

EXPERIMENT 1

Feb 11,2024

AIM : Introduction to Computer hardware : Physical identification of major components of a computer system such as mother board, RAM modules, daughter cards, bus slots, SMPS, internal storage device, interfacing ports, Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use.

COMPUTER HARDWARE

Computer hardware includes the physical parts of a computer, such as the case, central processing unit (CPU), random access memory (RAM), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard.

By contrast, software is the set of instructions that can be stored and run by hardware. Hardware is so-termed because it is hard or rigid with respect to changes, whereas software is soft because it is easy to change.

Hardware is typically directed by the software to execute any command or instruction. A combination of hardware and software forms a usable computing system, although other systems exist with only hardware.

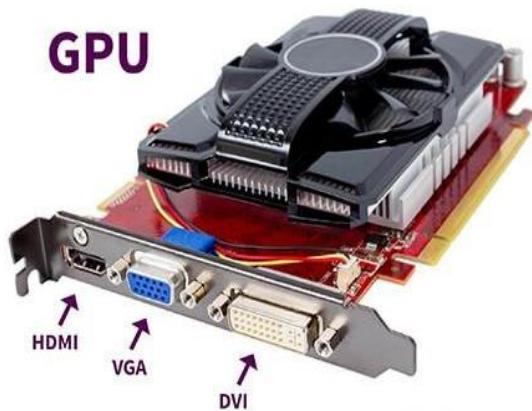
MOTHER BOARD

The motherboard serves as a single platform to connect all of the parts of a computer together. It connects the CPU, memory, hard drives, optical disk, video card, sound card, and other ports and expansion cards directly or via cables. It can be considered as the backbone of a computer. Motherboard contains ports to connect all of the internal components. It holds together many of the crucial components of a computer, including central processing unit, memory and connectors for input and output devices.



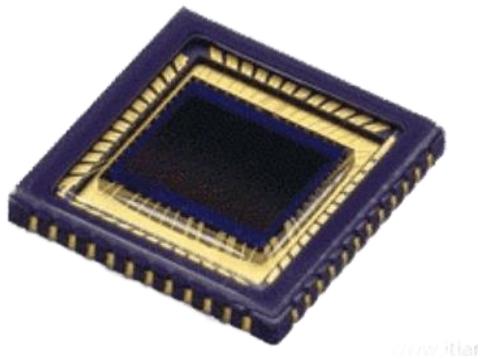
GPU (GRAPHIC PROCESSING UNITS)

GPUs also known as graphic cards or video cards or graphics cards. In order to display pictures, videos, audios, and 2D or 3D animations, each device uses a GPU. A GPU performs fast calculations of arithmetic and frees up the CPU to do different things.



CMOS (COMPLEMENTARY METAL OXIDE SEMICONDUCTOR)

CMOS is a combination of NMOS and PMOS transistors that operates under the applied electrical field. The structure of CMOS was initially developed for high density and low power logic gates. The main purpose of CMOS in computers is to store important system settings and configurations such as the date and time, boot order, hardware settings, and password information. This information is stored in a small battery-powered chip on the motherboard called CMOS battery.



www.itiae

HDMI (HIGH DEFINITION MULTIMEDIA INTERFACE)

It is an all digital audio-video interface which transmits signals in uncompressed format.

Eg : uncompressed video data and compressed or uncompressed digital data from a HDMI-compliant source device to a computer monitor, video projector, digital television...etc.



DGA (DOMAIN GENERATION ALGORITHM)

It is a technique used by cyber attackers to generate new domain names and IP addresses for malware's command and control servers.

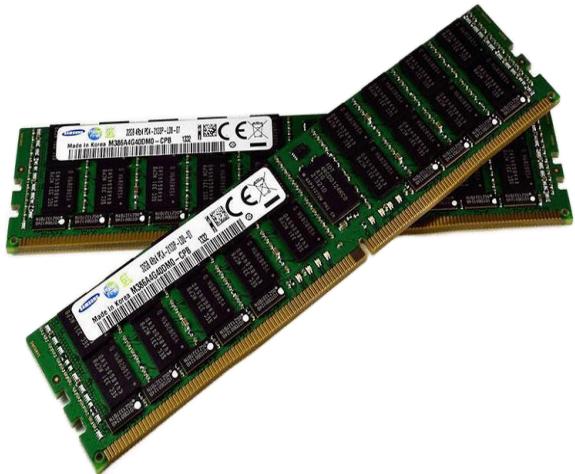
COOLING FAN

A computer is any fan inside, or attached to, a computer case used for active cooling. Fans are used to draw cooler air into the case from the outside. Expel warm air from inside and move air across a heat sink to cool a particular component.



RAM MODULES

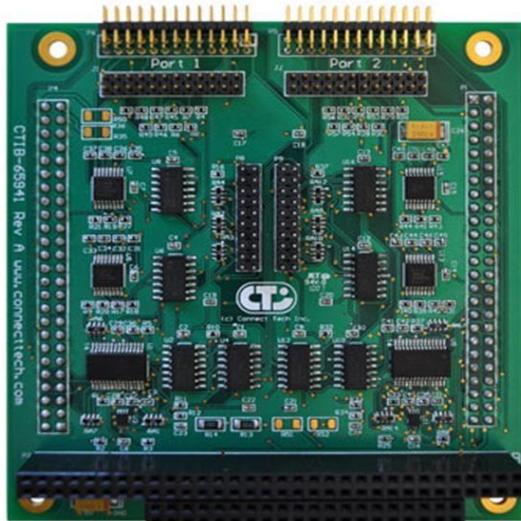
In computing, a memory module or RAM (random access memory) stick is a printed circuit board on which memory integrated circuit are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, word stations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer.



DAUGHTER CARD

A daughterboard (or daughter board , daughter card , or daughtercard) is a circuit board that plugs into and extends the circuitry of another circuit board. The other circuit board may be the computer's main board (its motherboard) or it may be another board or card that is already in

the computer, often a sound card. The term is commonly used by manufacturers of wavetable daughterboards that attach to existing sound cards.



SMPS (SWITCHED MODE POWER SUPPLY)

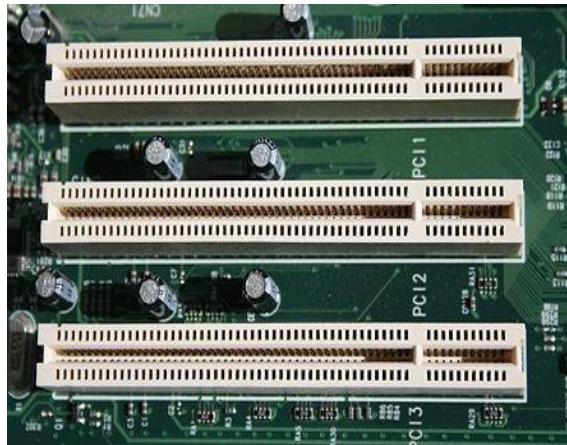
SMPS is an electronic power supply system that makes use of a switching regulator to transfer electrical power effectively. It is a PSU (POWER SUPPLY UNIT) and is usually used in computers to change the voltage to the appropriate range for the computer.



BUS SLOT

Alternatively known as a bus slot or expansion port, an expansion slot is a connection or port inside a computer on the motherboard or riser card. It provides an installation point for a

hardware expansion card to be connected. For example, if you wanted to install a new video card in the computer, you'd purchase a video expansion card and install that card into the compatible expansion slot.



STORAGE DEVICES

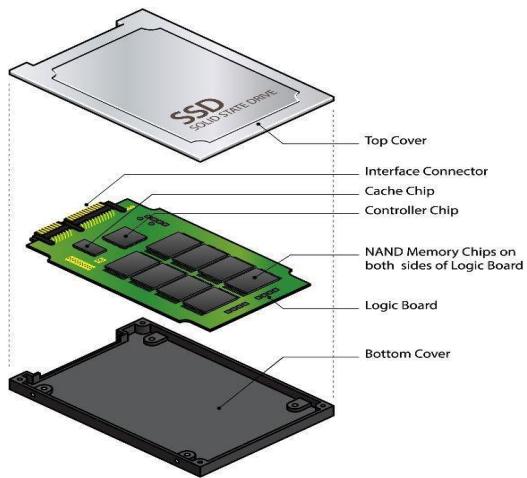
A storage device is a kind of hardware, which is also known as storage, storage medium, digital storage, or storage media that has the ability to store information either temporarily or permanently. It is used to hold, port, and extract data files.

Two storage devices are

- SSD
- HDD

SSD (SOLID STATE DRIVE)

SSD is non-volatile storage device, it stores the data on flash memory chips and maintains the data in a permanent state, even when the power is off. As compared to electromechanical drives, SSDs have lower latency and access quickly. These storage devices store the data in the semiconductor cells.



Several types of SSD are,

- **SATA SSD**
- **mSATA SSD**
- **M.2 SATA SSD**

SATA SSD

SATA is the acronym for ‘serial advanced technology attachment’. Speaking of SSD type SSD is the most popular today.



mSATA SSD

Its mini version of SATA. It has a smaller form factor mainly used in ultra-compact computers, laptops, mobile devices with an mSATA slot, in which the installation of an extended size SATA SSD is impossible.



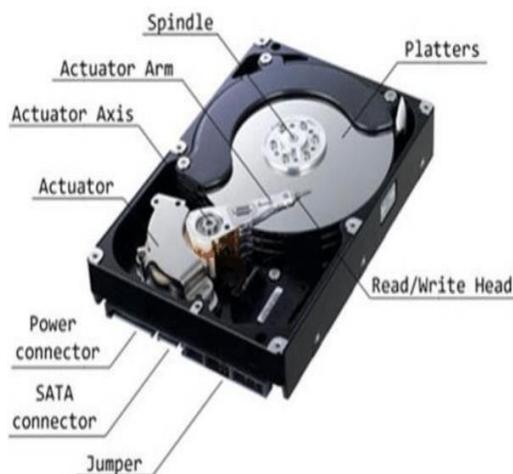
M.2 SATA SSD

Its newer, and its format is lighter and smaller than the SATA SSD.

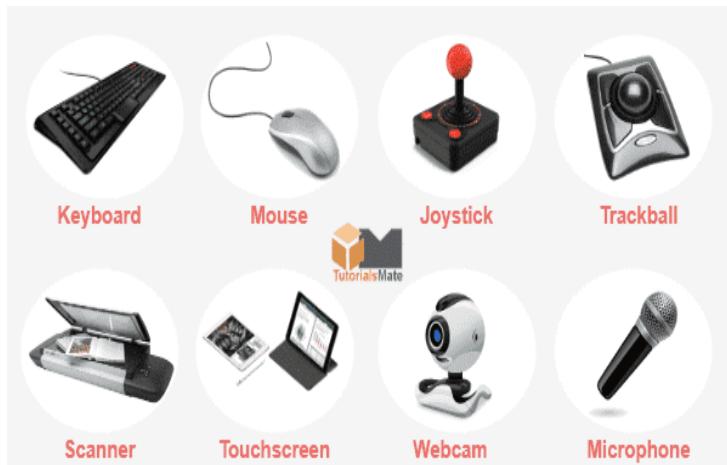


HDD (HARD DISK DRIVE)

HDD is an electro mechanical storage device, which is an abbreviation of hard disk drive. It uses magnetic storage for storing and retrieving the digital data. It is a non-volatile storage device. Hard disk is installed internally in our computer systems, which is connected directly to the disk controllers of the motherboard. HDD means data is retained when our computer system is shut down.



INPUT DEVICES /UNIT



An input device is essentially a piece of instrument or hardware that allows users to provide data, information, or control instructions to a computer used for interaction and control. Data is entered into a computer in a raw format, which is converted into computer understandable language by input devices and processed by a central processing unit (CPU) to produce output. Some common types of input devices are:

- ***KEYBOARD***
- ***SCANNER***
- ***MOUSE***

KEYBOARD

The keyboard is one of the primary input devices, which helps in entering data and commands in a computer. A normal keyboard is usually has a variety of keys, such as alphabetic character keys, function keys, number keys, arrow keys, and control keys. The keyboard can be connected to a computer using USB or BLUETOOTH.



SCANNER

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.



MOUSE

Mouse is the most common and very popular pointing device that helps interact with a computer through a process called 'point and click'. This is mainly used to move a cursor on the computer's screen and click on the corresponding object using buttons (usually left, right, and middle key roller buttons).



PROCESSING UNIT

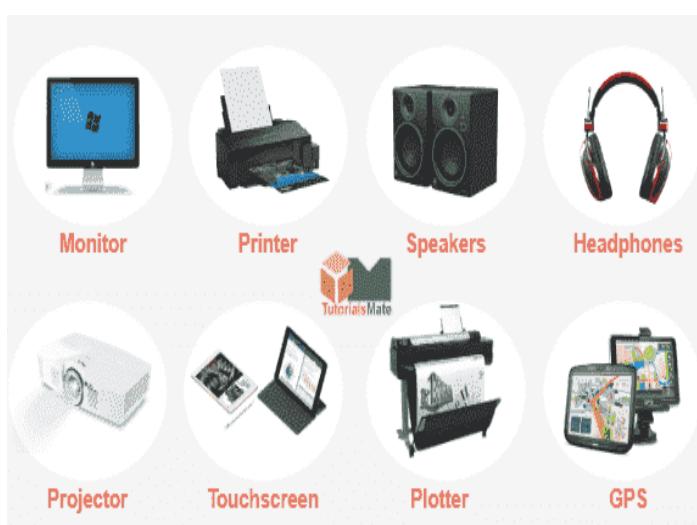
The part of a computer that performs logical and arithmetical operation on the data as specified in the instructions.

CPU (CENTRAL PROCESSING UNIT)

A central processing unit is also called a processor, central processor, or microprocessor. It carries out all the important functions of a computer. It stores all important programs like operating systems and application software. It is often referred to as the brain of the computer.



OUTPUT DEVICES/UNITS



The output device displays the result of the processing of raw data that is entered in the computer through an input device. There are a number of output devices that displays output in different ways such as text, images, hard copies, and audio or video.

Some popular output devices are:

- **MONITOR**
- **SPEAKERS**
- **PROJECTOR**

MONITOR

A monitor is a piece of computer hardware that accepts data from a computer and displays it on the system screen through the computers video card. Monitors have the ability to display information at much higher resolution. Additionally, these are much like televisions and also known as video screen, display, video display terminal, or video display unit.



SPEAKER

The most common output devices, speakers accept sound data from a computer and play the sounds for users to hear.



PROJECTOR

Projector is an output device that accepts data from a computer and projects that data or information as a picture onto a wall or screen or any large surface.



INTERFACING PORTS

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

An interfacing port, also known as a communication port, is a physical socket on a device that allows it to connect to other devices and exchange data. It acts as a gateway for sending and receiving information between different electronic systems.

USB, Keyboard and Mouse



Storage / Disk



Network / Communications



Audio



Video



Power



- **Serial port(COM Port):** A serial port is also called a communication port and they are used for connection of external devices like a modem, mouse, or keyboard (basically in older PCs). Serial cables are cheaper to make in comparison to parallel cables and they are easier to shield from interference. There are two versions of it, which are 9 pin model and 25 pin model. It transmits data at 115 KB/sec.
- **Parallel Port (LPT port):** Parallel ports are generally used for connecting scanners and printers. It can send several bits at the same time as it uses parallel communication. Its data transfer speed is much higher in comparison with the serial port. It is a 25 pin model. It is also known as Printer Port or Line Printer Port.
- **USB (Universal Serial Bus):** In 1997 USB was first introduced. This can connect all kinds of external USB devices, like external hard disk, printer, scanner, mouse, keyboard, etc. There are minimum of two USB Ports provided in most of the computer systems. It is a kind of new type serial connection Port that is much faster than the old serial Ports and These USB Ports are much smarter and more versatile, as it allows the “daisy chaining” of up to 127 USB peripherals connected to one port. The data transfer rate in this is Data12 megabits per second. It also provides plug & plays communication.
- **PS/2 Port:** PS/2 ports are special ports used for connecting old computer keyboard and mouse. It was invented by IBM. In old computers, there are minimum of two PS/2 Ports, each for the keyboard and the mouse. It is a 6 pin mini Din connector.
- **VGA Port:** VGA ports also known as Video Graphic Array connector are those which connect the monitor to a computer's video card. VGA port has 15 holes and it is similar to the serial port connector. But VGA Ports have holes in it and the serial port connector has pins in it.
- **Sockets:** Microphones and speakers are connected with the help of Sockets to the sound card of the computer.

- **FireWire Port:** The IEEE 1394 interface, which is developed in the late 1980s and early 1990s by Apple as FireWire. It can transfer large amount of data at very high speed. It is used to connect camcorders and video equipment to the computer. It comes up with three variants which are 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector, and 9-Pin FireWire 800 connector
- **Infrared Port:** An Infrared(IR) port is used to sends and receives infrared signals from other devices. It is a kind of wireless type port with a limited range of 5-10ft.
- **Game Port:** These ports are used previously to connect a joystick to a PC. But nowadays it is replaced by USB ports.
- **Modem Port:** As the name suggests, a Modem port is used to connects a PC's modem to the telephone network.
- **Digital Video Interface(DVI) Port:** DVI Port is used to connects LCD(flat panel) monitor to the computer's high-end video graphic cards and it is very popular among video card manufacturers.
- **Ethernet Port:** Ethernet Port helps to connect to a network and high-speed Internet(provided by LAN or other sources). It connects the network cable to a computer and resides in a Ethernet card. It provides a data travel speed of 10 Mb to 1000 Mb(megabits) per second.

DESKTOP

A desktop computer is a personal computer designed for regular use at a single location on or near a desk due to its size and power requirements. The most common configuration has a case that houses the power supply, motherboard (a printed circuit board with a microprocessor as the central processing unit, memory, bus, certain peripherals and other electronic components), disk storage (usually one or more hard disk drives, solid state drives, optical disc drives, and in

early models a floppy disk drive), a keyboard and mouse for input; and a computer monitor, speakers, and, often, a printer for output. The case may be oriented horizontally or vertically and placed either underneath, beside, or on top of a desk.

SERVER OPERATING SYSTEM

A server operating system is a type of operating system that is designed to be installed and used on a server computer. It is advanced version of operating system, having features and capabilities required within a client-server architecture or similar enterprise computing environment.

Example: Windows Operating System, Linux Operating System

DATA SERVER

A data server is a software program/platform used to provide database service like storing, processing, and securing data.

FILE SERVERS

File servers store and distribute files. Multiple clients or users may share files stored on a server. In addition, centrally storing files offers easier backup or fault tolerance solutions than attempting to provide security and integrity for files on every device in an organization. File server hardware can be designed to maximize read and write speeds to improve performance.

MAIL SERVERS

Mail servers are a very common type of application server. Mail servers receive emails sent to a user and store them until requested by a client on behalf of said user. Having an email server allows for a single machine to be properly configured and attached to the network at all times. It is then ready to send and receive messages rather than requiring every client machine to have its own email subsystem continuously running.

WEB SERVERS

One of the most abundant types of servers in today's market is a web server. A web server is a special kind of application server that hosts programs and data requested by users across the Internet or an intranet. Web servers respond to requests from browsers running on client computers for web pages, or other web-based services. Common web servers include Apache web servers, Microsoft Internet Information Services (IIS) servers and Nginx servers.

Server-class computers:

BLADE SERVERS

The original computer server hardware was large and stored in racks that could hold hundreds of pounds. Over time, however, faster means of connecting hardware resulted in parts of the server being extracted from a single self-contained device. By removing hard drives, eliminating internal cooling, and the ongoing miniaturization of computing parts, servers were eventually reduced to a single thin server known as a blade server. While still stored in racks in server rooms, blade servers are smaller and can be replaced more easily.

RACK SERVERS

A rack server, also known as a rack mount server, rack-mounted server or rack mount computer, is a computer designed to be situated in a rectangular structure called a server rack. The advantages of a server rack include better space conservation for rack servers, increased scalability, maximized air flow when coupled with a cooling system and ease of regular computer maintenance and diagnostics, given that their design allows technicians and operators to easily slide rack servers in and out of them.

TOWER SERVERS

A tower server is a computer intended for use as a server and built in an upright cabinet that stands alone. The cabinet, called a tower, is similar in size and shape to the cabinet for a tower-style personal computer. This is in contrast to rack servers or blade servers, which are designed to be rack-mounted. Advantages of tower servers include: Easier cooling, because the overall

component density is fairly low. Scalability, because an unlimited number of servers can be added to an existing network.

