above.

- Write a method to return the factorial of member variables 1 and 2 as a List.
    - Use a range for loop to complete this task
    - The output should look like this:

```
!number1 = 6
!number2 = 24
```

- FULLY COMMENT THIS CLASS. One of the Learning Outcomes that will be assessed in your assignment is your ability to follow good coding practices.
    - I will give 0 points for any work that does not follow good programming practices that I have taught during this module. This may prevent you from getting the grades that you are aiming for.

- Test the class using inputs 5 and 6
    - Round the division print to 2 decimal places

```
5 + 6 = 11
5 - 6 = -1
5 * 6 = 30
5 / 6 = 0.8333333333333334
5 % 6 = 5
5 ^ 6 = 15625
6 ^ 5 = 7776
!5    = 120
!6    = 720
```

File Reading and Writing (Solution will not be released for this)

- Write a class for file reading or file writing.
- Create a member variable called file name.

- Write a constructor that sets the filename member variable. Add type hints to this method.
- Write a method called ReadFile that reads the entire file to a variable called contents and return this to the user.
- Write a method called WriteFile that takes a parameter called contents and overwrites the contents of the filename member variable.
- Write a method called AppendFile that takes a parameter called contents and writes contents onto a newline in the file.
- Test this class to make sure everything is good. Open the file when testing.

Unit Testing

Look into documentation around Unit Testing in Python: unittest — Unit testing framework — Python 3.12.0 documentation

THAT IS ALL FOR NOW

Submission

1. Upload your work to the GitHub classroom – Here
   a. Classroom Link for Week 8