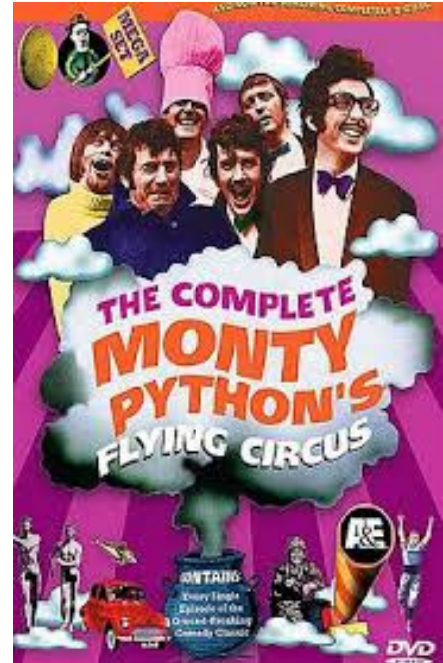


Practical 1: Introduction to Python

Python is a programming language created by Guido Van Rossum and released in 1991, which was started as a **hobby** in 1989.



The author: Guido Van Rossum



the inspiration of the title















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(<https://www.python.org/psf/license/>)

It is now one of the most popular languages in existence. IEEE ranked Python number 1 in the top 10 programming languages in the world, right after C and Java

| Rank | Language | Type | Score |
|------|------------|--|-------|
| 1 | Python |    | 100.0 |
| 2 | Java |    | 96.3 |
| 3 | C |    | 94.4 |
| 4 | C++ |    | 87.5 |
| 5 | R |  | 81.5 |
| 6 | JavaScript |  | 79.4 |
| 7 | C# |     | 74.5 |
| 8 | Matlab |  | 70.6 |
| 9 | Swift |   | 69.1 |
| 10 | Go |   | 68.0 |

<https://spectrum.ieee.org/computing/software/the-top-programming-languages-2019>

IEEE ranked Top 10 Programming Languages from 2017-2019

| Rank/Language | 2019 | 2018 | 2017 |
|---------------|------------|------------|------------|
| 1 | Python | Python | Python |
| 2 | Java | C++ | C |
| 3 | C | Java | Java |
| 4 | C++ | C | C++ |
| 5 | R | C# | C# |
| 6 | JavaScript | PHP | R |
| 7 | C# | R | JavaScript |
| 8 | Matlab | JavaScript | PHP |
| 9 | Swift | Go | Go |
| 10 | Go | Assembly | Swift |

<https://spectrum.ieee.org/>

< Instruction / >

Pre-requisite: Before you start this practical, please ensure you have installed Anaconda (ref: www.anaconda.com)

Refer to Practical 1 practical manual for Python tutorials.

Exercise:

1. Define a function named **volume** that receives two user inputs: **r** (radius) and **h** (height) of a cylinder. The area function calculates and display the volume V of a cylinder, given that

$$V = \pi r^2 h \quad (1)$$

2. Assume that your monitor screen resolution is 1280x800. Write a program to simulate how mouse movement speed can be estimated:

- Record the **start** time when the program is run. The following code shows how to record the current time in seconds. Assume that the **end** time captured after a delay of 1 second ($\text{end} = \text{start} + 1$). Therefore the **duration** = $\text{end} - \text{start} = 1$

```
import time
ms = time.time()
```

- **Randomly** generates TWO (2) coordinates of a mouse pointer (make sure they are within the screen resolution), and stores the first coordinate into a tuple called **first** ($\text{first} = (x_1, y_1)$), and the second into another tuple called **second** ($\text{second} = (x_2, y_2)$). Record the **end** time when this process ends.
- Define a function named **calculateMouseSpeed** that receives the first and second coordinate, and time duration as input parameters. This function shall **returns** the estimated **speed** of the mouse movement (pixel per second) between 2 locations. To calculate the speed, the formulas below are given:

$$\text{Speed} = \text{distance} / \text{time} \quad (2)$$

$$\text{distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (3)$$

$$\text{time} = \text{end} - \text{start} \quad (4)$$

3. Modify the program in Q2 so that it can **repeatedly** generates tuple of coordinates for TEN (10) times, and stores all the tuples into a list called **coordinatesList**. Delay the time for 1 second in each iteration (to delay, use `time.sleep(seconds)`).

Record the **end** time when the entire loop process ends.

- Define a function named **calculateMouseSpeed** that receives the **coordinatesList** and the duration as input parameters. This function shall **returns** the estimated **average speed** of the mouse movements, where $\text{average_speed} = \text{total distance} / \text{total time}$

4. Define a function named **mastermind** that fulfill the following:

- It randomly generates an ordered list of 4 colours, named as **answer**, from a set of 6 fixed colours, i.e. `CODES = set(['green', 'cyan', 'red', 'purple', 'blue', 'orange'])`
- It receives an input argument of an ordered list of 4 colours, named as **guess**.
- It compares the series of the colours in both **answer** and **input**. Display 'black' if an item has the right colour and is placed at the right place; display 'white' if a correct color code item placed in the wrong position. Otherwise, display nothing. For instance, assume that the **answer** is `['orange', 'green', 'cyan', 'purple']` and the input is `['green', 'cyan', 'red', 'purple']`. The mastermind function shall display the following on the screen

```
White
White
Black
```

- The function shall limit only 10 trials per game. If the user successfully breaks the code within the 10 trials, display “Congratulation”, otherwise display “You lose”.

Write a program that asks a user to enter 4 colour codes based on the fixed set of colours, and calls the **mastermind** function. After the execution of the **mastermind** function, prompt the user whether s/he likes to try another round. If s/he likes to continue, restart the game with different series of colours, otherwise stop the program.