INSTALL UBUNTU ON VIRTUALBOX

Oracle VM VirtualBox is free and open-source and being developed by oracle corporation. Oracle VirtualBox is a cross-platform virtualization application. It installs on your existing Intel or AMD-based computers, whether they are running Windows, Mac, Linux or Solaris operating systems .VirtualBox can create and run a "guest" operating system (virtual machine) in a window of the host operating system. The virtual machine provides a self-contained environment in which to experiment with new software without risking damaging changes to the host operating system

VirtualBox Installation

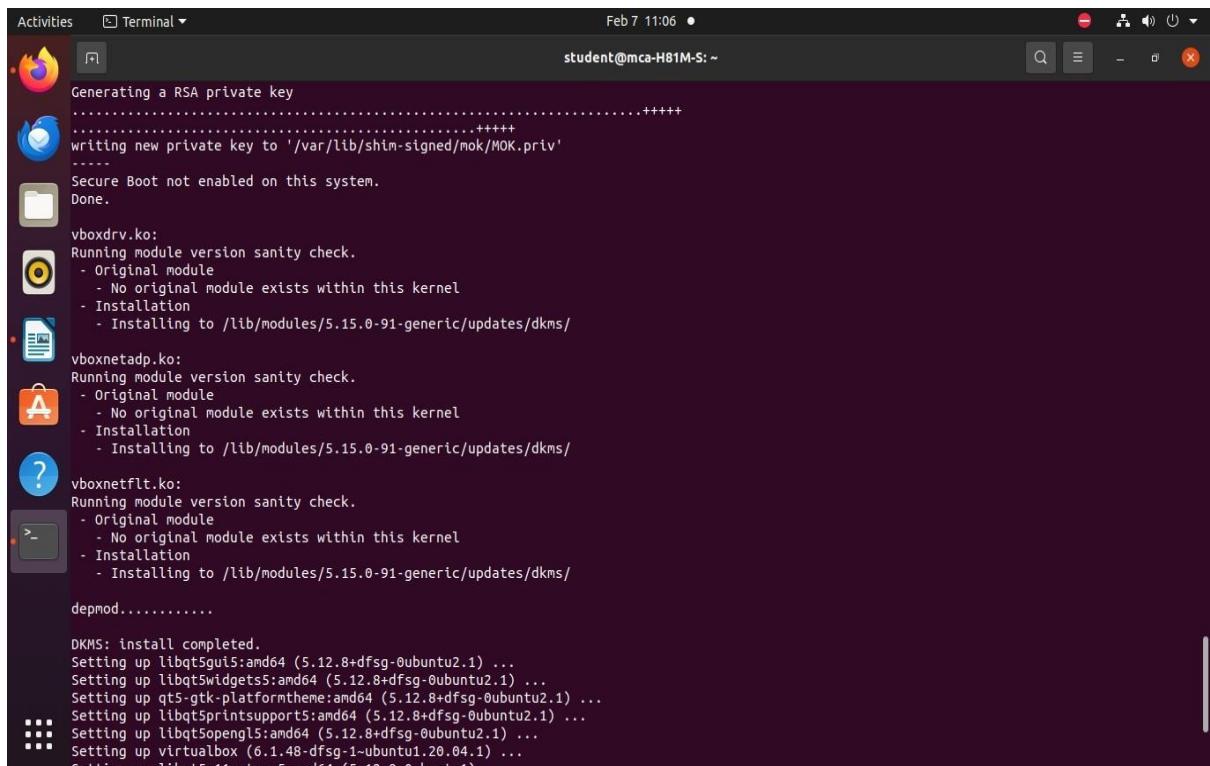
- sudo apt-get install virtualbox
 - sudo apt-get install virtualbox-ext-pack

```
Setting up libalgorithm-merge-perl (0.08-3) ...
Setting up libqt5network5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up dpkg-dev (1.19.7ubuntu3.2) ...
Setting up dkms (2.8.1-Subuntu2) ...
Setting up build-essential (12.8ubuntu1.1) ...
Setting up virtualbox-dkms (6.1.48-dfsg-1-ubuntu1.20.04.1) ...
Loading new virtualbox-6.1.48 DKMS files...
Building for 5.15.0-91-generic
Building initial module for 5.15.0-91-generic
Can't load '/var/lib/shim-signed/mok/.rnd' into RNG
140362495628608:error:2406F079:random number generator:RAND_load_file:Cannot open file:../crypto/rand/randfile.c:98:Filename=/var/lib/shim-signed/mok/.rnd
Generating a RSA private key
.....+++++
.....+++++
writing new private key to '/var/lib/shim-signed/mok/MOK.priv'
-----
Secure Boot not enabled on this system.
Done.

vboxdrv.ko:
Running module version sanity check.
- Original module
  - No original module exists within this kernel
- Installation
  - Installing to /lib/modules/5.15.0-91-generic/updates/dkms/

vboxnetadp.ko:
Running module version sanity check.
- Original module
  - No original module exists within this kernel
- Installation
  - Installing to /lib/modules/5.15.0-91-generic/updates/dkms/

vboxnetflt.ko:
Running module version sanity check.
- Original module
  - No original module exists within this kernel
```



```

Activities Terminal Feb 7 11:06 •
student@mca-H81M-S: ~
Generating a RSA private key
.....+++++
writing new private key to '/var/lib/shim-signed/mok/MOK.priv'
-----
Secure Boot not enabled on this system.
Done.

vboxdrv.ko:
Running module version sanity check.
- Original module
  - No original module exists within this kernel
- Installation
  - Installing to /lib/modules/5.15.0-91-generic/updates/dkms/

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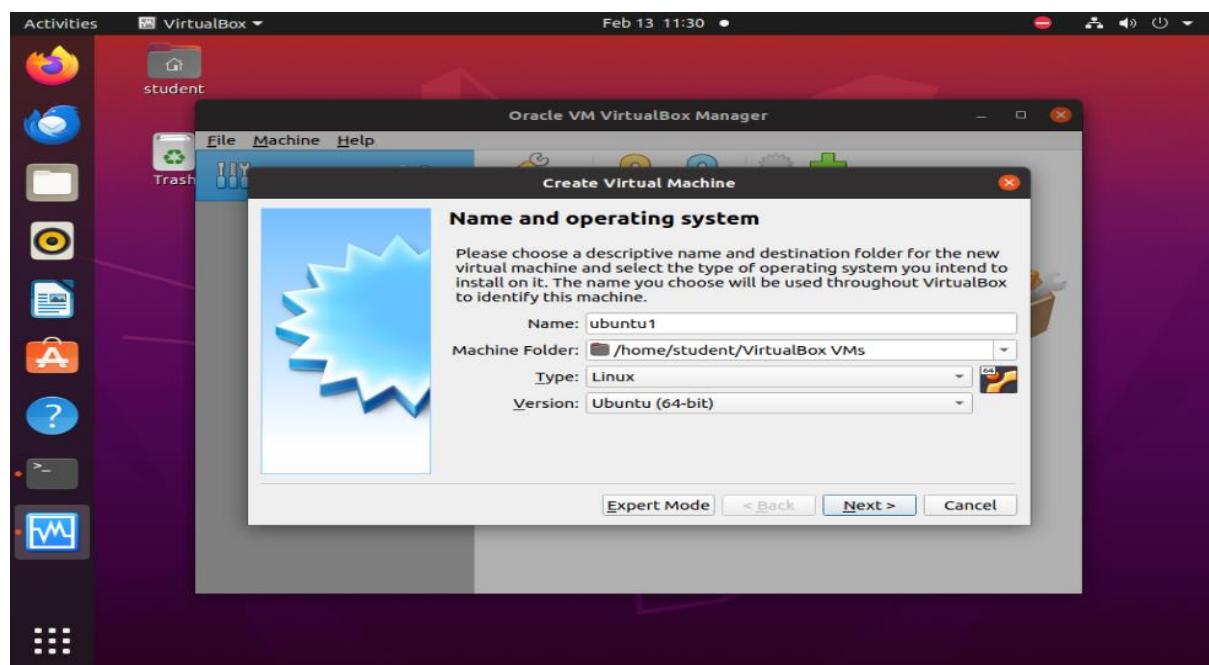
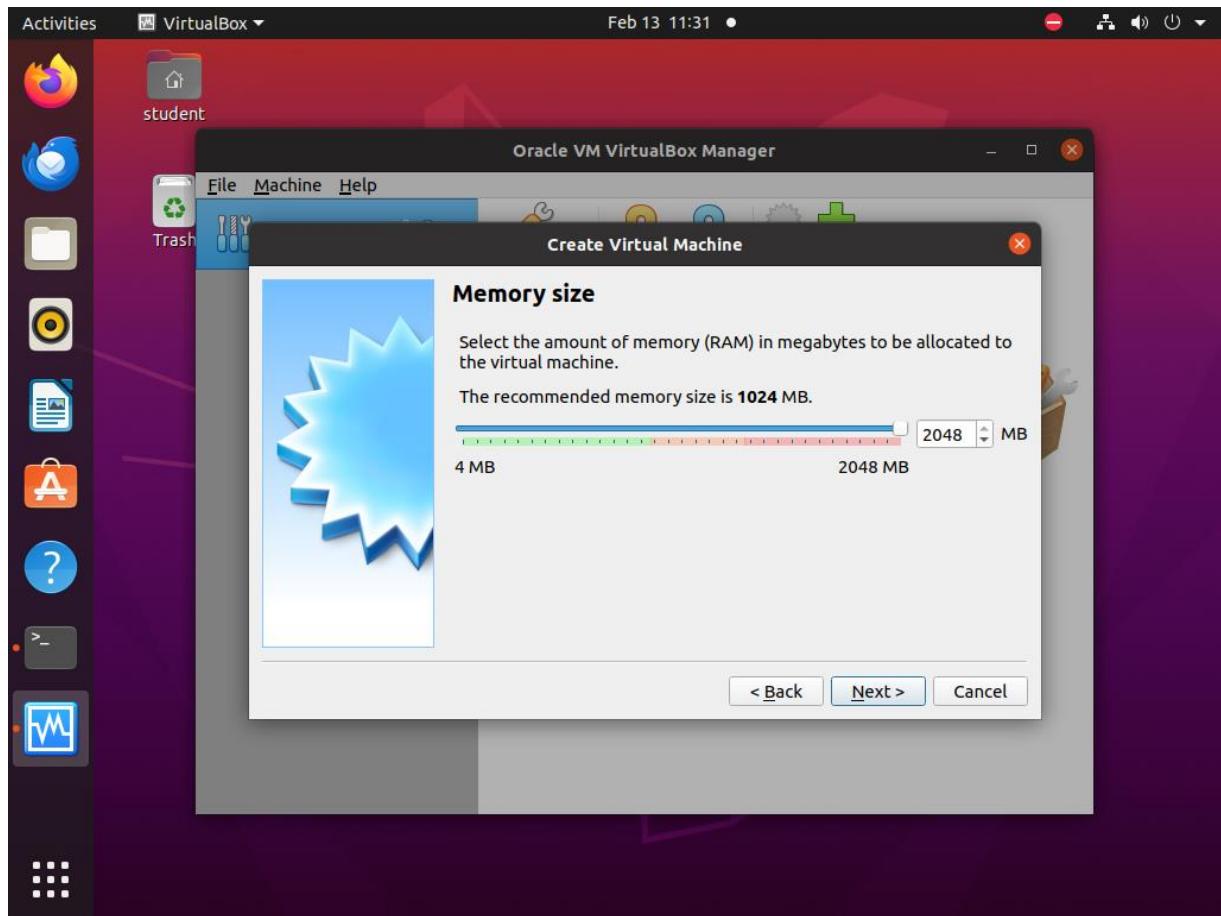
depmod.....
DKMS: install completed.
Setting up libqt5gui5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up libqt5widgets5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up qt5-gtk-platformtheme:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up libqt5printsupport5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up libqt5opengl5:amd64 (5.12.8+dfsg-0ubuntu2.1) ...
Setting up virtualbox (6.1.48-dfsg-1-ubuntu1.20.04.1) ...

```

**Create virtual machine by just clicking on this new
Click -> new
we can install ubuntu so type ubuntu and choose the type**



Click Next

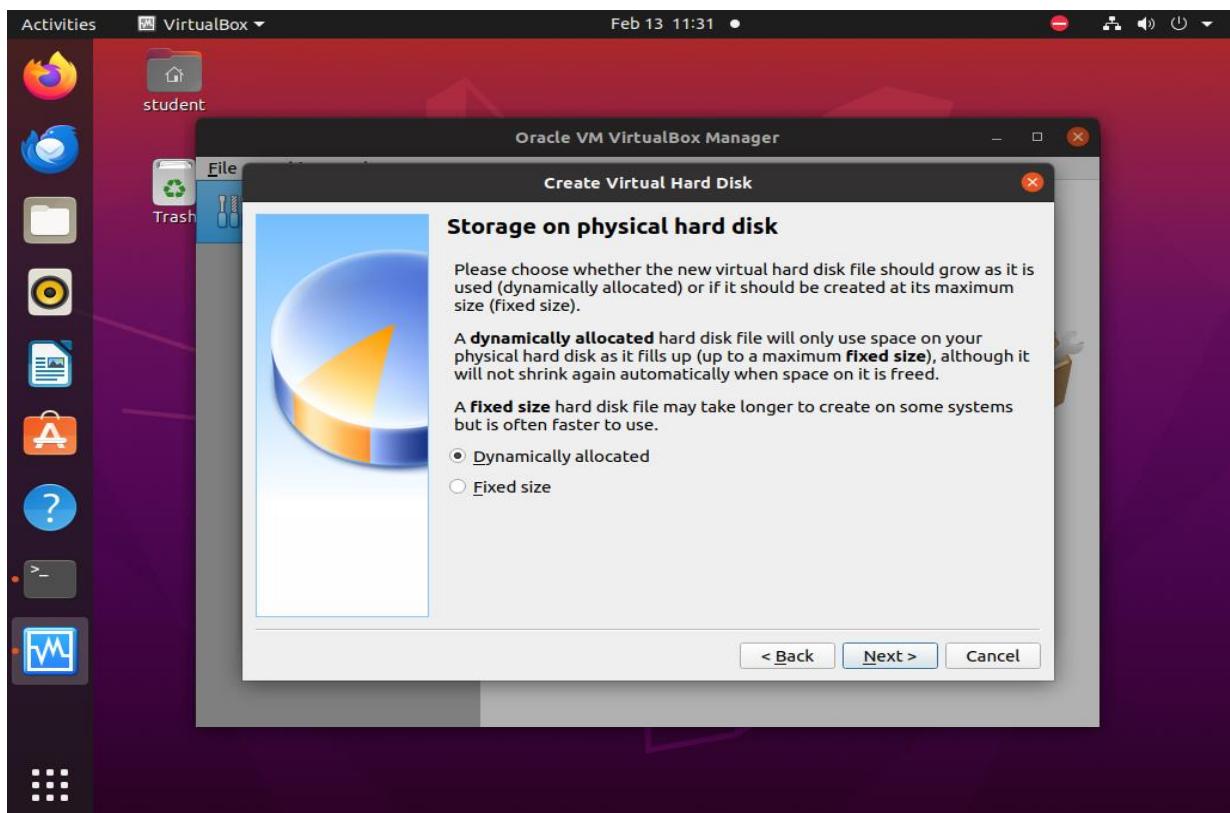


Click next



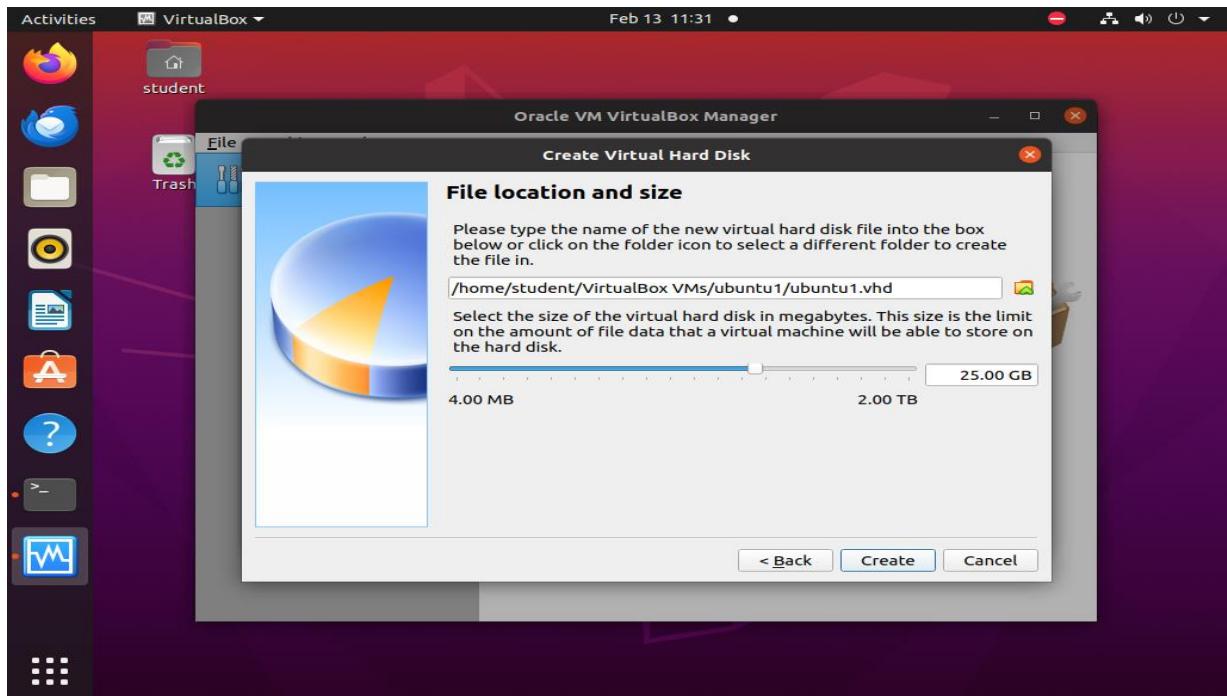
Select the Virtual hard disk

Click-> Next



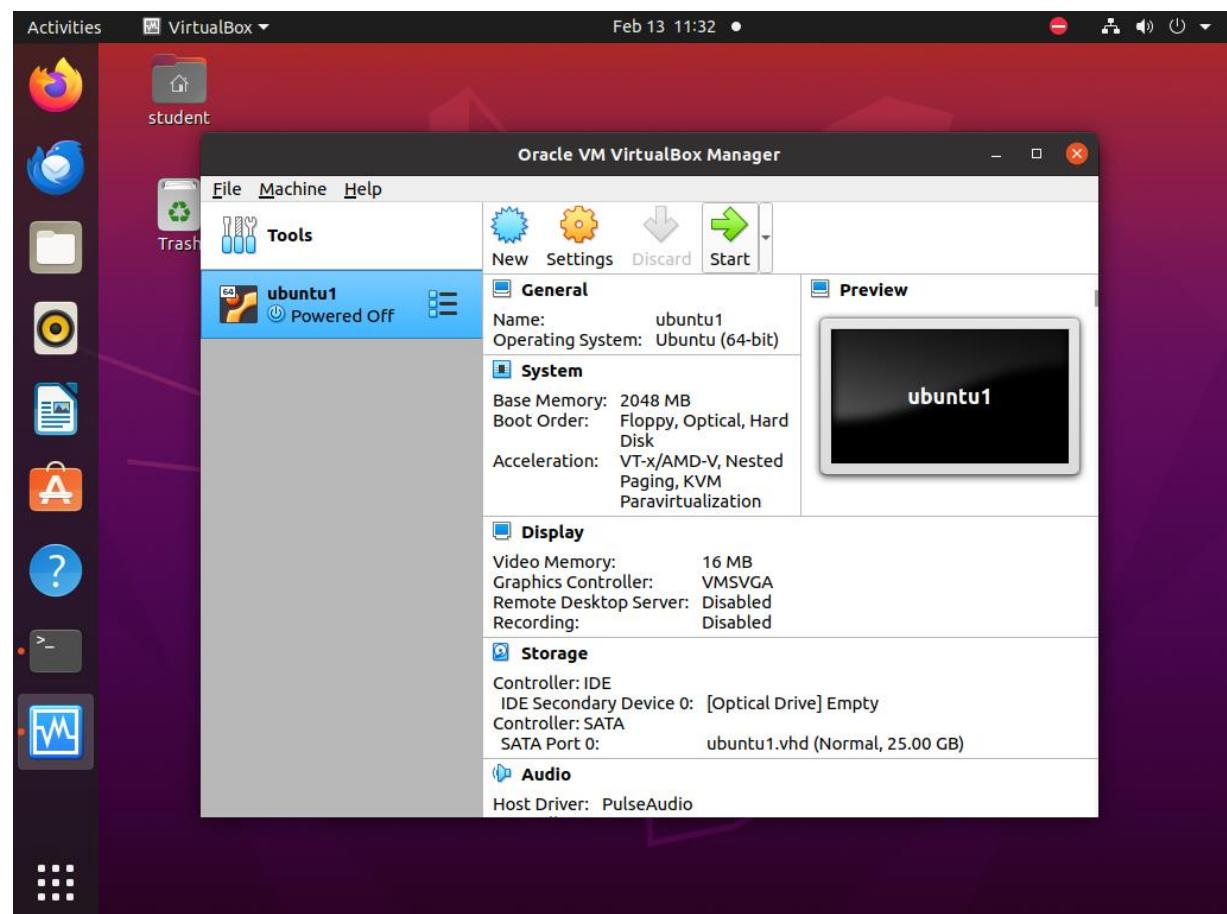
Select Dynamically allocated memory.

Click->Next

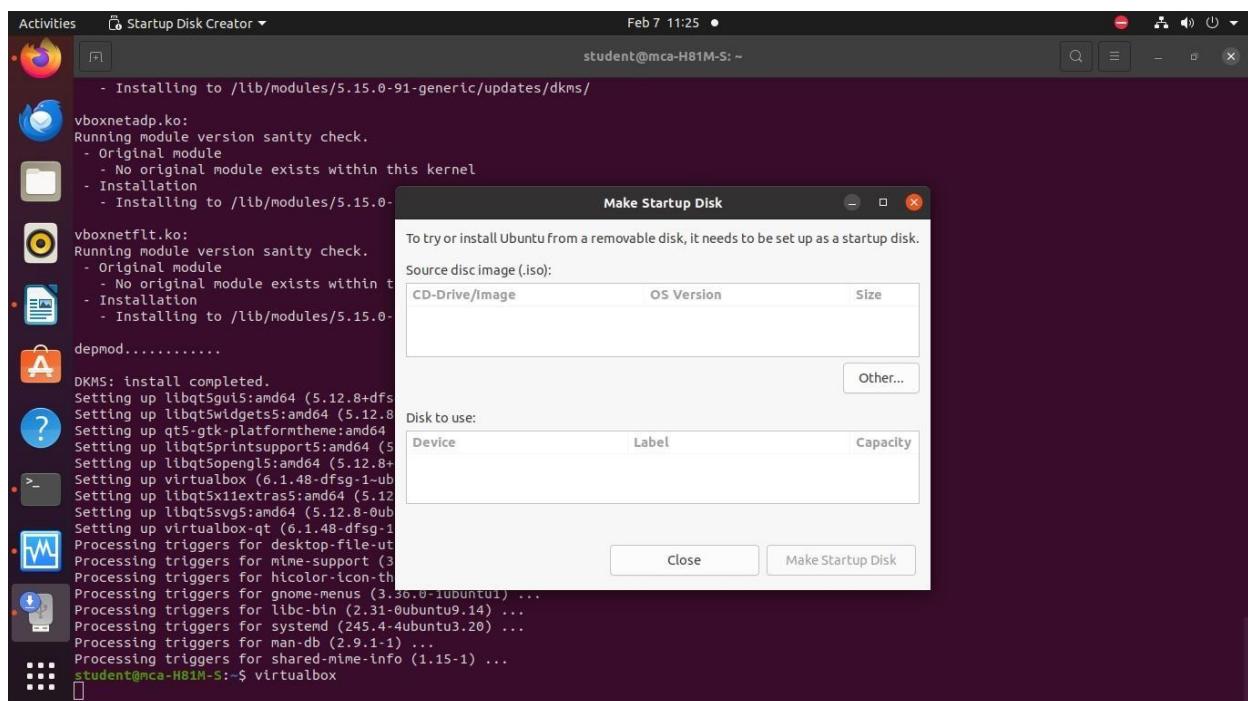
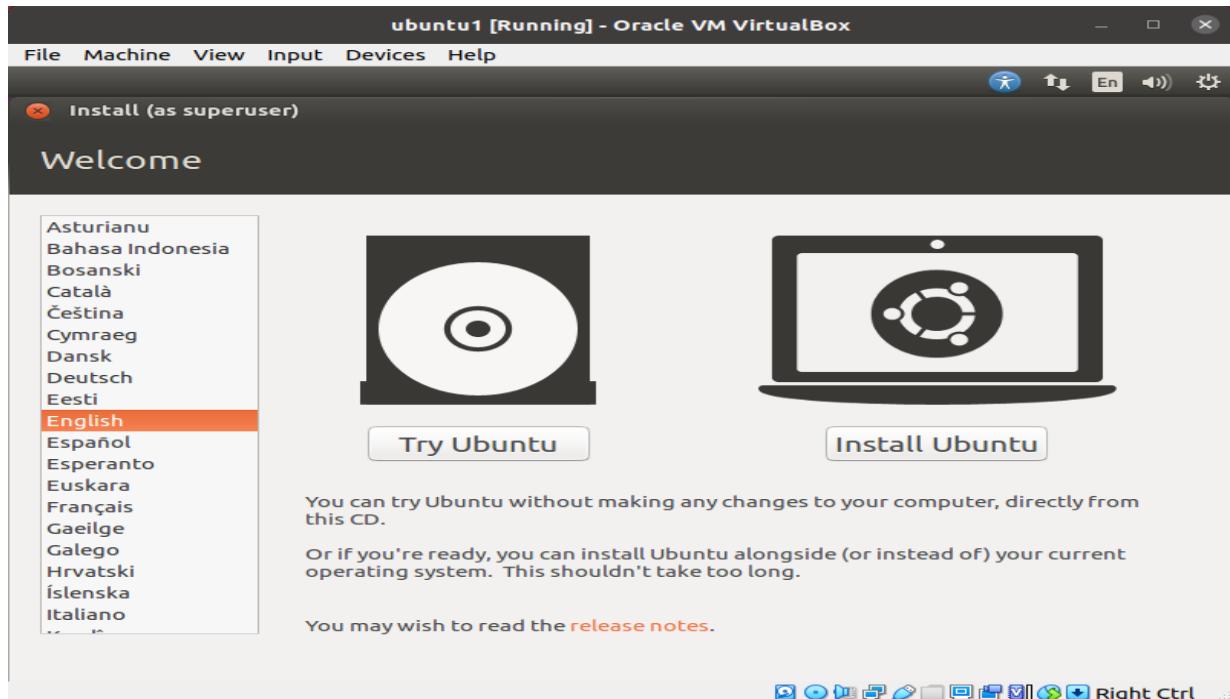


Select size of the virtualbox

Click->create



Click-> Start



EXPERIMENT 2

Aim: Study of a terminal based text editor such as Vim or Emacs. (By the end of the course, students are expected to acquire following skills in using the editor: cursor operations, manipulate text, search for patterns, global search and replace)

Basic Linux commands,

Familiarity with following commands/operations expected .

