

PES UNIVERSITY, BENGALURU

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UE25CS151A – PYTHON FOR COMPUTATIONAL PROBLEM SOLVING LAB MANUAL

WEEK 1

TOPICS:

Intro to Flowcharts and writing Algorithms

Overview of Various Operating Systems and various IDE's for python program execution

Puzzle Questions

Introduction to Ubuntu OS and execution of basic commands

OBJECTIVE:

To Learn and Understand

- Introduction to flowcharts and writing algorithms for problem-solving.
- Overview of various operating systems (Windows, macOS, Ubuntu) and popular IDEs (IDLE, PyCharm, VS Code) for Python program execution.
- Engagement with puzzle questions to enhance logical thinking.
- Introduction to the Ubuntu OS and execution of basic commands.

TASK 1: The Art of Problem Solving - Algorithms & Flowcharts

Before writing a single line of code, a programmer must first devise a plan. This plan is called an algorithm.

Algorithm

An algorithm is a clear, step-by-step set of instructions defined to solve a computational problem.

Think of it as a recipe: a finite sequence of actions to get a specific output. Algorithms can be represented as pseudocode (a simplified, code-like text) or as a flowchart.

In short, A sequence of activities to be processed for getting desired output from a given input.

General representation of an Algorithm:

```

Step 1: start
Step 2: statement 1
Step 3: statement 3
.
.
.
Step N: stop
  
```

Example 1:

Add two numbers provided by the user and output their sum.

Algorithm (Pseudocode)

1. Input number1.
2. Input number2.
3. Calculate sum = number1 + number2.
4. Output sum.

Example 2:

Given a number, determine whether it is odd or even and output the result.

Algorithm (Pseudocode)

1. Input number.
2. If number % 2 == 0:
 - a. Output "Even".
3. Else:
 - a. Output "Odd".

Example 2:

There are 8 boxes, each containing 100 balls. One box contains defective balls weighing 1.2 grams each, while the others contain standard balls weighing 1 gram each. Identify the box with defective balls using a single weighing

Algorithm: (Pseudocode)

1. Initialize total_balls as an empty collection.
2. For i = 1 to 8:
 - a. Take i balls from box i.

- b. Add these balls to total_balls.
3. Weigh total_balls to get actual_weight.
4. Calculate expected_weight = 36 (sum of 1 + 2 + ... + 8 grams).
5. Calculate excess_weight = actual_weight - expected_weight.
6. Calculate box_number = excess_weight / 0.2.
7. Output box_number as the box containing defective balls.

Flowchart:

A flowchart is a pictorial or graphical representation of a process.

Name	Symbol	Purpose
Terminal	oval	Start /stop/begin/end
Input / output	Parallelogram	Input/output of data
Process	Rectangle	Any processing to be performed can be represented
Decision box	Diamond	Decision operations that determine which of the alternative paths to be followed
Connector	Circle	Used to connect different parts of flowchart
Flow	Arrows	Joins 2 symbols and also represents flow of execution
Pre defined process	Double sided rectangle	Modules (or)subroutines specified else where
For loop symbol	Hexagon	Shows initialization, condition and incrementation of loop variable.
Document	Printout	Shows the data that is ready for printout

Source: <https://studyglance.in/c/display.php?tno=5&topic=Algorithms-and-Flow-Chart>

Task 2: Various OS and Simple commands of Ubuntu OS

Operating System: An Operating System (OS) is a system software that acts as an interface between the user and computer hardware. There are several types of OS depending on the purpose of use. The list of OS is as follows:

Type of Operating System	Examples
Single-User, Single-Tasking OS	MS-DOS (Microsoft Disk Operating System)
Single-User, Multi-Tasking OS	Microsoft Windows (various versions), macOS
Multi-User OS	Unix, Linux, AIX (IBM)
Real-Time OS	QNX, VxWorks, RTLinux
Embedded OS	FreeRTOS, Android (for mobile devices), VxWorks (for embedded systems)
Network OS	Cisco IOS, Junos (used in network routers and switches)
Distributed OS	Plan 9 from Bell Labs, Amoeba
Mobile OS	Android, iOS
Server OS	Windows Server, Linux Server (e.g., Ubuntu Server)
Mainframe OS	z/OS (IBM)
Clustered OS	Windows Server Failover Clustering, Linux HA Cluster (Pacemaker/Corosync)
Hybrid OS	Chrome OS

Task 3: Few Ubuntu OS Commands:

Navigating the File System:

pwd: Print the current working directory.

```
$ pwd
/home/cg/root/64f2db72ceff
```

ls: List files and directories in the current directory.

```
$ ls
c c++ python
```

ls -l : lists files and directory in the current directory in-detail

```
$ ls -l
total 12
drwxr-xr-x 2 webmaster webmaster 4096 Sep  2 12:23 c
drwxr-xr-x 2 webmaster webmaster 4096 Sep  2 12:23 c++
drwxr-xr-x 2 webmaster webmaster 4096 Sep  2 12:23 python
```

cd: Change the current directory.

```
$ pwd
```

```
/home/cg/root/64f2db72ceeff
$ cd python
$ pwd
```

cd ..: Move up one directory.

```
$ pwd
/home/cg/root/64f2db72ceeff/python
$ cd ..
$ pwd
/home/cg/root/64f2db72ceeff
```

cd ~: Change to your home directory.

```
$ pwd
/home/cg/root/64f2db72ceeff/python/week1
$ cd ~
$ pwd
/home/webmaster
```

Mkdir directory_name :Create a new directory

```
$ mkdir newdirectory
$ ls
2 3 newdirectory week week1
```

rmdir: Remove an empty directory.

```
$ ls
2 3 newdirectory week week1
$ rmdir newdirectory
$ ls
2 3 week week1
```

touch: Create an empty file.

```
$ touch file1
$ ls -l
-rw-r--r-- 1 webmaster webmaster 0 Sep 2 12:35 file1
drwxr-xr-x 2 webmaster webmaster 4096 Sep 2 12:29 week
drwxr-xr-x 2 webmaster webmaster 4096 Sep 2 12:28 week1
```

Working with Files:**cp:** Copy files or directories.

```
$ cp file1 copyfile  
$ ls  
2 3 copyfile file1 week week1
```

mv: Move files

```
$ mv src_file dest_file
```

rm: Remove files

```
$ rm file_name
```

cat: display the contents of a file.

```
$ cat filename
```

View and Managing Process:**ps:** List running process**kill:** Terminate Process**File Permissions:****chmod:** Change file permissions.**Info:****uname, df, who, whoami:** System details, users.

Keep Learning! Python skills grow stronger with consistent practice.