- **MAN**
- **LS, ECHO, READ**
- **MORE, LESS, CAT,**
- **CD, MKDIR, PWD, FIND**
- **MV, CP, RM, TAR**
- **WC, CUT, PASTE**
- **HEAD, TAIL, GREP, EXPR**
- **CHMOD, CHOWN**
- **REDIRECTIONS & PIPING**
- **USERADD, USERMOD, USERDEL, PASSWD**
- **DF, TOP, PS**
- **SSH, SCP, SSH-KEYGEN, SSH-COPY-ID**

TEXT EDITOR

A text editor is a type of computer program that edits plain text

Text editors are provided with operating systems and software development packages, and can be used to change files such as configuration files, documentation files and programming language source code.

Unix text editors are:

- **VIM**
- **EMACS**
- **NANO**
- **PICO**

VIM

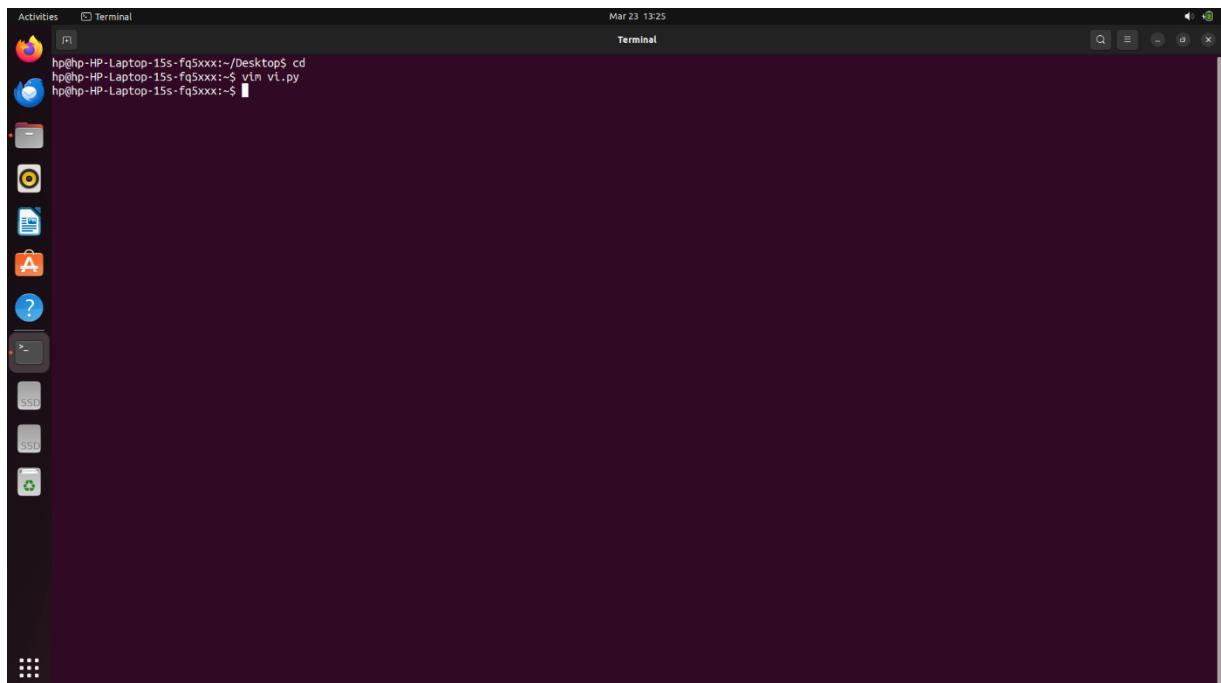
A text editor, written by Bill Joy in 1976. Short for Visual Interface. It enables fast, simple, and effective text editing mostly based on simple key bindings. It provides fast and convenient moving around files and between files. One must learn a good number of commands to be proficient in vi.

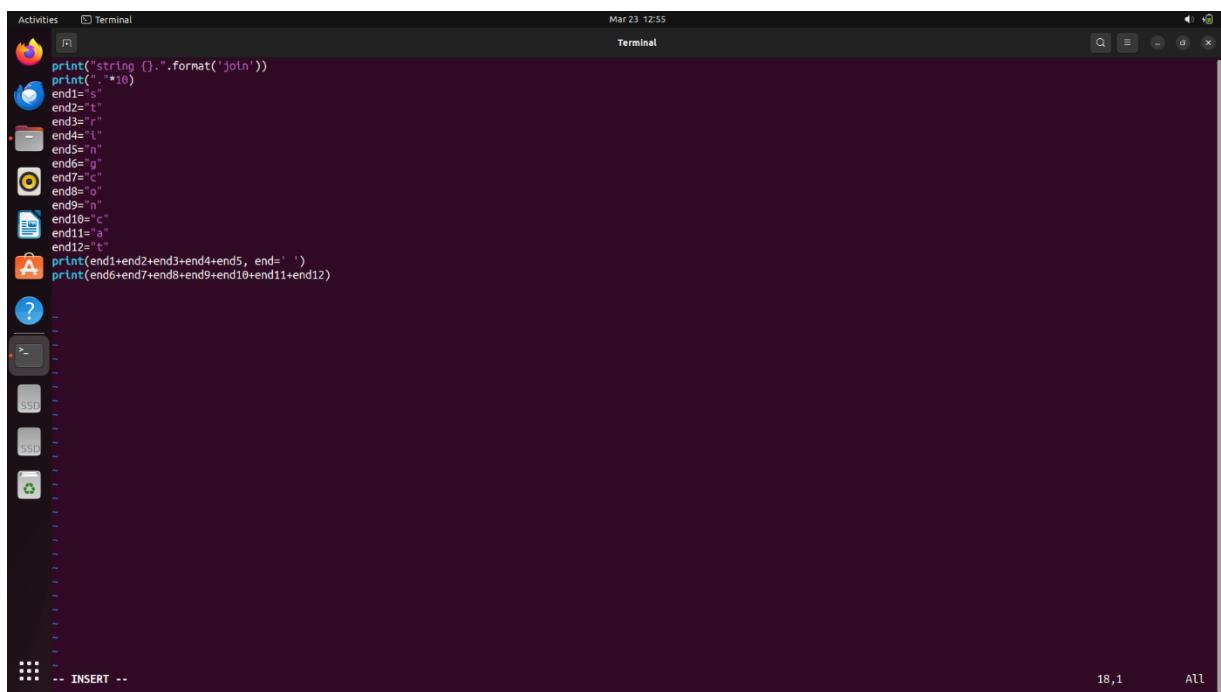
Vim has two modes:

- **COMMAND**
- **INPUT**

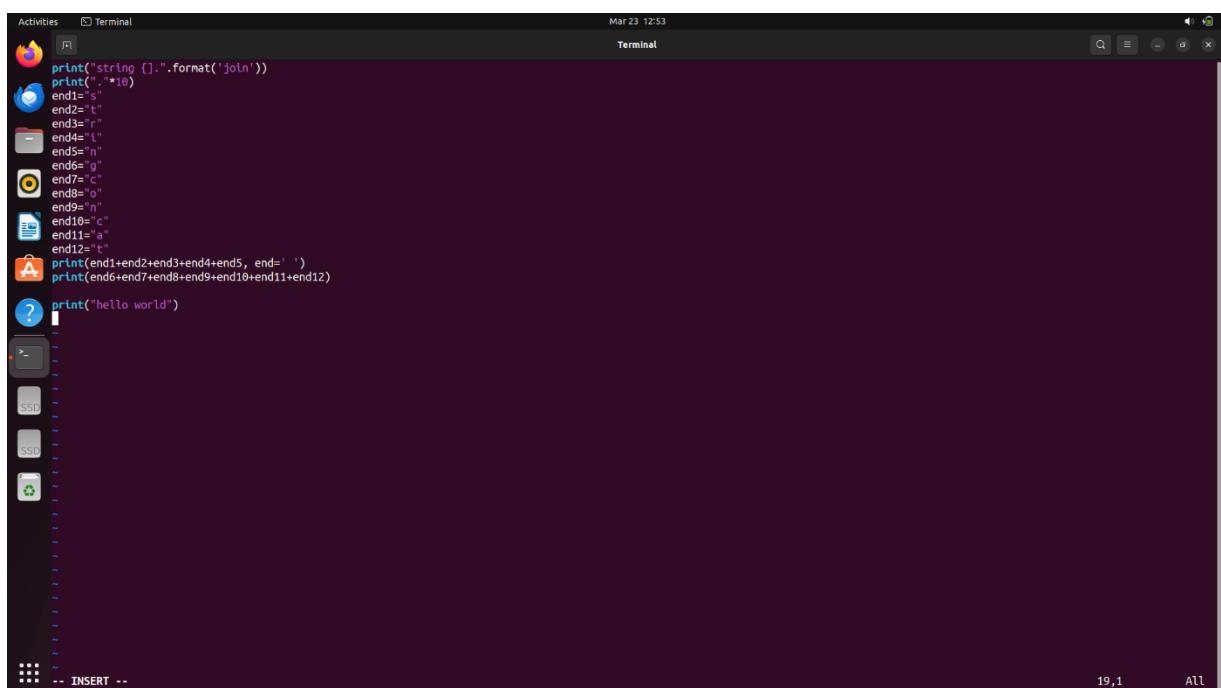
COMMAND MODE: Allows you to do global operations like saving the file, searching for a string and replacing it. Used to enter commands. It allows Text manipulation

INSERT MODE/INPUT MODE: The mode that lets you edit and enter the text. Hitting 'I' will get you to insert mode from command mode.

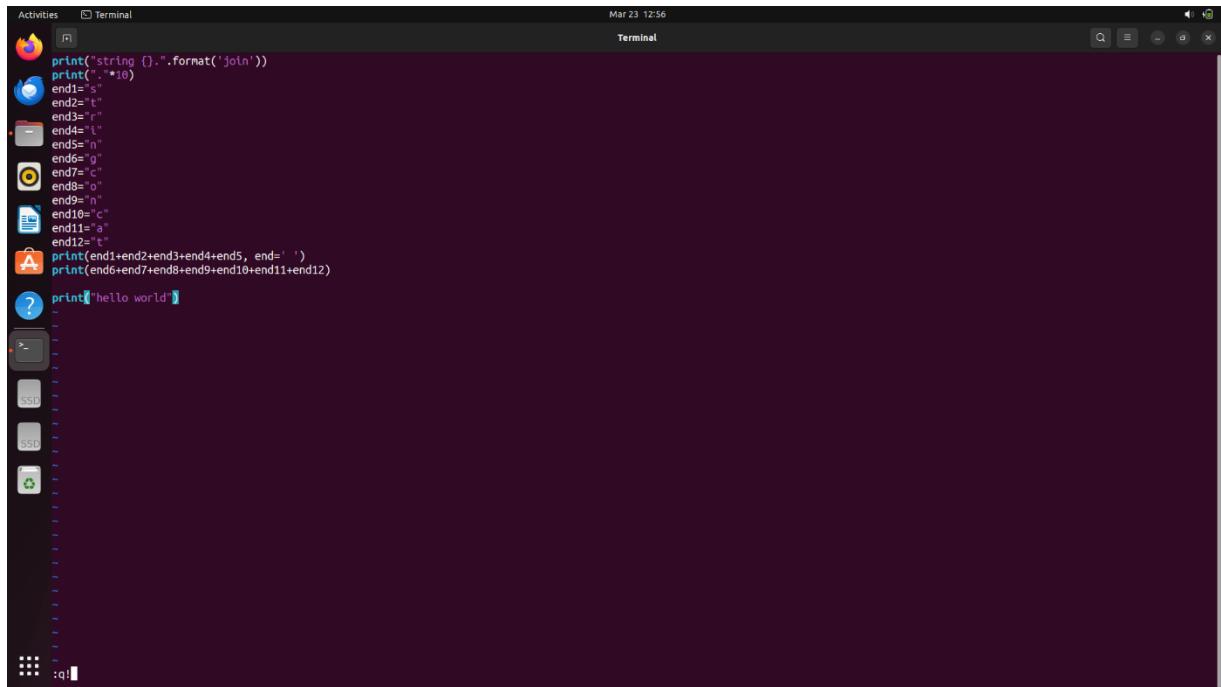




The file is get edited



ESCape : q! [Exit without save]

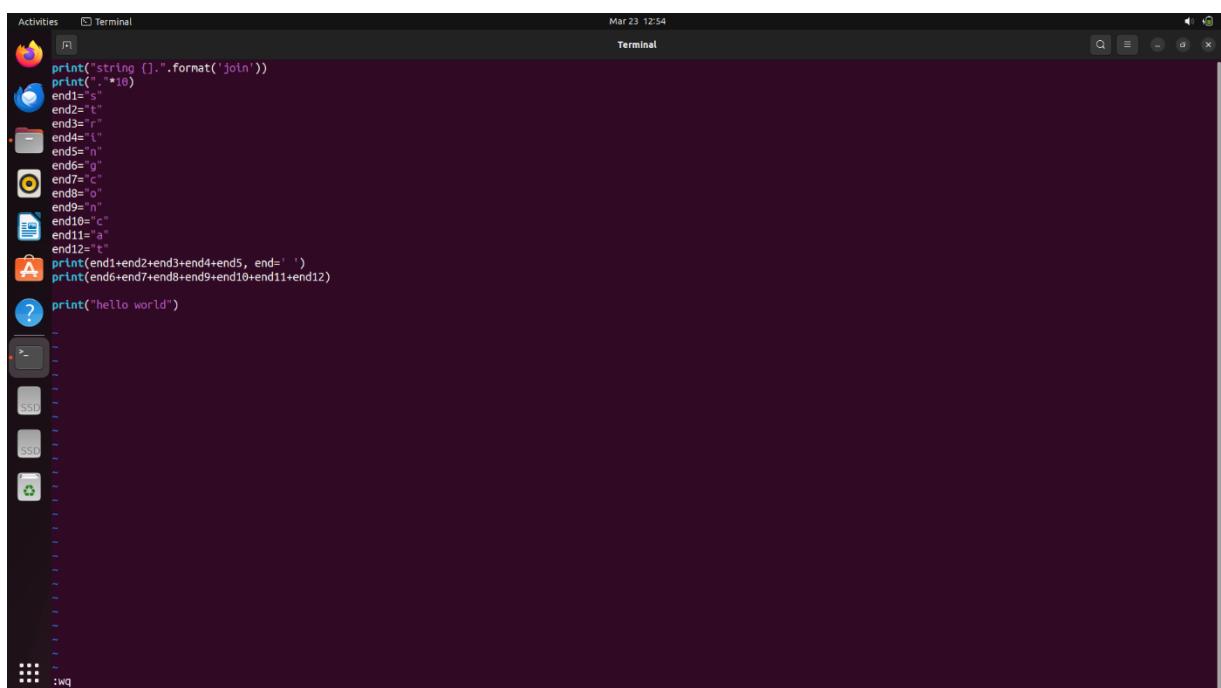


A screenshot of a terminal window titled "Terminal" on a dark-themed desktop environment. The window shows the following command being typed:

```
Activities Terminal Mar 23 12:56
:q!
```

The terminal window is dark, and the command is highlighted in white. The window title bar also displays the word "Terminal".

ESCape : wq [Save and Exit]

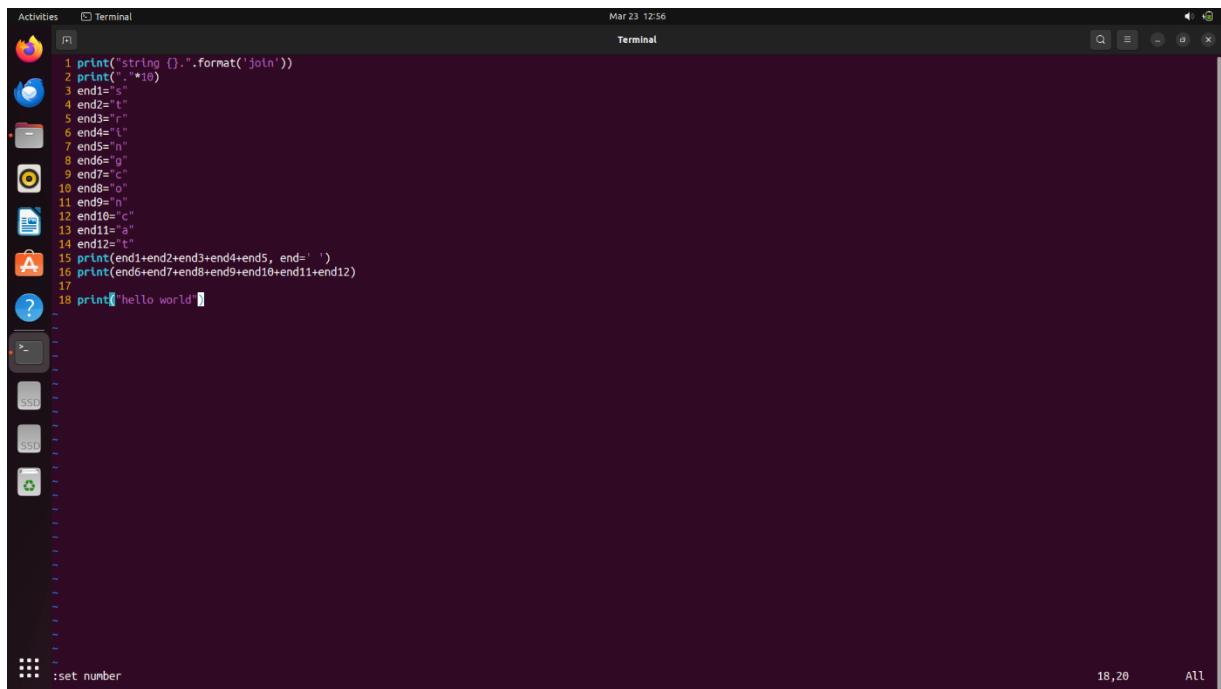


A screenshot of a terminal window titled "Terminal" on a dark-themed desktop environment. The window shows the following command being typed:

```
Activities Terminal Mar 23 12:54
:wq
```

The terminal window is dark, and the command is highlighted in white. The window title bar also displays the word "Terminal".

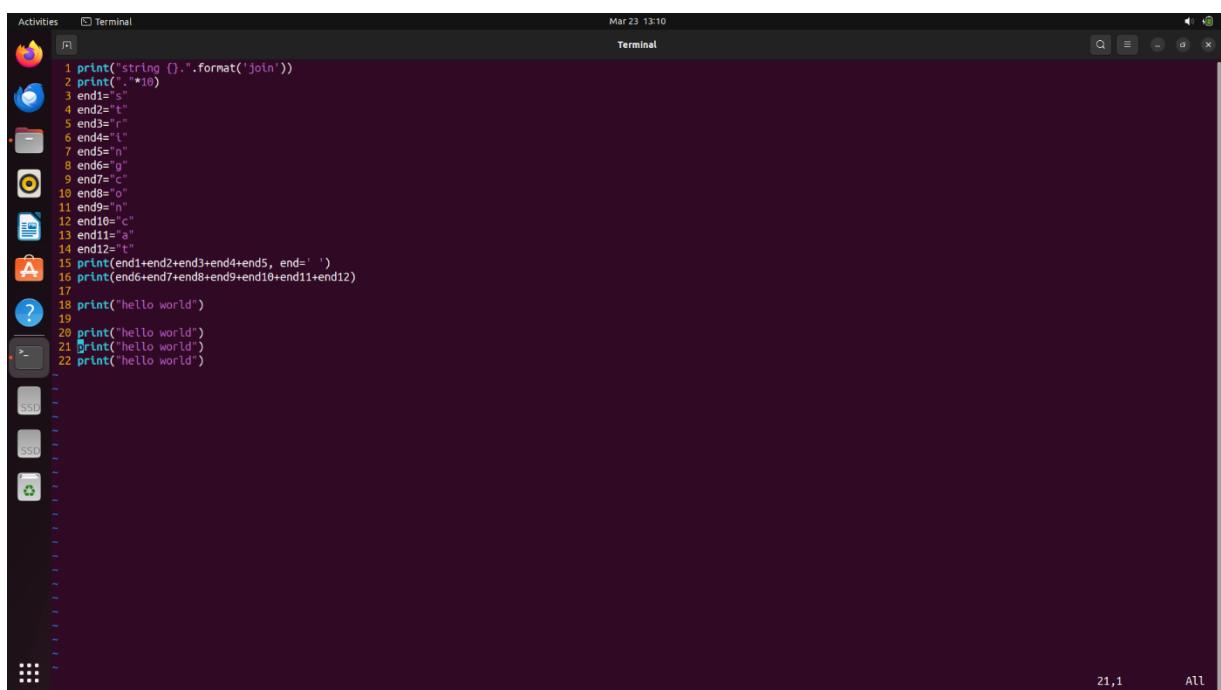
ESCape : set number [Set number to the lines]



A screenshot of a terminal window titled "Terminal" on a dark-themed desktop environment. The window shows a Python script with line numbers 1 through 18. The command `:set number` is entered at the bottom of the terminal window. The status bar at the bottom right shows "18,20" and "All".

```
1 print("string {}".format('join'))
2 print("*10)
3 end1="s"
4 end2="t"
5 end3="r"
6 end4="l"
7 end5="n"
8 end6="g"
9 end7="c"
10 end8="o"
11 end9="n"
12 end10="c"
13 end11="a"
14 end12="t"
15 print(end1+end2+end3+end4+end5, end=' ')
16 print(end6+end7+end8+end9+end10+end11+end12)
17
18 print("hello world")
```

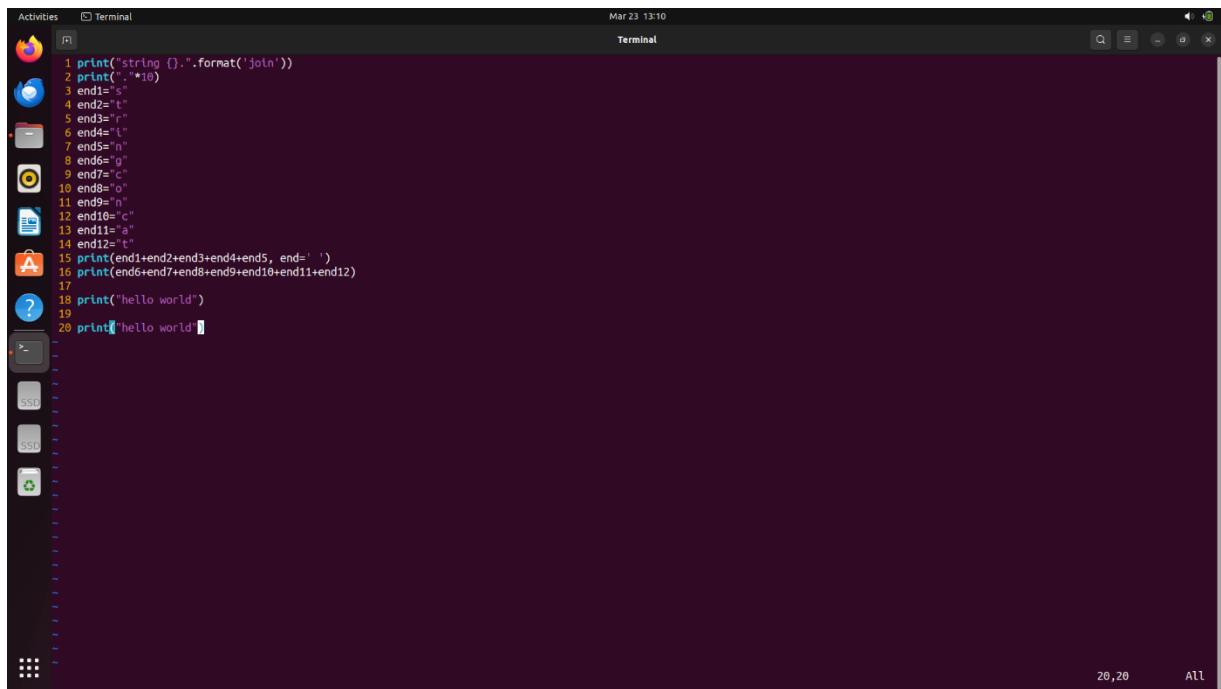
ESCape yy [Copy the line] p [Paste]



A screenshot of a terminal window titled "Terminal" on a dark-themed desktop environment. The window shows the same Python script as the previous image. The command `yy` is entered at the bottom of the terminal window, followed by `p`. The status bar at the bottom right shows "21,1" and "All".

```
1 print("string {}".format('join'))
2 print("*10)
3 end1="s"
4 end2="t"
5 end3="r"
6 end4="l"
7 end5="n"
8 end6="g"
9 end7="c"
10 end8="o"
11 end9="n"
12 end10="c"
13 end11="a"
14 end12="t"
15 print(end1+end2+end3+end4+end5, end=' ')
16 print(end6+end7+end8+end9+end10+end11+end12)
17
18 print("hello world")
19
20 print("hello world")
21 print("hello world")
22 print("hello world")
```

✖ ESCAPE dd [To delete a line]

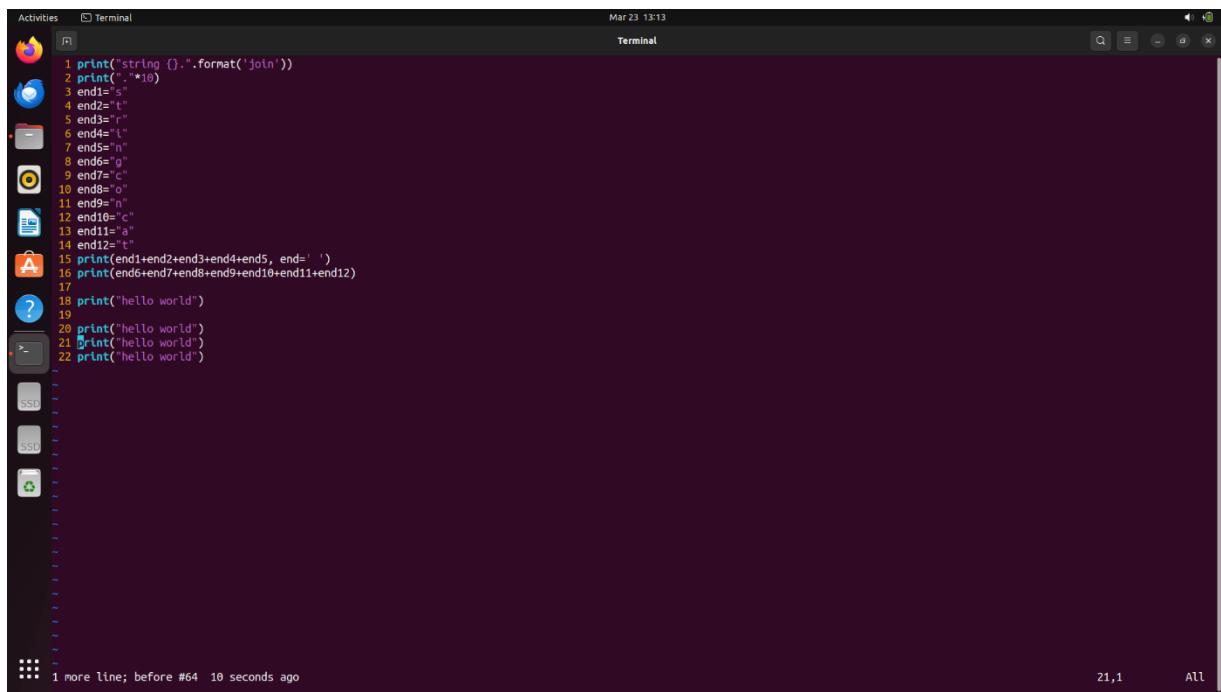


Activities Terminal Mar 23 13:10

```
1 print("string {}".format('join'))
2 print("."*10)
3 end1="s"
4 end2="t"
5 end3="r"
6 end4="l"
7 end5="n"
8 end6="g"
9 end7="c"
10 end8="o"
11 end9="n"
12 end10="c"
13 end11="a"
14 end12="t"
15 print(end1+end2+end3+end4+end5, end=' ')
16 print(end6+end7+end8+end9+end10+end11+end12)
17
18 print("hello world")
19
20 print("hello world")
```

20,20 All

✖ ESCAPE u [Undo]

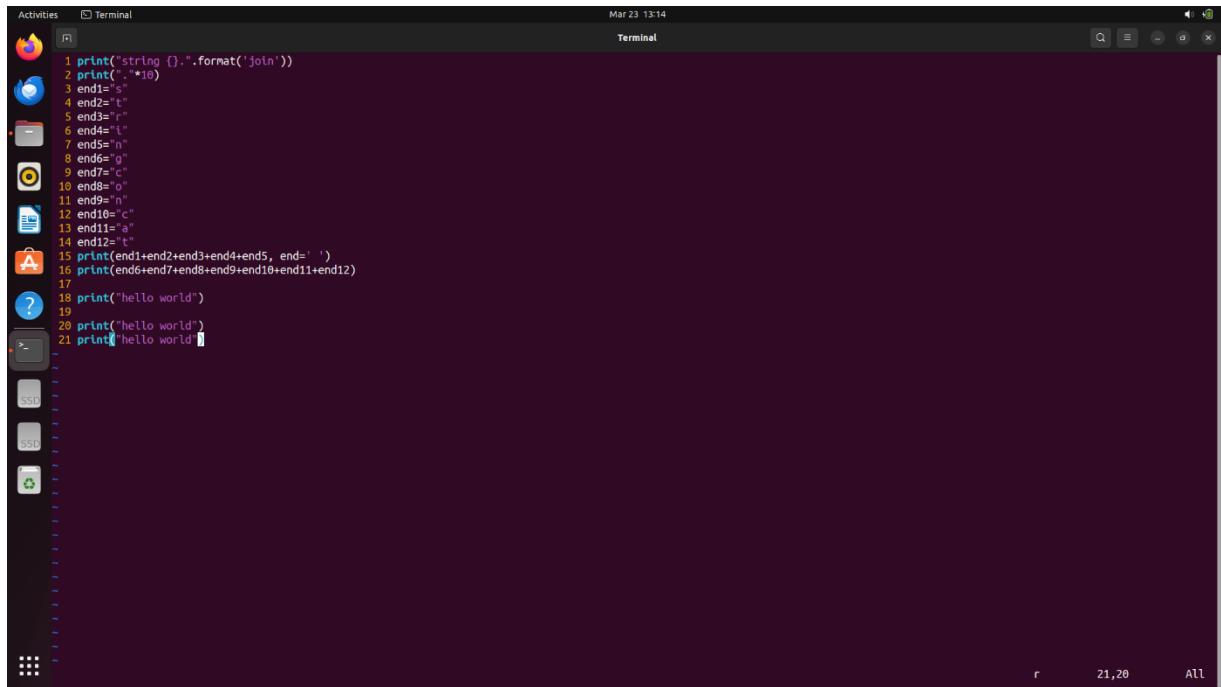


Activities Terminal Mar 23 13:13

```
1 print("string {}".format('join'))
2 print("."*10)
3 end1="s"
4 end2="t"
5 end3="r"
6 end4="l"
7 end5="n"
8 end6="g"
9 end7="c"
10 end8="o"
11 end9="n"
12 end10="c"
13 end11="a"
14 end12="t"
15 print(end1+end2+end3+end4+end5, end=' ')
16 print(end6+end7+end8+end9+end10+end11+end12)
17
18 print("hello world")
19
20 print("hello world")
21 print("hello world")
22 print("hello world")
```

1 more line; before #64 10 seconds ago 21,1 All

✖ ESCAPE ctrl+r [Redo]



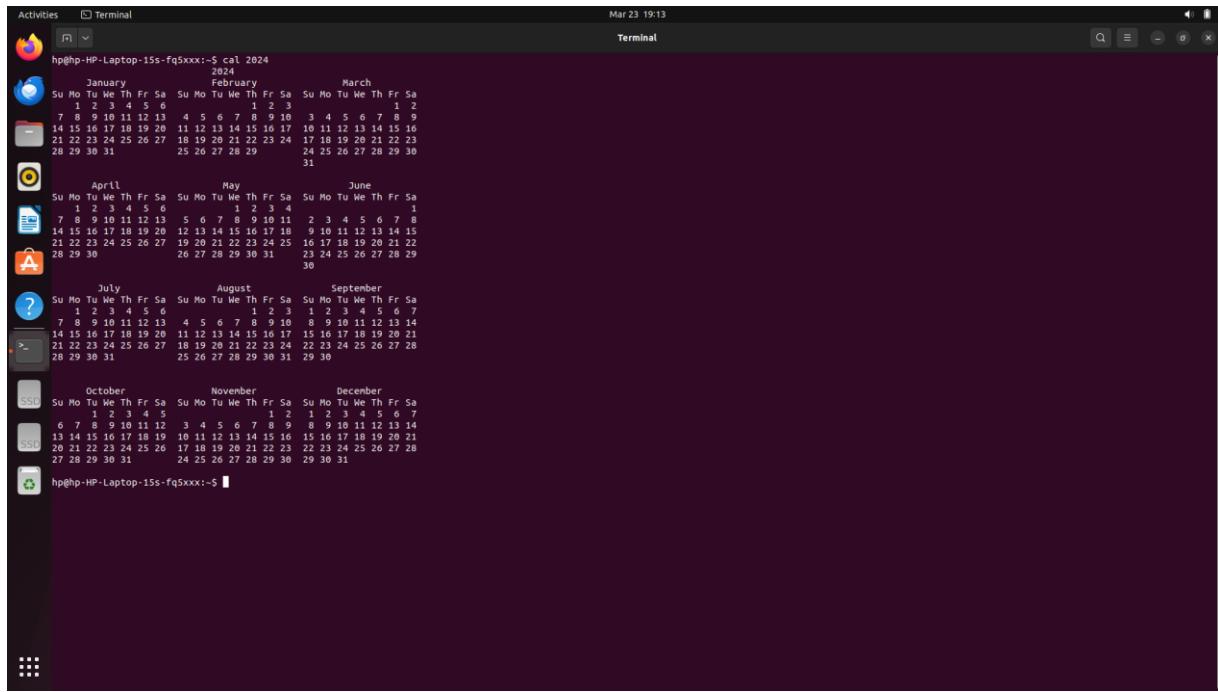
A screenshot of a Linux desktop environment. On the left, the Unity Dash (Activities) is open, showing various application icons including a terminal, file manager, and system monitor. The main window is a terminal application titled 'Terminal' with the status bar showing 'Mar 23 13:14'. The terminal window contains the following Python code:

```
1 print("string {}".format('join'))
2 print("*10)
3 end1="s"
4 end2="t"
5 end3="r"
6 end4="l"
7 end5="n"
8 end6="g"
9 end7="c"
10 end8="o"
11 end9="n"
12 end10="c"
13 end11="a"
14 end12="t"
15 print(end1+end2+end3+end4+end5, end=' ')
16 print(end6+end7+end8+end9+end10+end11+end12)
17
18 print("hello world")
19
20 print("hello world")
21 print("hello world")
```

The terminal window has a dark background and light-colored text. The status bar at the bottom right shows '21,20' and 'All'.

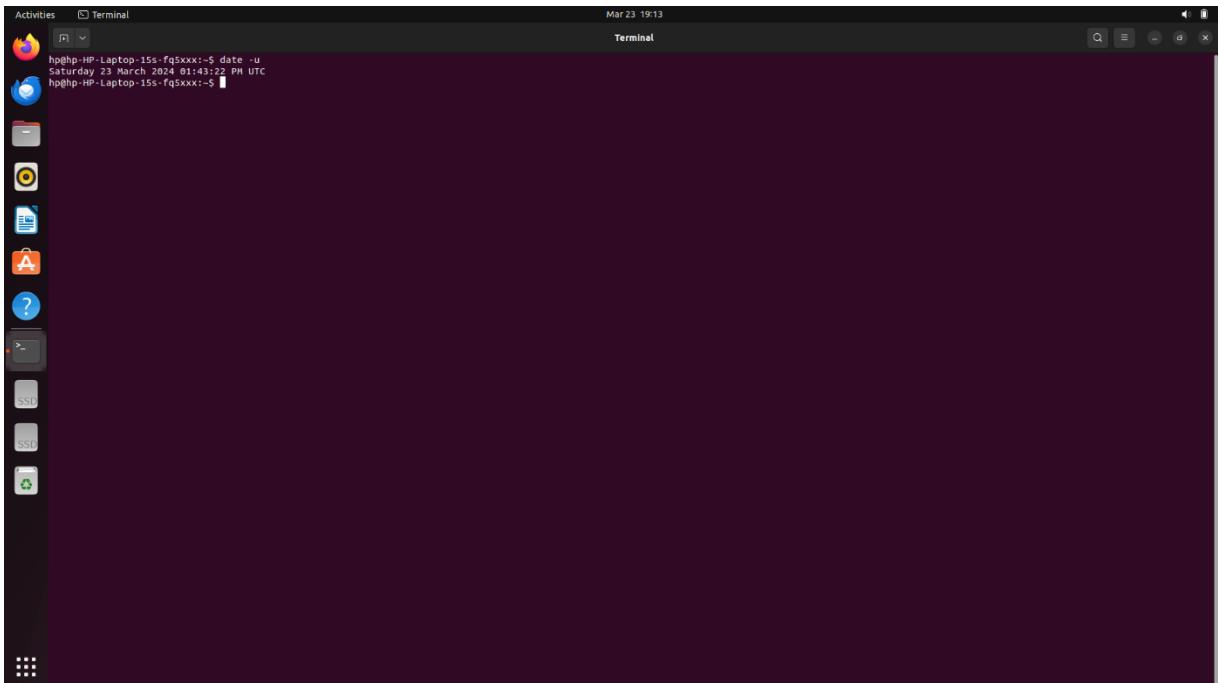
BASIC LINUX COMMANDS

Cal : Show the calender



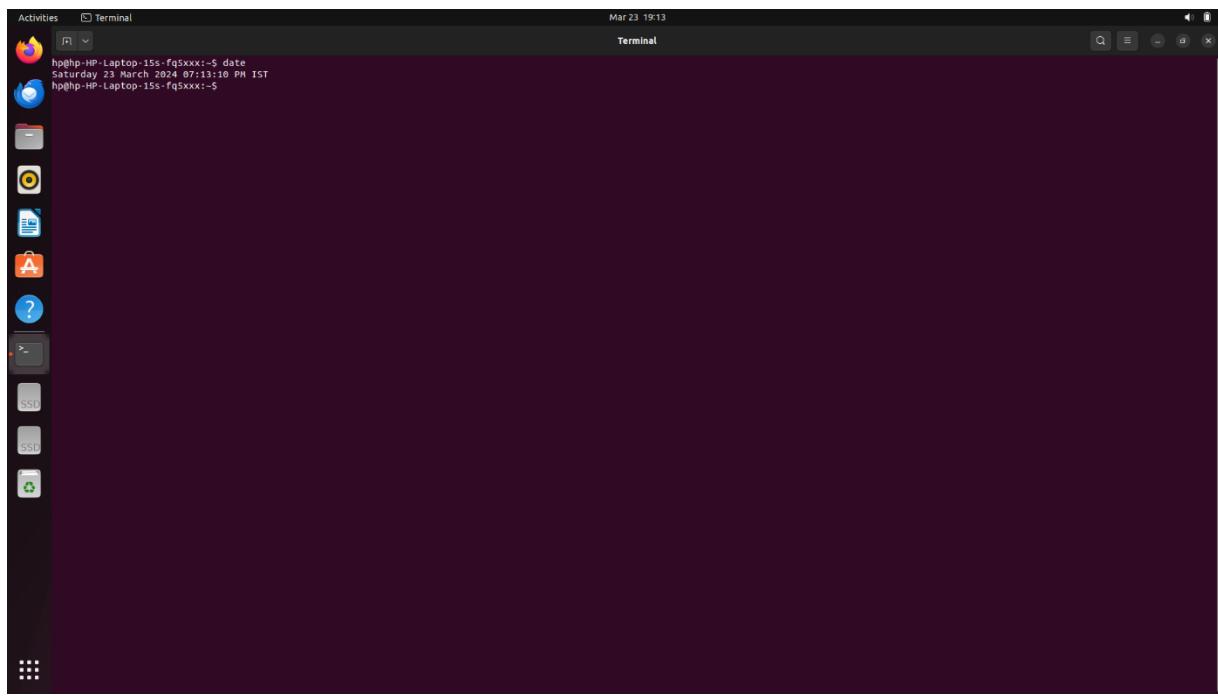
```
hp@hp-HP-Laptop-15s-fq5xxx:~$ cal 2024
          January          February          March
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6      1  2  3      1  2
 7  8  9 10 11 12 13  4  5  6  7  8  9 10  3  4  5  6  7  8  9
14 15 16 17 18 19 20 11 12 13 14 15 16 17 18 11 12 13 14 15 16
21 22 23 24 25 26 27 18 19 20 21 22 23 24 17 18 19 20 21 22 23
28 29 30 31      25 26 27 28 29      24 25 26 27 28 29 30
          April           May           June
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6      1  2  3  4      1
 7  8  9 10 11 12 13  5  6  7  8  9 10 11  2  3  4  5  6  7  8
14 15 16 17 18 19 20 12 13 14 15 16 17 18  9 10 11 12 13 14 15
21 22 23 24 25 26 27 19 20 21 22 23 24 25 16 17 18 19 20 21 22
28 29 30 31      26 27 28 29 30 31      23 24 25 26 27 28 29
          July           August          September
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5      6  7  8  9  10  11  12  13  14
 7  8  9 10 11 12 13  4  5  6  7  8  9  10 11 12 13 14
14 15 16 17 18 19 20 11 12 13 14 15 16 17 15 16 17 18 19 20 21
21 22 23 24 25 26 27 18 19 20 21 22 23 24 22 23 24 25 26 27 28
28 29 30 31      25 26 27 28 29 30 31      29 30
          October          November          December
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5      6  7  8  9  10  11  12  13  14
 6  7  8  9 10 11 12  3  4  5  6  7  8  9  8  9 10 11 12 13 14
13 14 15 16 17 18 19 10 11 12 13 14 15 16 15 16 17 18 19 20 21
20 21 22 23 24 25 26 17 18 19 20 21 22 23 24 25 26 27 28
27 28 29 30 31      24 25 26 27 28 29 30 29 30 31
```

Date -u : show the universal date

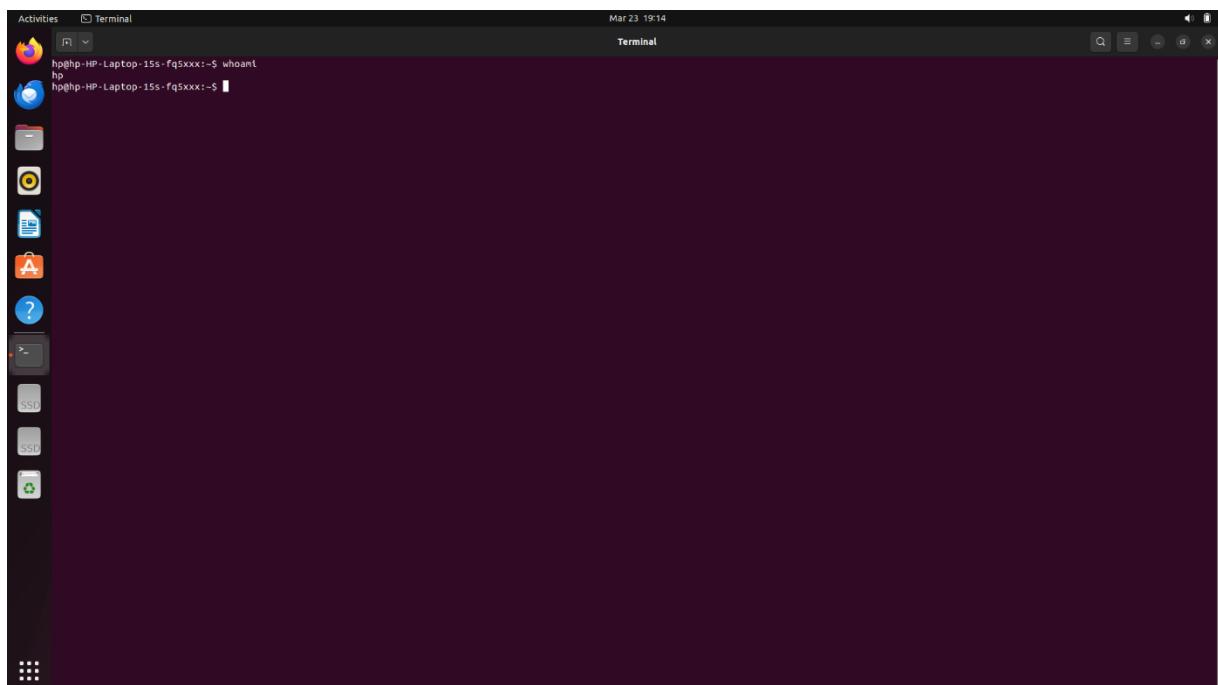


```
hp@hp-HP-Laptop-15s-fq5xxx:~$ date -u
Saturday 23 March 2024 01:43:22 PM UTC
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

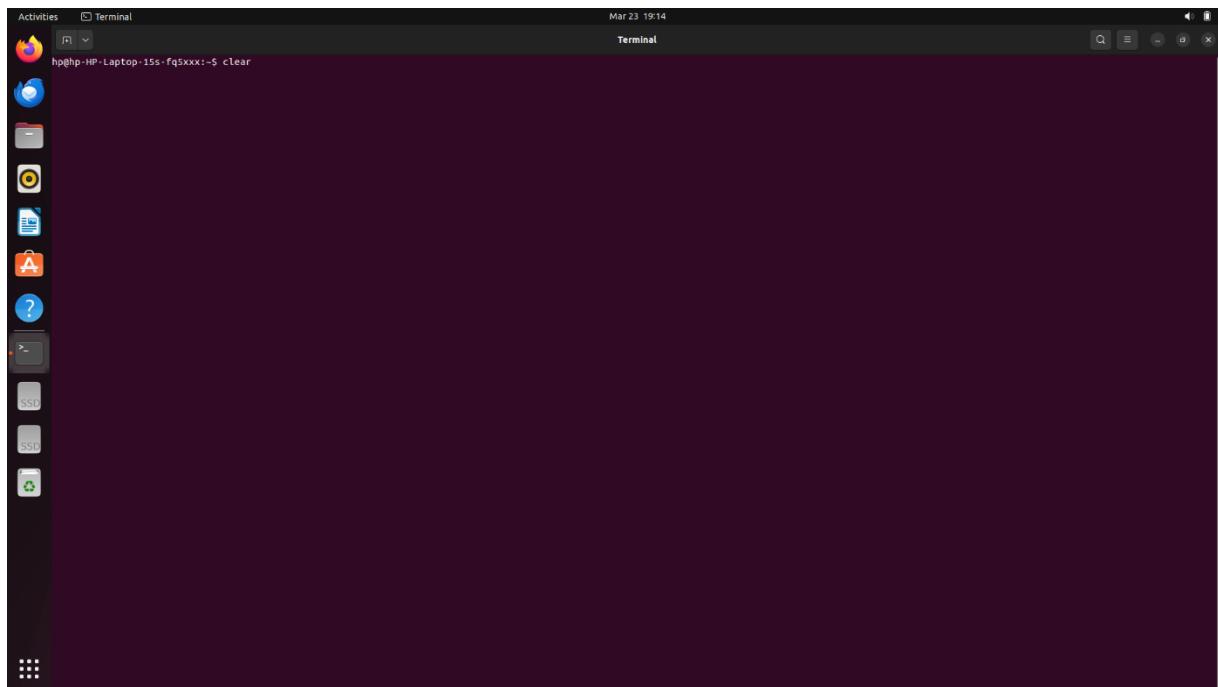
⊕ **Date** : show the date



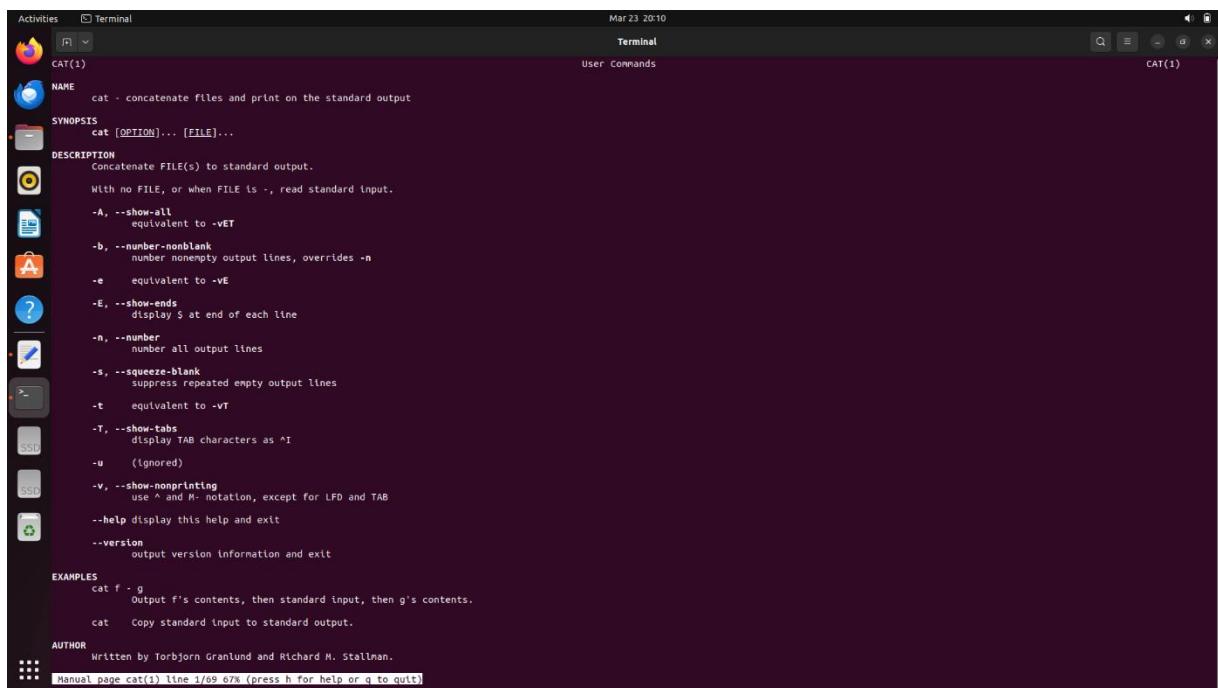
⊕ **whoami** : show the username

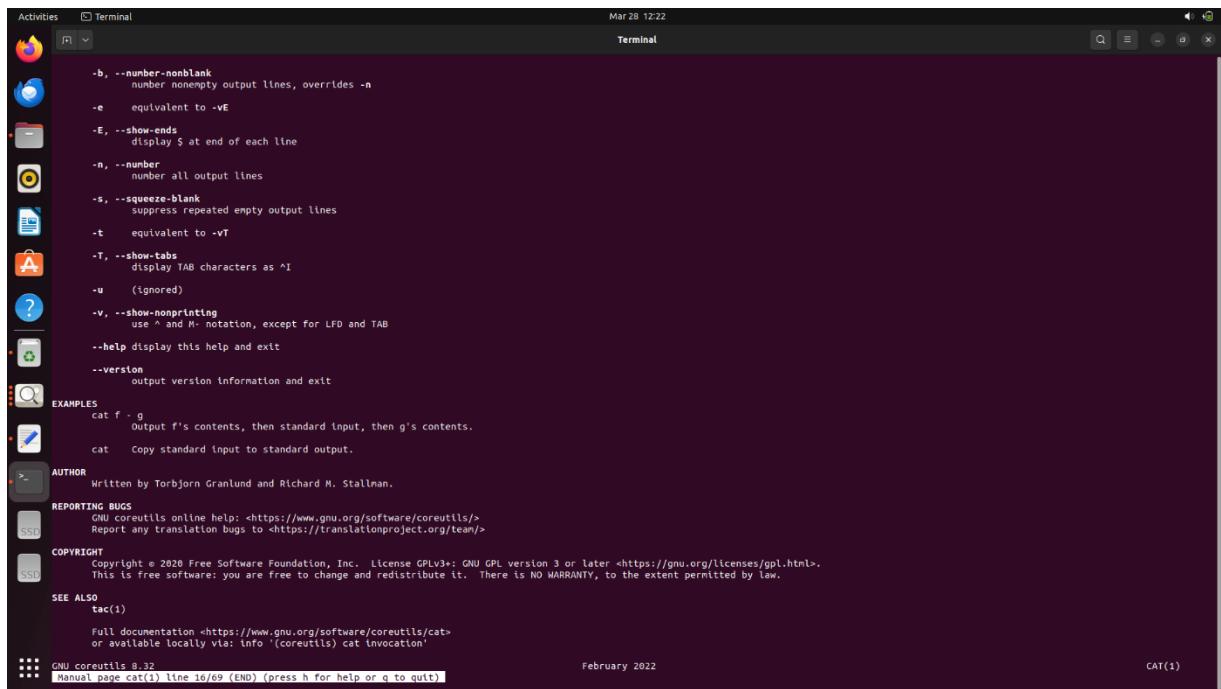


Clear : clear the terminal



1)man: Show the manual for a given command.

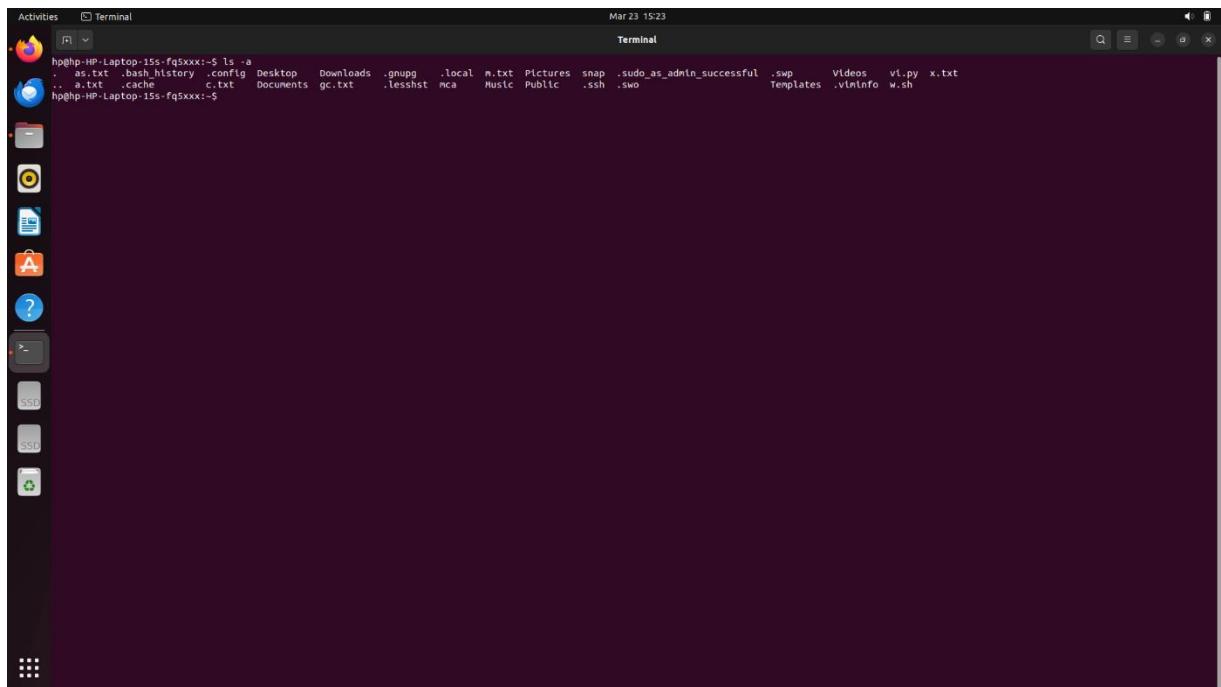




The terminal window displays the man page for the 'cat' command. The page includes sections for options like -b, -e, -E, -n, -s, -t, -T, -u, -v, and --version, as well as examples for using 'cat' to copy files and its history. It also includes sections for 'AUTHOR', 'REPORTING BUGS', 'COPYRIGHT', and 'SEE ALSO'. The bottom of the page shows the footer with 'GNU coreutils 8.32', 'Manual page cat(1) line 16/69 (END) (press h for help or q to quit.)', 'February 2022', and 'CAT(1)'.

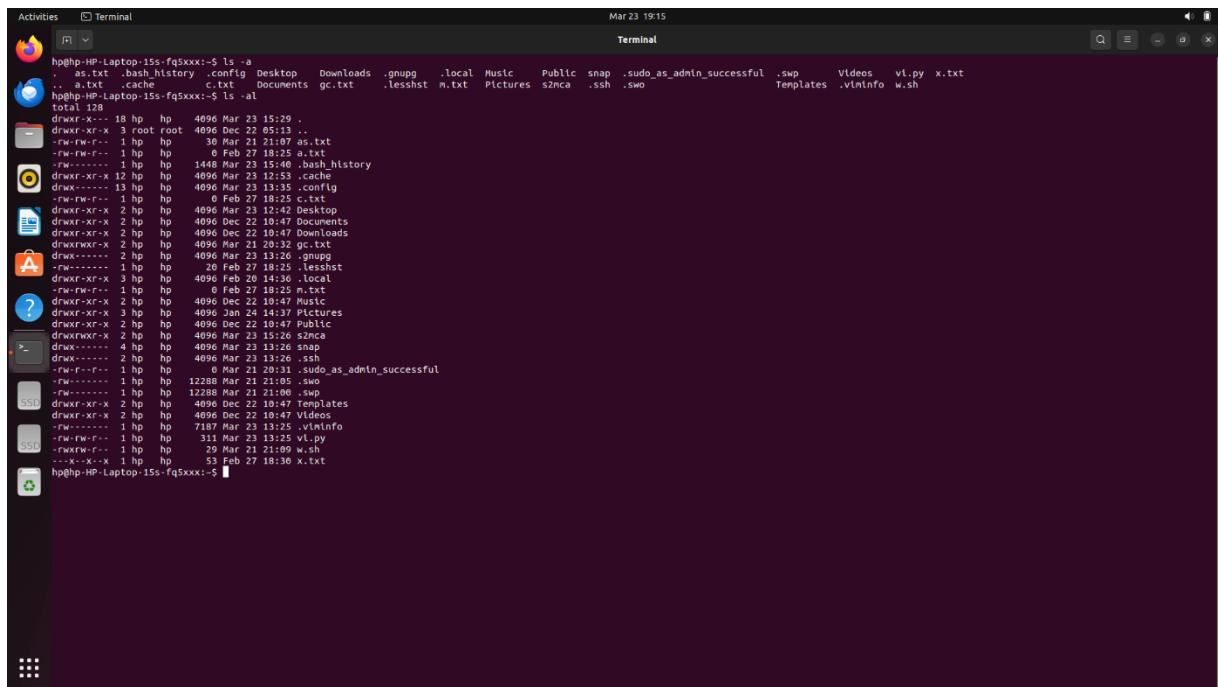
2)ls: List the directory(folder) system.

- **ls -a:** Will show the hidden file.



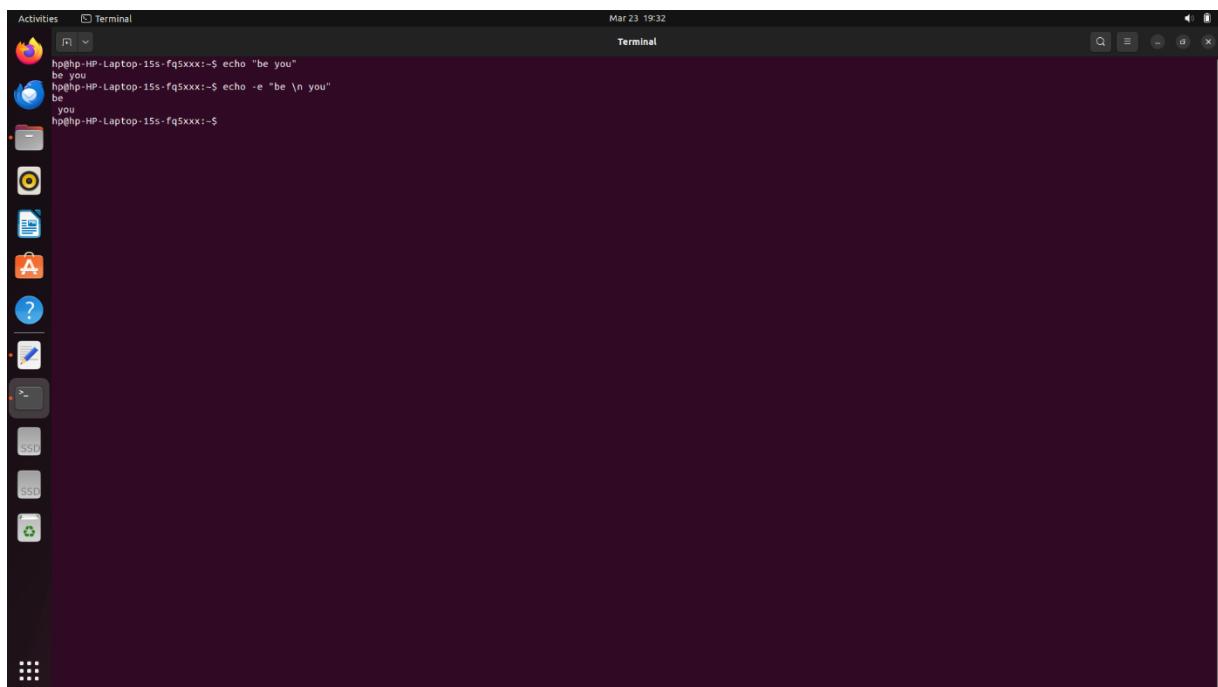
The terminal window shows the output of the 'ls -a' command. The command lists all files and directories in the current directory, including hidden files like '.as.txt', '.bash_history', '.config', '.gnupg', '.local', '.ssh', and '.sudo_as_admin_successful'. The command was run on an HP laptop with the command 'hp@hp-HP-Laptop-15s-fq5xxx:~\$ ls -a'.

- **ls -al:** Will list the file and directory with detailed information like the permission size ,owner...etc.



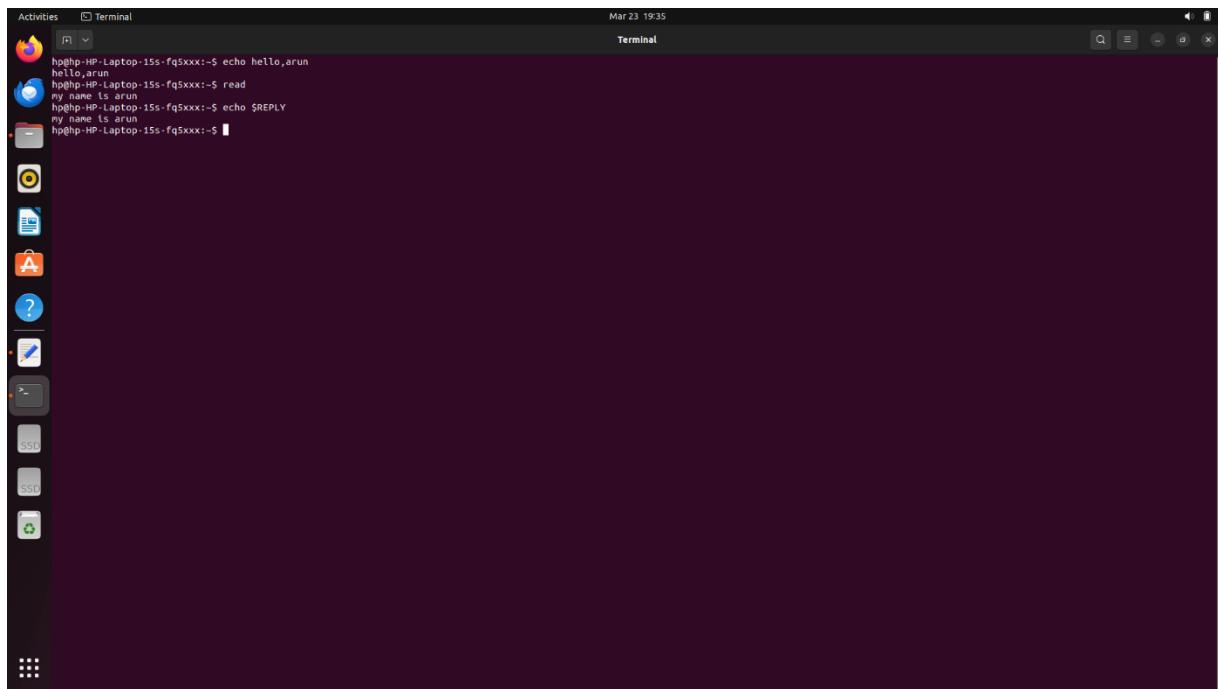
```
hp@hp-HP-Laptop-15s-fq5xxx:~$ ls -al
total 128
drwxr-x--- 18 hp hp 4096 Mar 23 15:19 .
drwxr-xr-x  3 root root 4096 Dec 22 05:19 ..
-rw-rw-r--  1 hp hp 58 Feb 27 18:25 as.txt
-rw-rw-r--  1 hp hp 0 Feb 27 18:25 as.txt
-rw-rw-r--  1 hp hp 1448 Mar 23 15:40 .bash_history
drwxr-xr-x 12 hp hp 4096 Mar 23 12:53 .cache
drwxr-xr-x 13 hp hp 4096 Mar 23 13:35 .config
-rw-rw-r--  1 hp hp 0 Feb 27 18:25 c.txt
-rw-rw-r--  1 hp hp 4096 Mar 23 13:35 config
drwxr-xr-x  2 hp hp 4096 Dec 22 10:47 Documents
drwxr-xr-x  2 hp hp 4096 Dec 22 10:47 Downloads
drwxrwxr-x  2 hp hp 4096 Mar 21 20:32 gc.txt
drwxr-xr-x  2 hp hp 4096 Mar 23 13:26 gnupg
drwxr-xr-x  2 hp hp 4096 Mar 20 14:36 .lessht
drwxr-xr-x  3 hp hp 4096 Feb 28 14:36 .local
-rw-rw-r--  1 hp hp 0 Feb 27 18:25 m.txt
drwxr-xr-x  2 hp hp 4096 Dec 22 10:47 Music
drwxr-xr-x  3 hp hp 4096 Jan 24 14:37 Pictures
drwxr-xr-x  2 hp hp 4096 Mar 23 13:26 .public
drwxr-xr-x  2 hp hp 4096 Mar 23 13:26 sznca
drwxr-xr-x  2 hp hp 4096 Mar 23 13:26 snap
drwxr-xr-x  2 hp hp 4096 Mar 23 13:26 .ssh
-rw-r----  1 hp hp 0 Mar 21 20:31 .sudo_as_admin_successful
-rw-r----  1 hp hp 12288 Mar 23 21:05 swo
-rw-r----  1 hp hp 12288 Mar 21 21:05 swo
drwxr-xr-x  2 hp hp 4096 Dec 22 10:47 Templates
drwxr-xr-x  2 hp hp 4096 Dec 22 10:47 Videos
drwxr-xr-x  1 hp hp 7187 Mar 23 13:25 .vtvInfo
-rw-rw-r--  1 hp hp 311 Mar 23 13:25 vt.py
-rw-rw-r--  1 hp hp 0 Mar 21 21:09 w.sh
drwxr-xr-x  1 hp hp 53 Feb 27 18:30 x.txt
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

3)echo: It is built in Linux feature that print out arguments as the standard output.



```
hp@hp-HP-Laptop-15s-fq5xxx:~$ echo "be you"
be you
hp@hp-HP-Laptop-15s-fq5xxx:~$ echo -e "be \n you"
be
you
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

4)read: It is used to read the contents of a line into a variable.

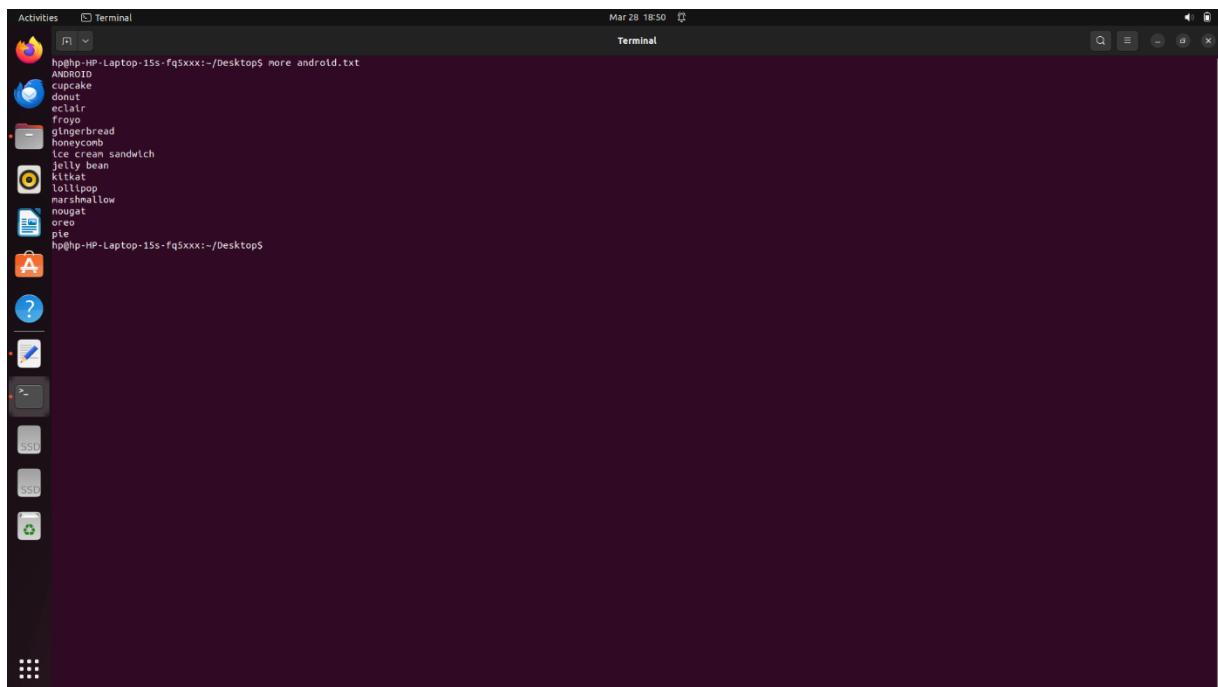


Activities Terminal Mar 23 19:35

```
hp@hp-HP-Laptop-15s-fq5xxx:~$ echo hello,arun
hello,arun
hp@hp-HP-Laptop-15s-fq5xxx:~$ read
my name is arun
hp@hp-HP-Laptop-15s-fq5xxx:~$ echo $REPLY
my name is arun
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

The screenshot shows a Linux desktop environment with a dark theme. A terminal window is open in the Activities overview, displaying the command 'read' being used to capture the input 'my name is arun' and then echoing it back as \$REPLY. The terminal window has a title bar 'Terminal' and a status bar showing the date and time 'Mar 23 19:35'. The desktop background is dark, and the taskbar at the bottom shows various application icons.

5)more: It is used to view the text files in the command prompt ,displaying one screen at a time in case the file is large.

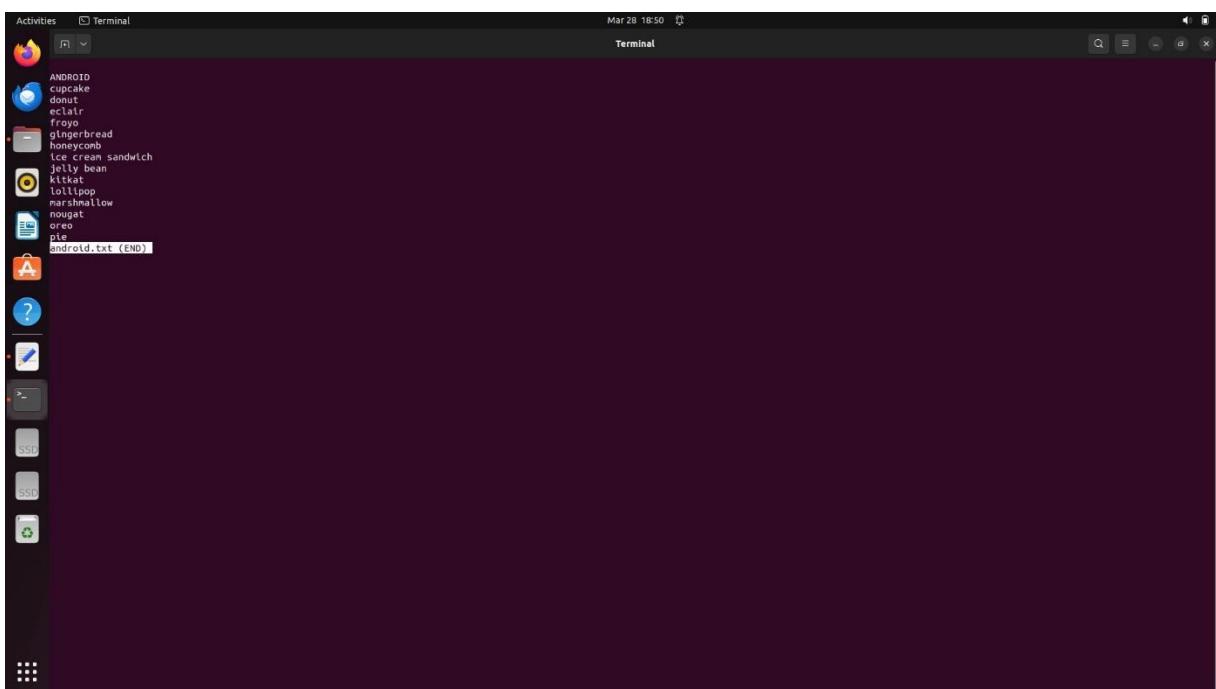
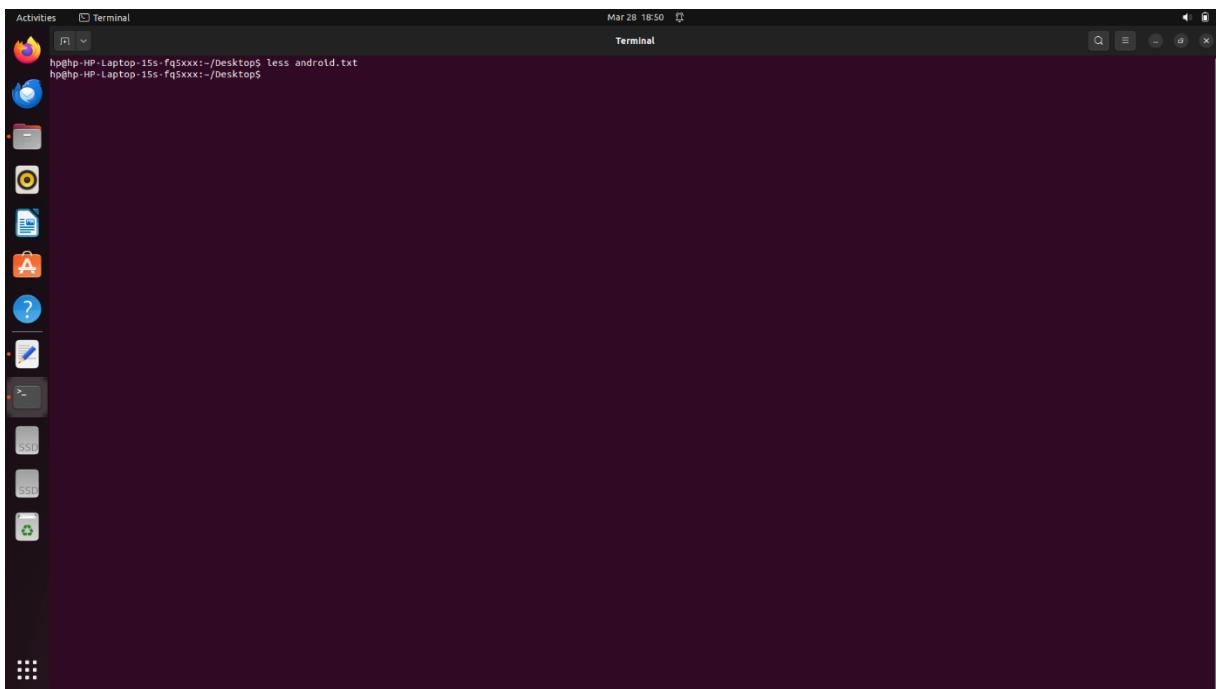


Activities Terminal Mar 28 16:50

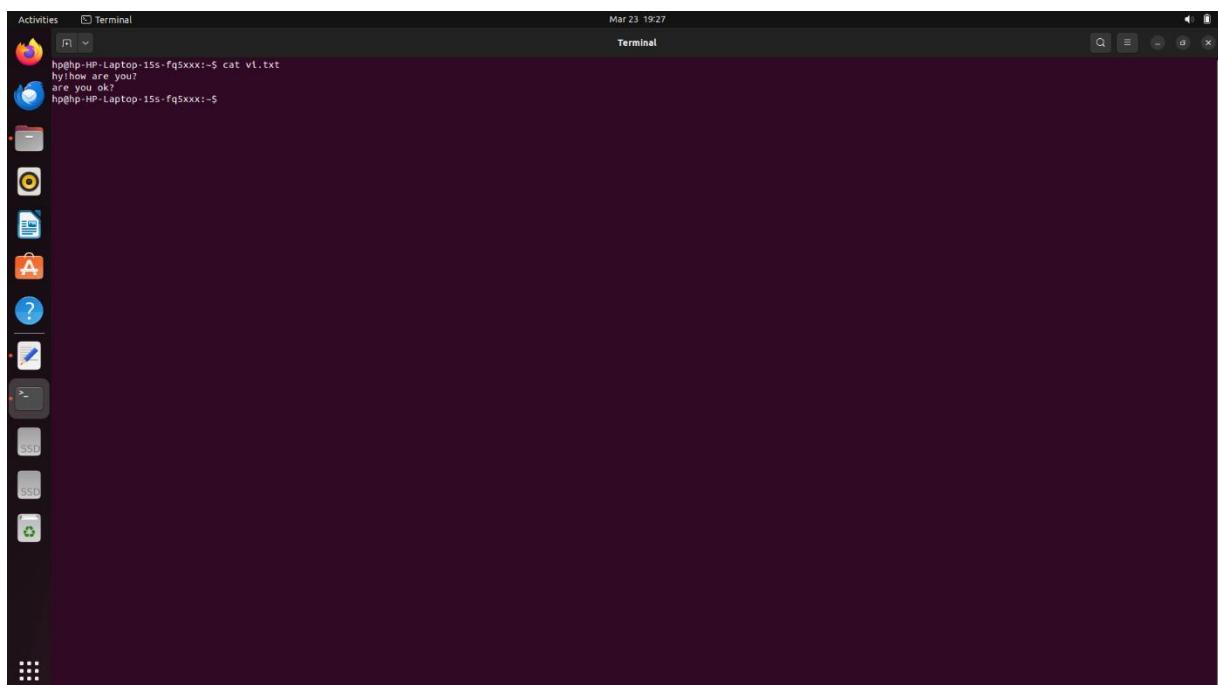
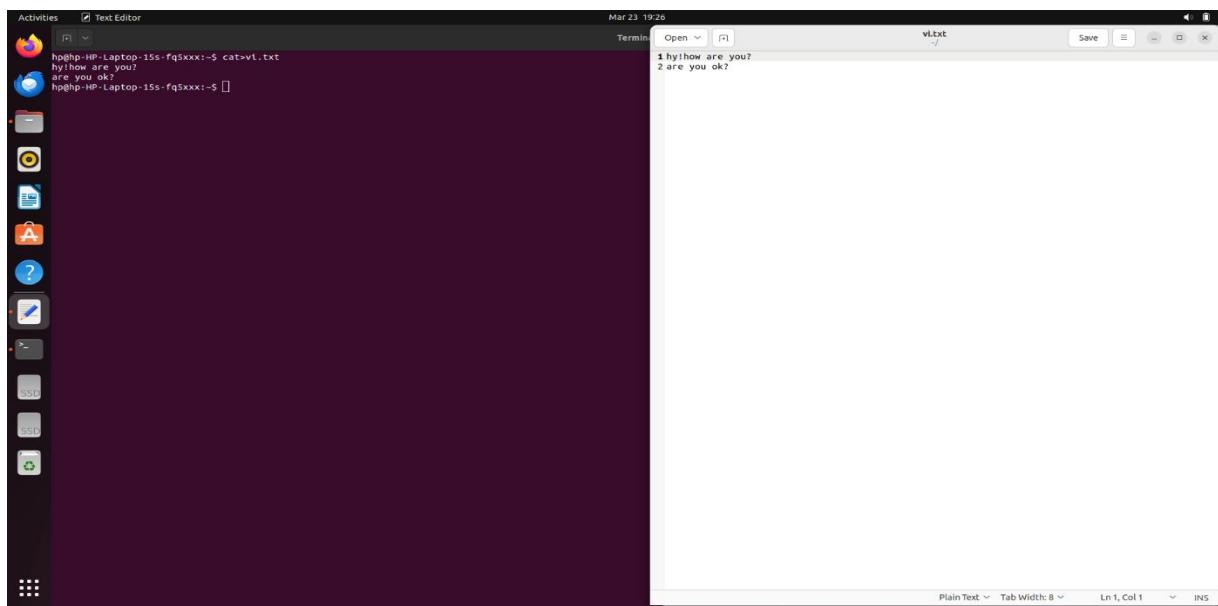
```
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ more android.txt
ANDROID
cupcake
donut
eclair
froyo
gingerbread
honeycomb
ice cream sandwich
jelly bean
kitkat
lollipop
marshmallow
nougat
oreo
pie
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

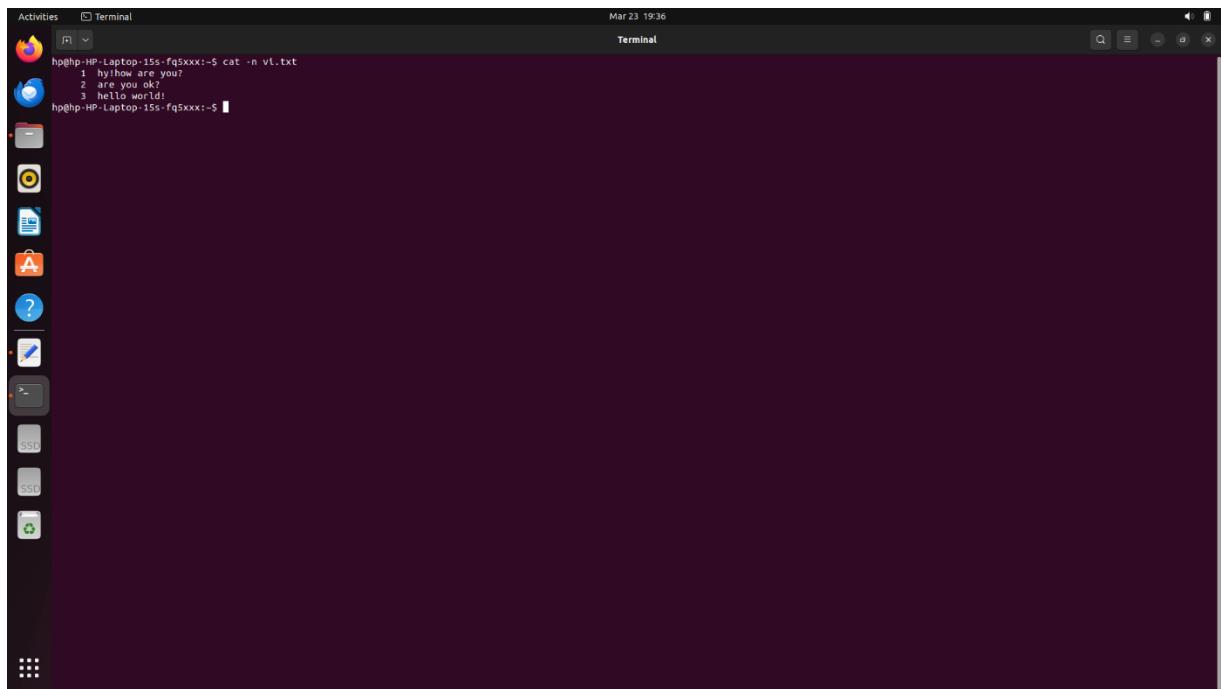
The screenshot shows a Linux desktop environment with a dark theme. A terminal window is open in the Activities overview, displaying the command 'more android.txt' being run. The output shows the names of various Android versions: ANDROID, cupcake, donut, eclair, froyo, gingerbread, honeycomb, ice cream sandwich, jelly bean, kitkat, lollipop, marshmallow, nougat, oreo, and pie. The terminal window has a title bar 'Terminal' and a status bar showing the date and time 'Mar 28 16:50'. The desktop background is dark, and the taskbar at the bottom shows various application icons.

6)less: Less command is a linux utility that can be used to read the contents of a text file one page(one screen) at a time.



7)cat: It is used to list the contents of a file on the standard output.

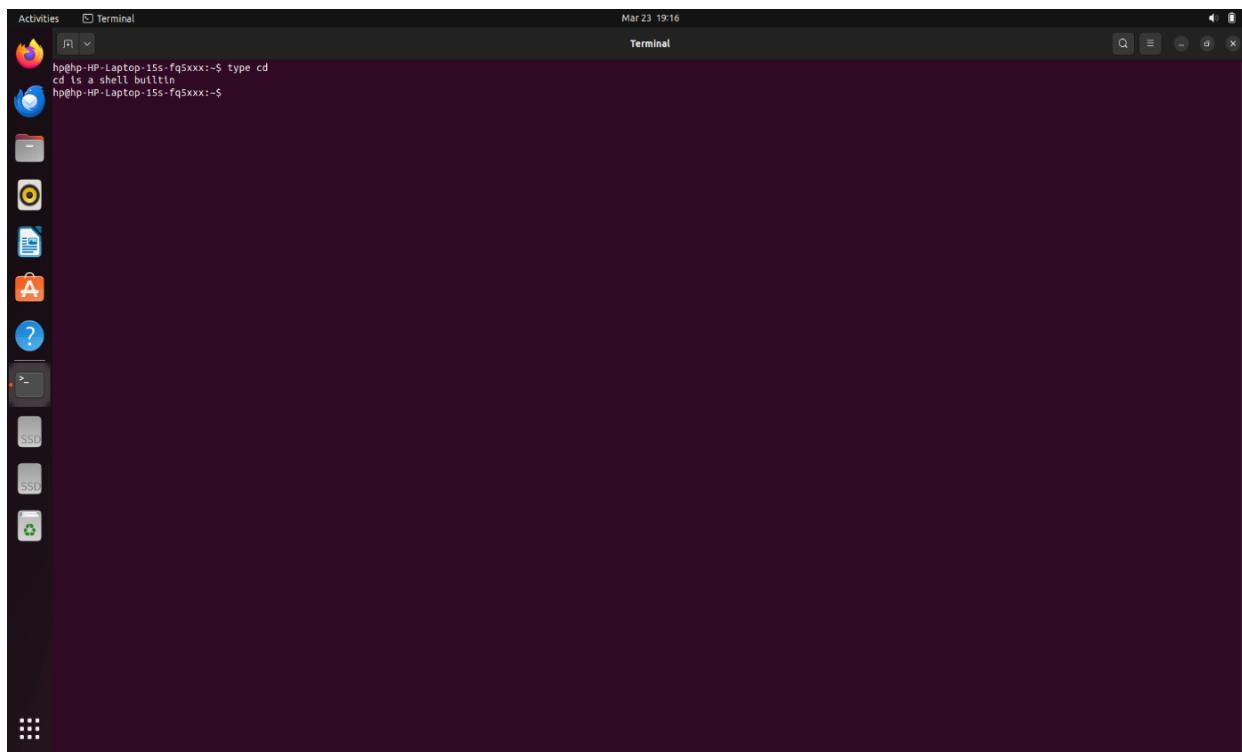




Activities Terminal Mar 23 19:36

```
hp@hp-HP-Laptop-15s-fq5xxx:~$ cat -n vt.txt
1 hyihow are you?
2 are you on?
3 hello world!
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

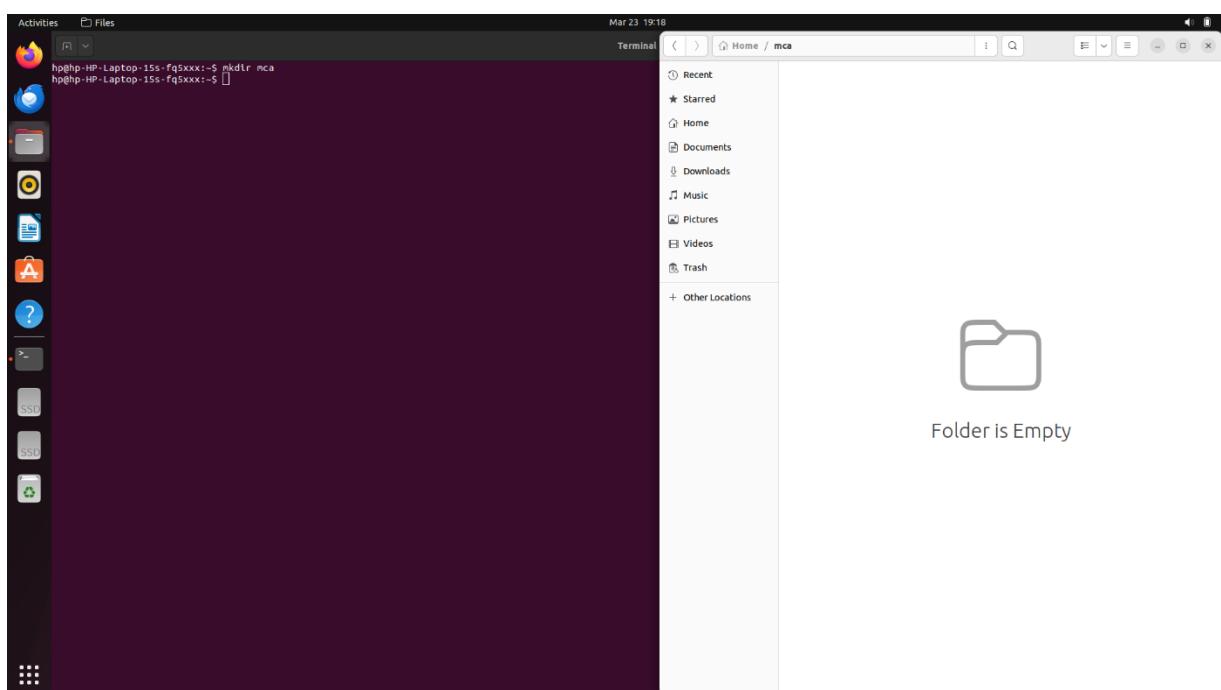
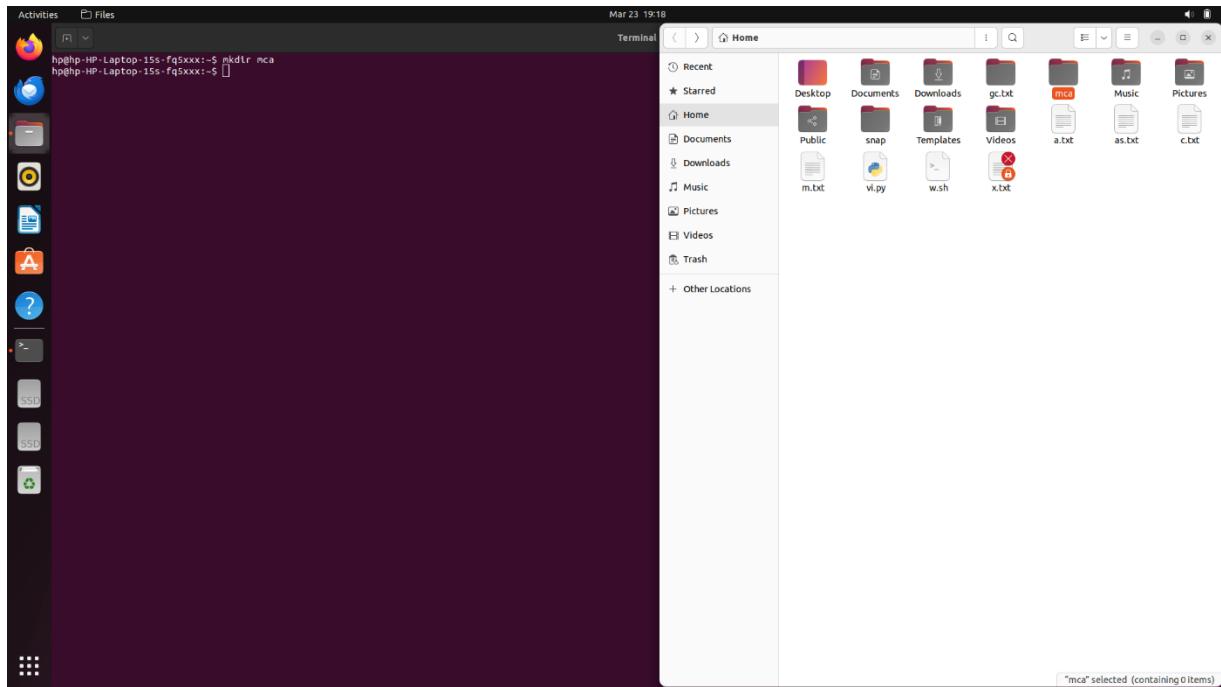
8)cd: It is used to navigate through the Linux files and directories.



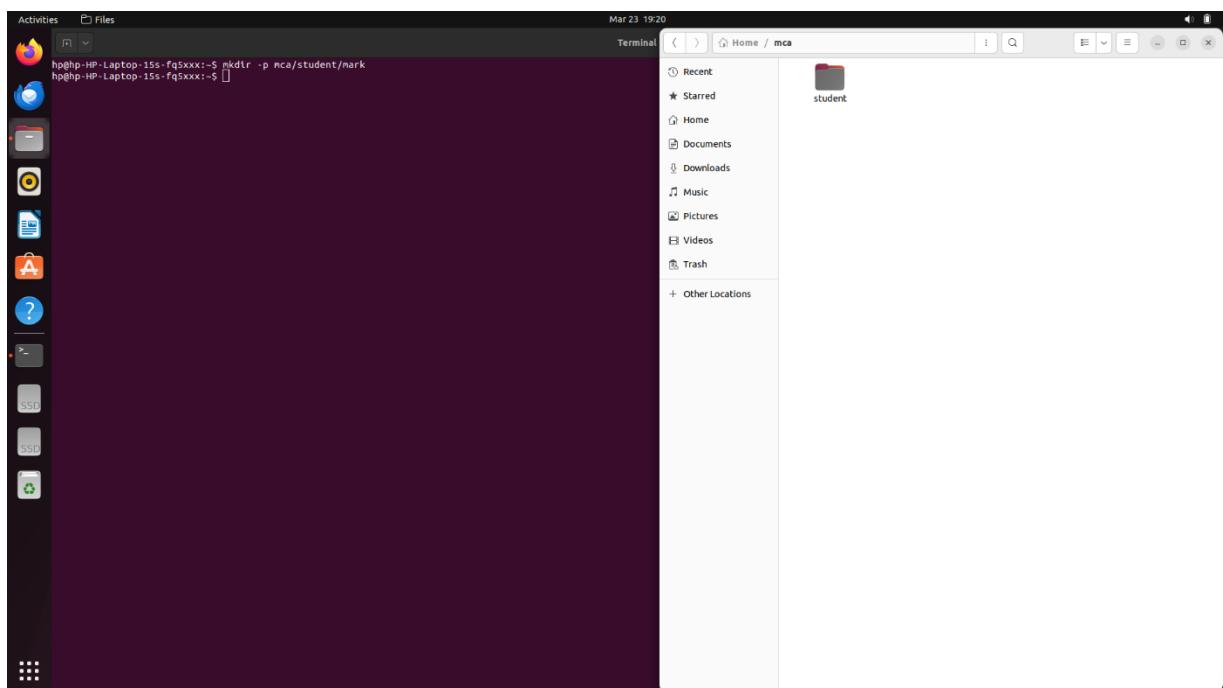
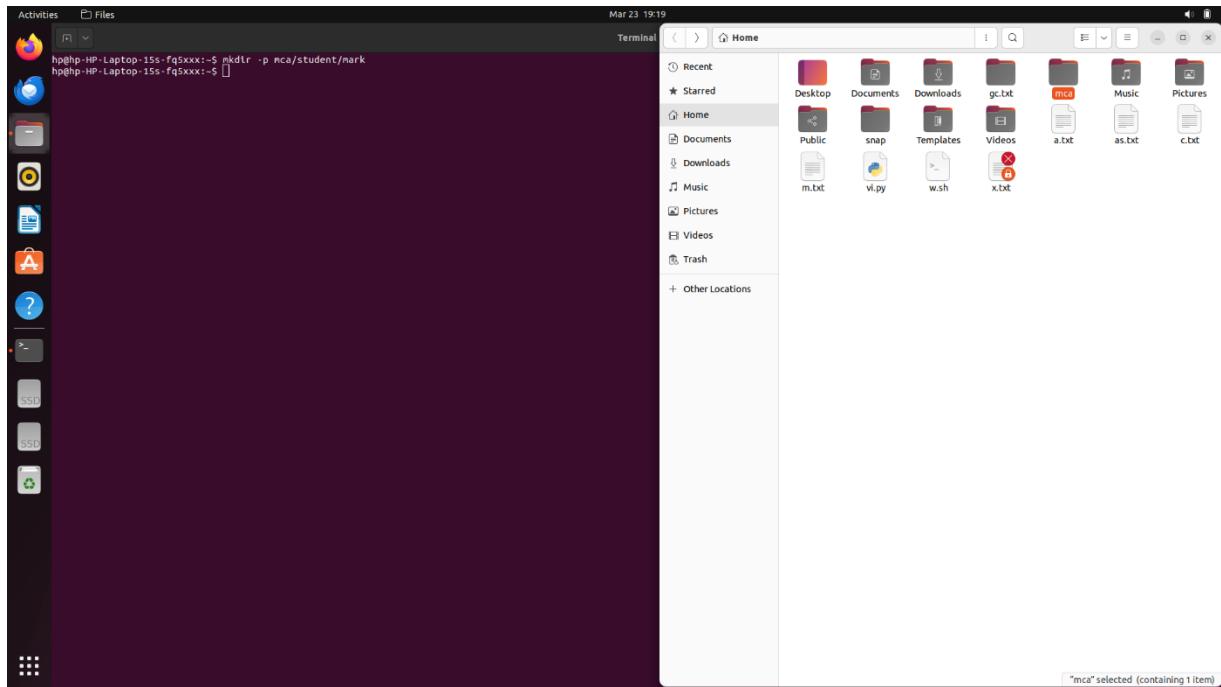
Activities Terminal Mar 23 19:16

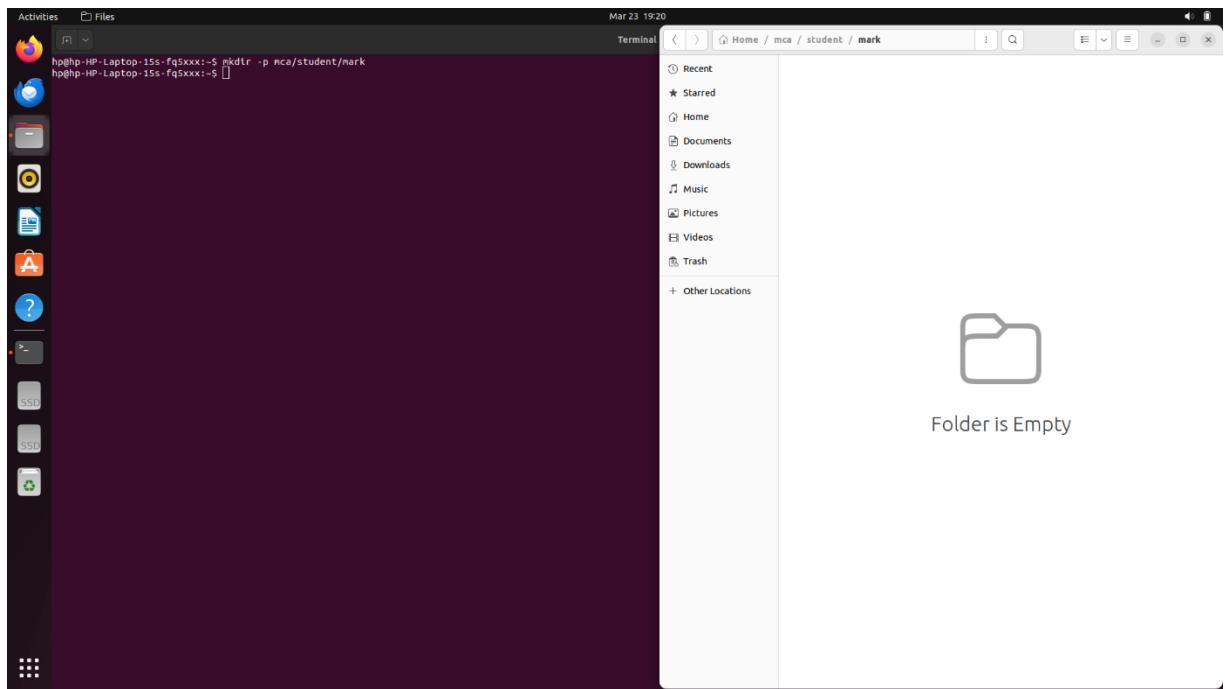
```
hp@hp-HP-Laptop-15s-fq5xxx:~$ type cd
cd is a shell builtin
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

9) **mkdir**: Create a new directory (folder).

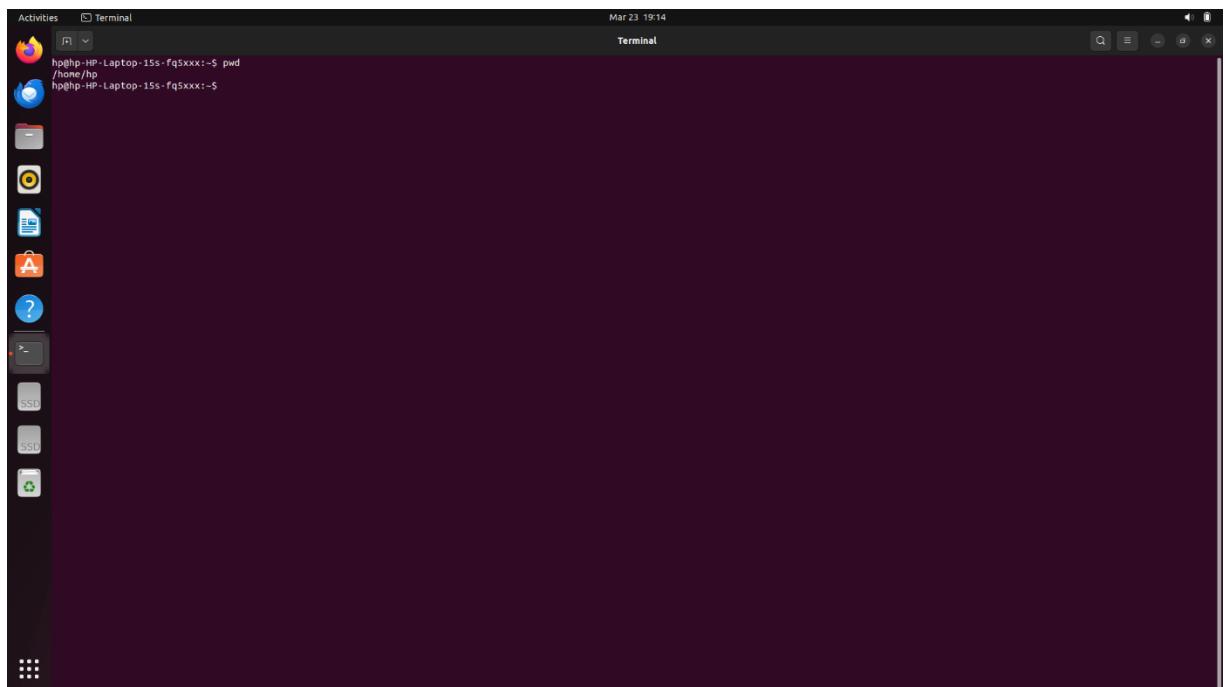


Mkdir -p :create folders



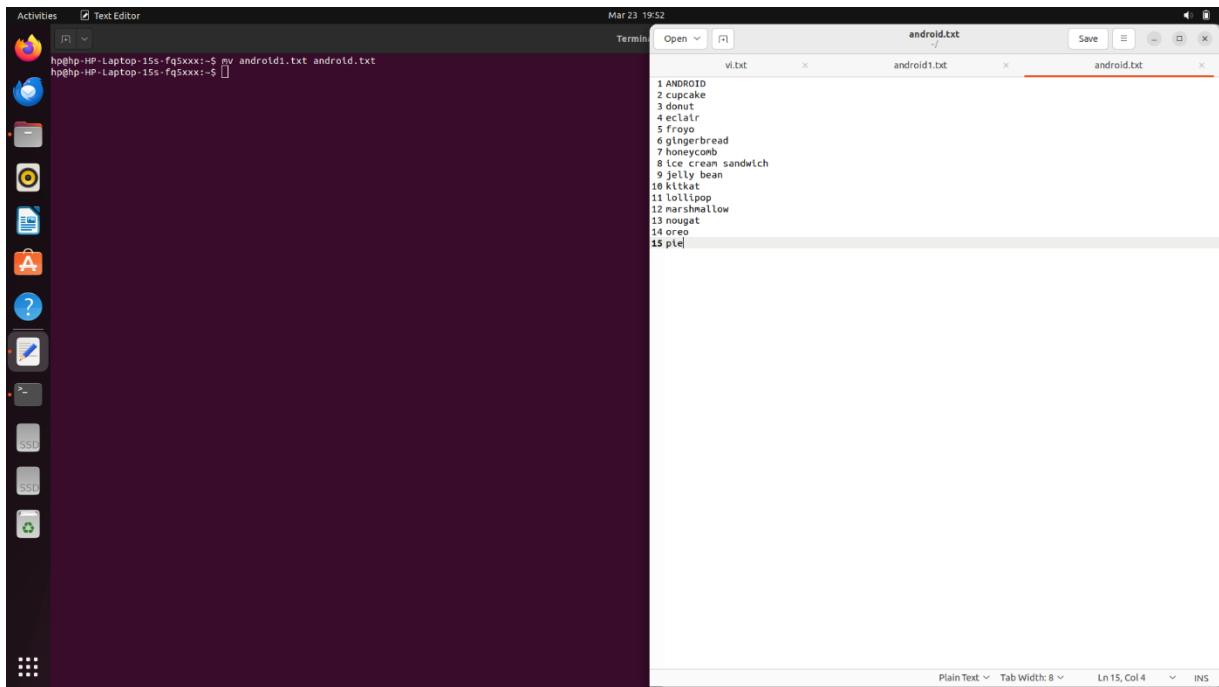


10)pwd: It print the current working directory path ,starting from the root(/).



11)find: It is used to search and locate the list of files and directories based on conditions you specify for files that match the arguments.

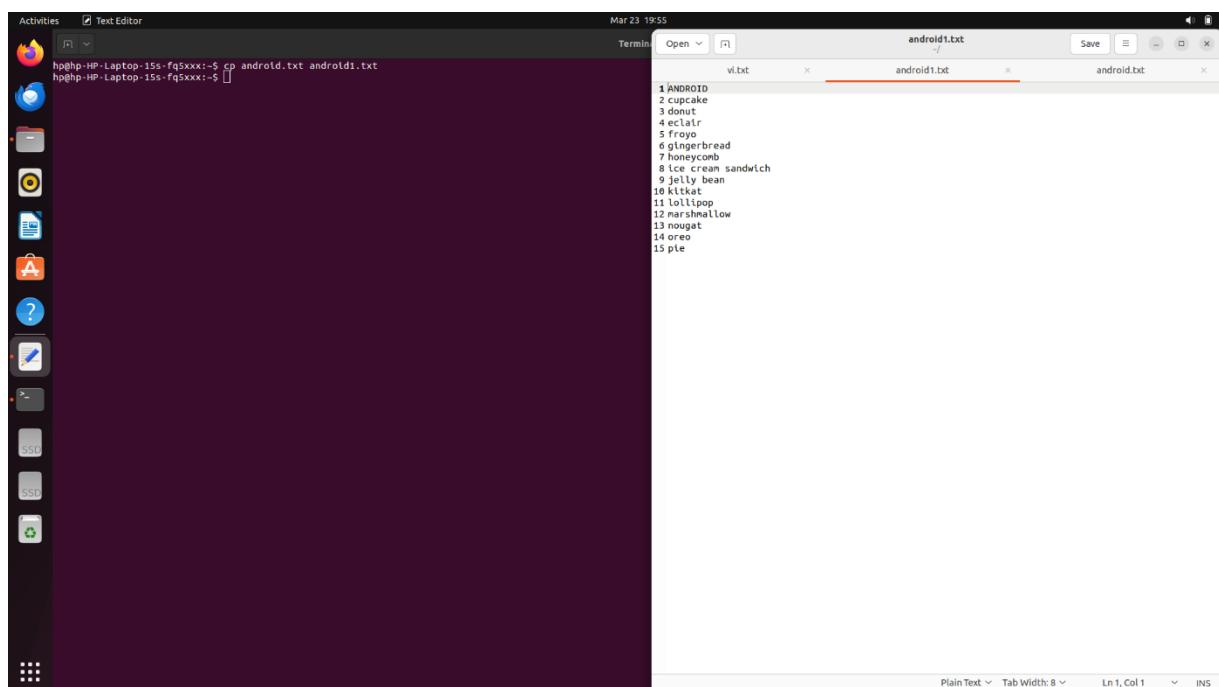
12)mv: It is used to move one or more files or directories from one place to another in a file system like unix.



A screenshot of a Linux desktop environment. On the left is a dark-themed dock with various icons. In the center is a terminal window titled 'Terminal' with the command 'mv android1.txt android.txt' entered. The terminal shows the output of the command, which is a list of Android versions from 1 to 15. To the right of the terminal is a text editor window titled 'Text Editor' with three tabs: 'vi.txt', 'android1.txt', and 'android.txt'. The 'android.txt' tab is active, showing the same list of Android versions. The status bar at the bottom of the text editor indicates 'Plain Text' and 'Ln 15, Col 4'.

```
1 ANDROID
2 cupcake
3 donut
4 eclair
5 froyo
6 gingerbread
7 honeycomb
8 ice cream sandwich
9 jelly bean
10 kitkat
11 lollipop
12 marshmallow
13 nougat
14 oreo
15 pie
```

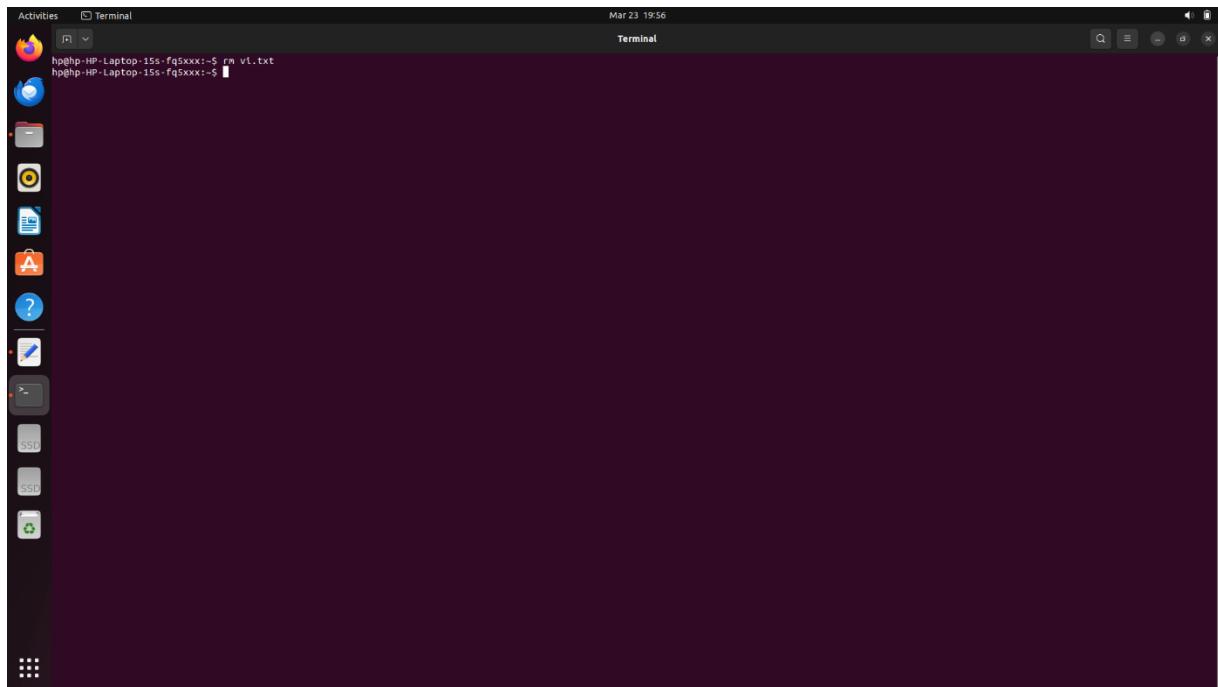
13)cp: This command used to copy files or group of files or directory.



A screenshot of a Linux desktop environment, similar to the previous one. The terminal window shows the command 'cp android.txt android1.txt' being run. The output shows the list of Android versions again. The text editor window is still open with the same three tabs and content. The status bar at the bottom of the text editor indicates 'Plain Text' and 'Ln 15, Col 4'.

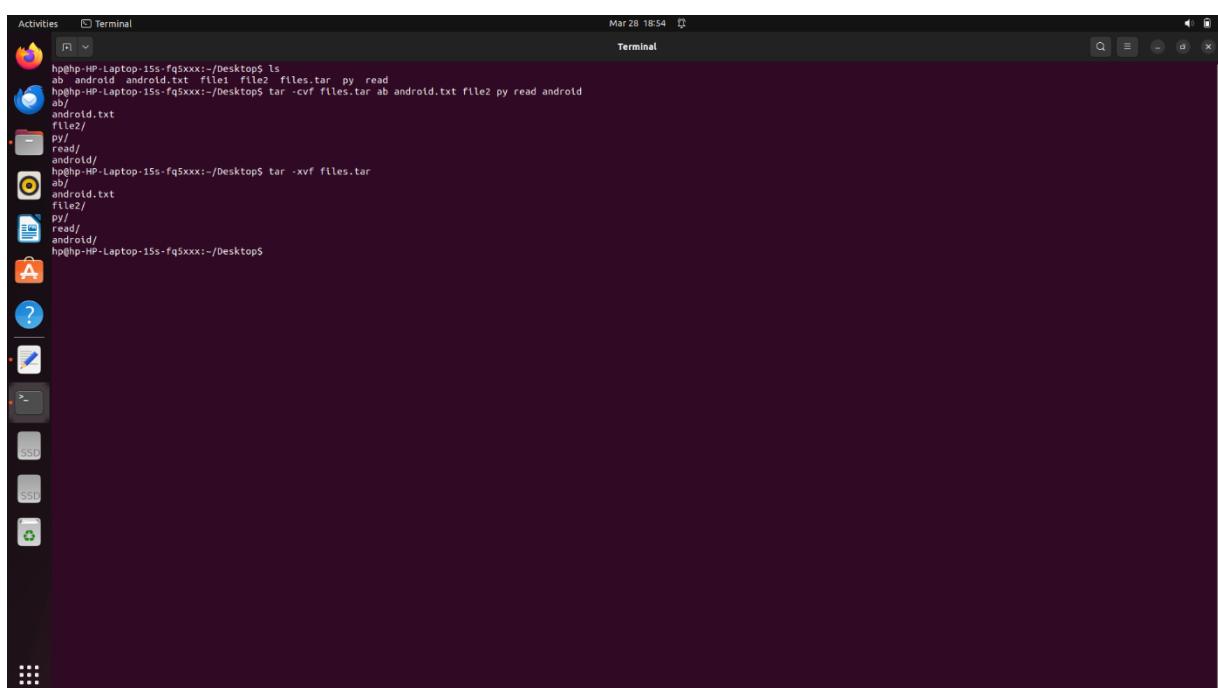
```
1 ANDROID
2 cupcake
3 donut
4 eclair
5 froyo
6 gingerbread
7 honeycomb
8 ice cream sandwich
9 jelly bean
10 kitkat
11 lollipop
12 marshmallow
13 nougat
14 oreo
15 pie
```

14)rm: It is used to remove objects such as files, directories, symbolic, links and so on from the file system.



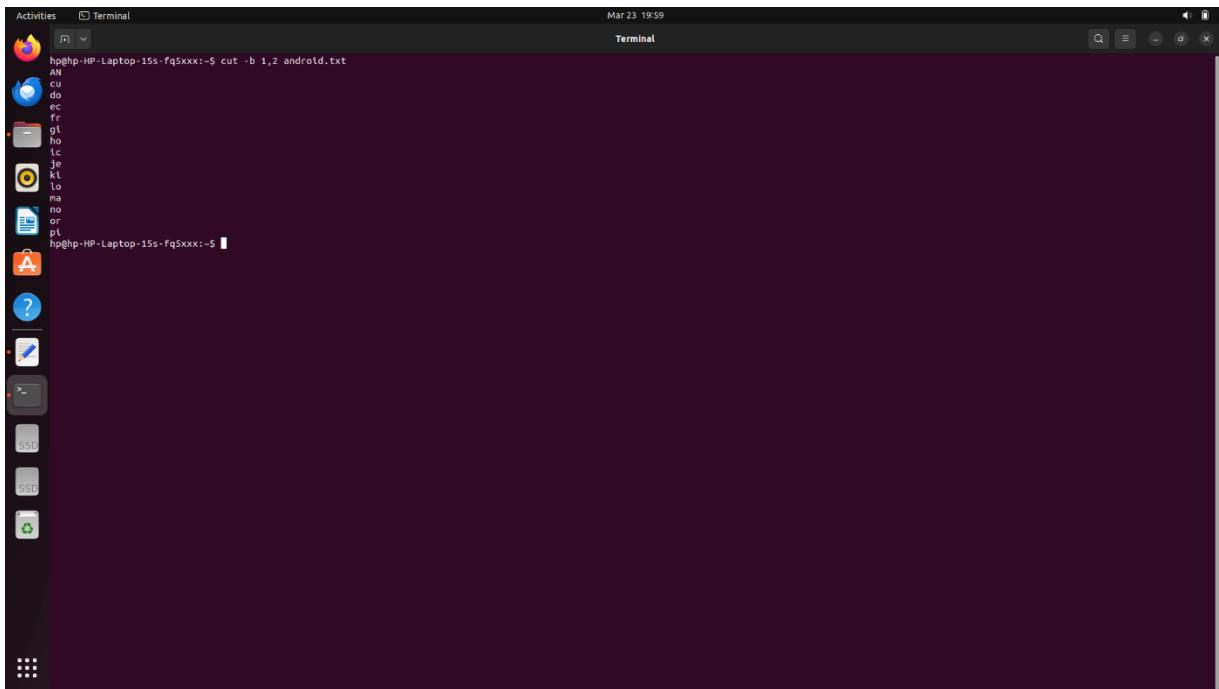
```
Activities Terminal Mar 23 19:56
hp@hp-HP-Laptop-15s-fq5xxx:~$ rm v1.txt
hp@hp-HP-Laptop-15s-fq5xxx:~$
```

15)tar: It is used for saving several files into an archive file.



```
Activities Terminal Mar 28 18:54
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls
ab android android.txt file1 file2 files.tar py read
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ tar -cvf files.tar ab android.txt file2 py read android
ab/
android.txt
file2/
py/
read/
android/
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ tar -xvf files.tar
ab/
android.txt
file2/
py/
read/
android/
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

16)cut: It is used for cutting out the sections from each line of files and writing the result to standard output.



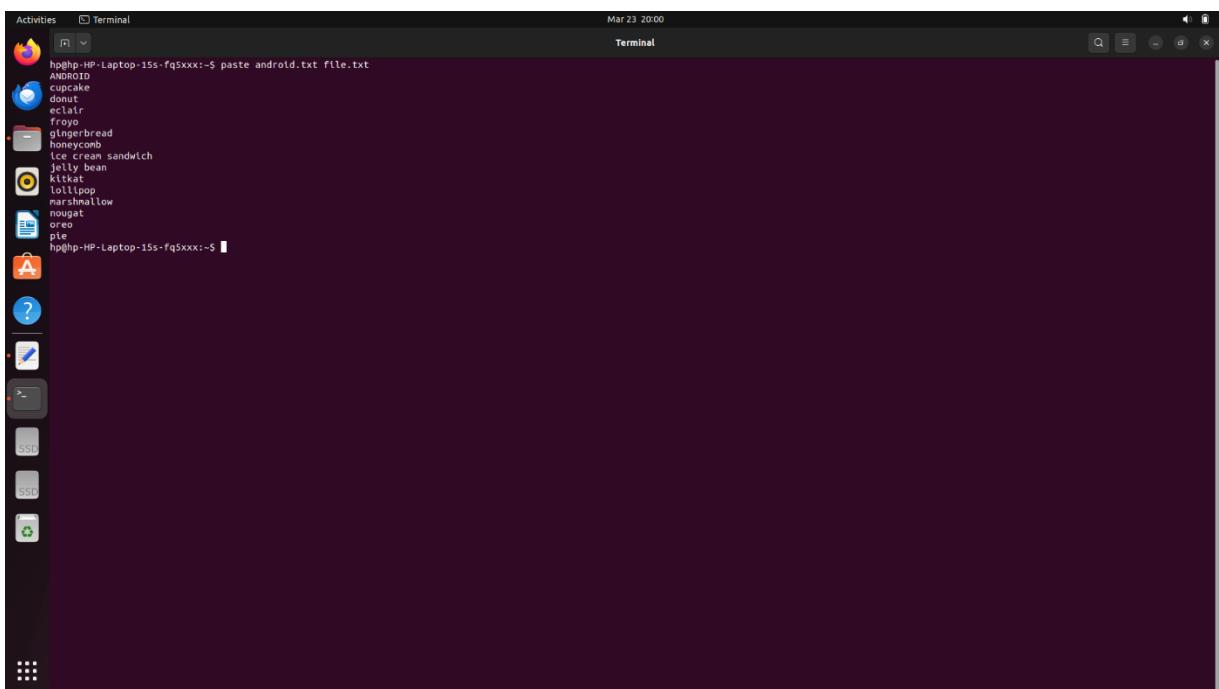
Activities Terminal Mar 23 19:59

```
hp@hp-HP-Laptop-15s-fq5xxx:~$ cut -b 1,2 android.txt
```

Terminal

File Manager, Dash, and other desktop icons are visible on the left.

17)paste: It is used to join horizontally by outputting lines consisting of lines from each file specified ,separated by tab as delimiter, to standard output.



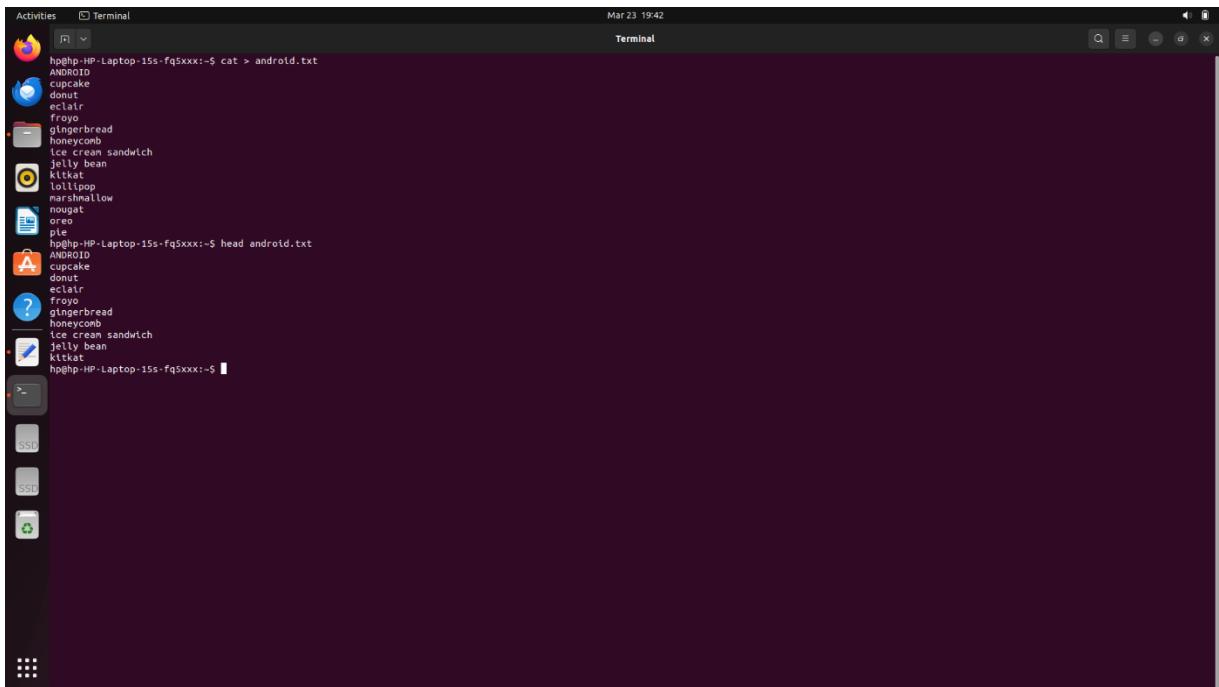
Activities Terminal Mar 23 20:00

```
hp@hp-HP-Laptop-15s-fq5xxx:~$ paste android.txt file.txt
```

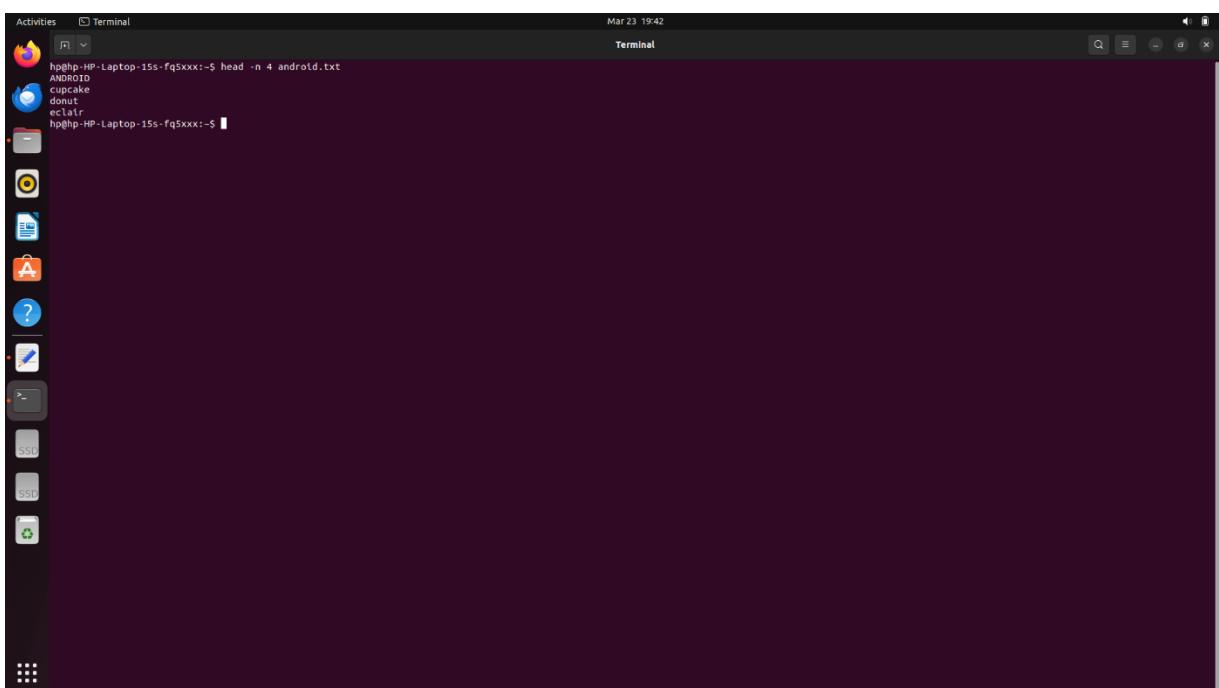
Terminal

File Manager, Dash, and other desktop icons are visible on the left.

18)head: It present in all major Linux distributions which are used to print out data from the start of a file.

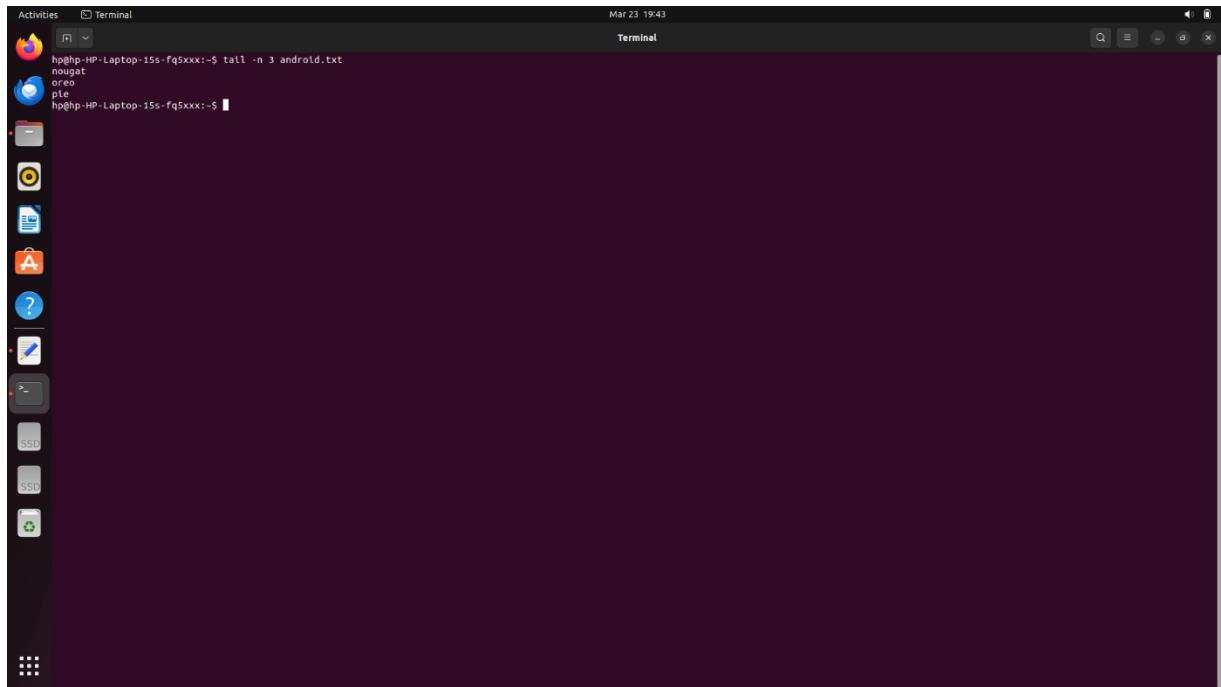


```
Activities Terminal Mar 23 19:42
hp@hp-HP-Laptop-15s-fq5xxx:~ cat > android.txt
ANDROID
cupcake
donut
eclair
froyo
gingerbread
honeycomb
ice cream sandwich
jelly bean
kitkat
lollipop
marshmallow
nougat
oreo
pie
hp@hp-HP-Laptop-15s-fq5xxx:~ head android.txt
ANDROID
cupcake
donut
eclair
froyo
gingerbread
honeycomb
ice cream sandwich
jelly bean
kitkat
hp@hp-HP-Laptop-15s-fq5xxx:~
```



```
Activities Terminal Mar 23 19:42
hp@hp-HP-Laptop-15s-fq5xxx:~ head -n 4 android.txt
ANDROID
cupcake
donut
eclair
hp@hp-HP-Laptop-15s-fq5xxx:~
```

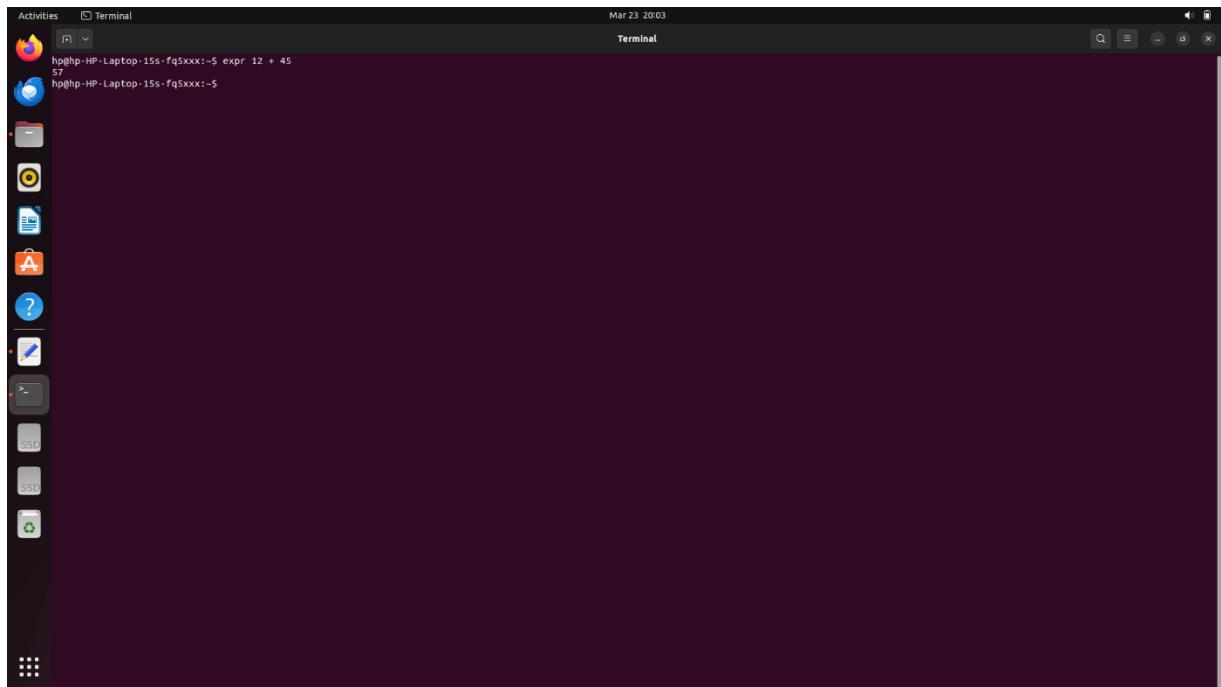
19)tail: The basic functionality of Linux tail commands is to output the end of a file.



A screenshot of a Linux desktop environment. On the left is a vertical dock with icons for various applications like a browser, file manager, and terminal. The main window is a terminal window titled 'Terminal' with the text 'Mar 23 19:43' at the top. The terminal content shows the command 'tail -n 3 android.txt' being run, and the output 'nougat' and 'oreo' are visible. The desktop background is a dark purple color.

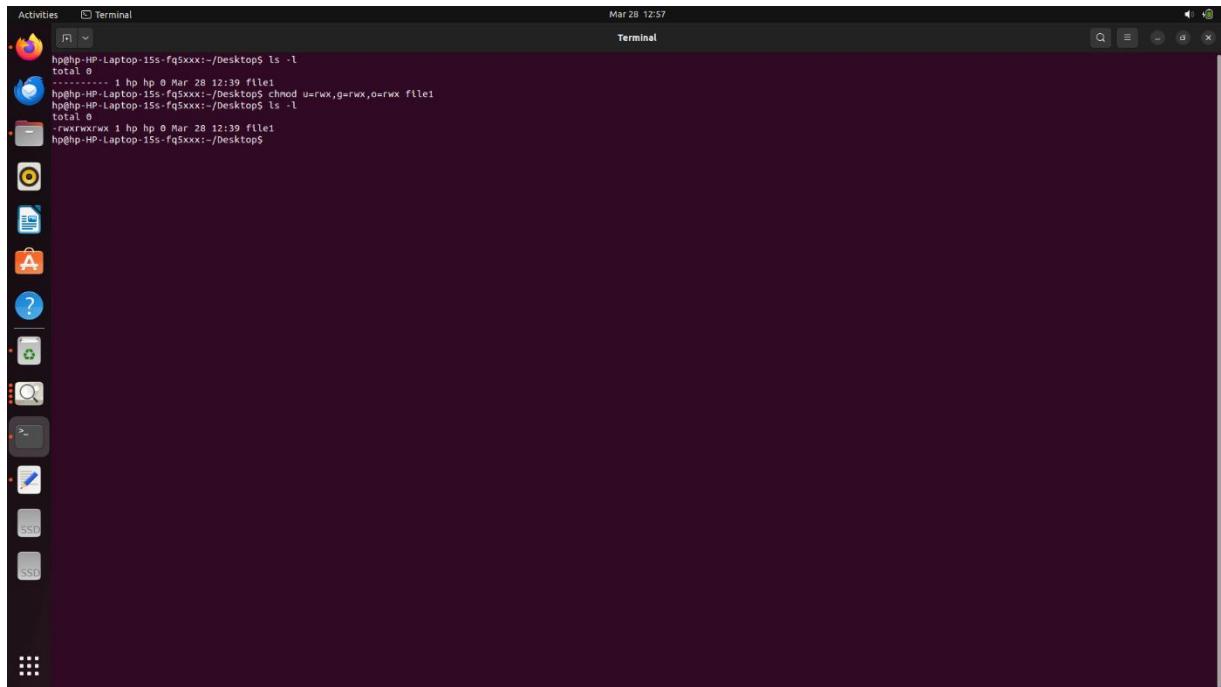
20)grep: Grep command is used to search through all the text in a given file.

21)expr: It was used to evaluate a given expression and display its corresponding output.



A screenshot of a Linux desktop environment, identical to the one above. The terminal window shows the command 'expr 12 + 45' being run, and the output '57' is displayed. The desktop background is a dark purple color.

22)chmod: It is used to change the access permissions of files and directories.

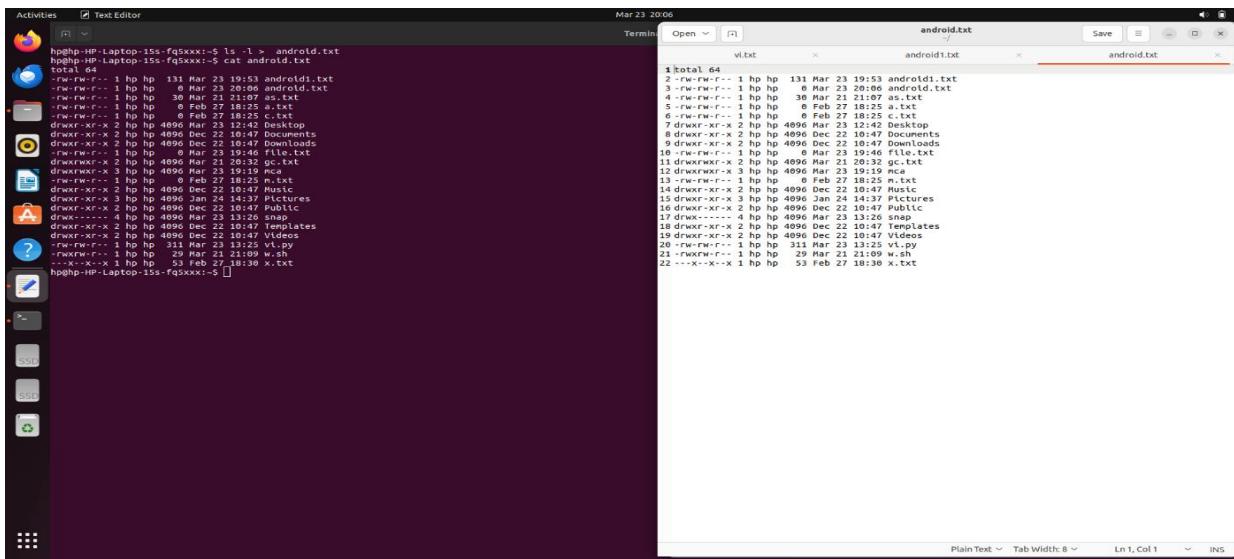
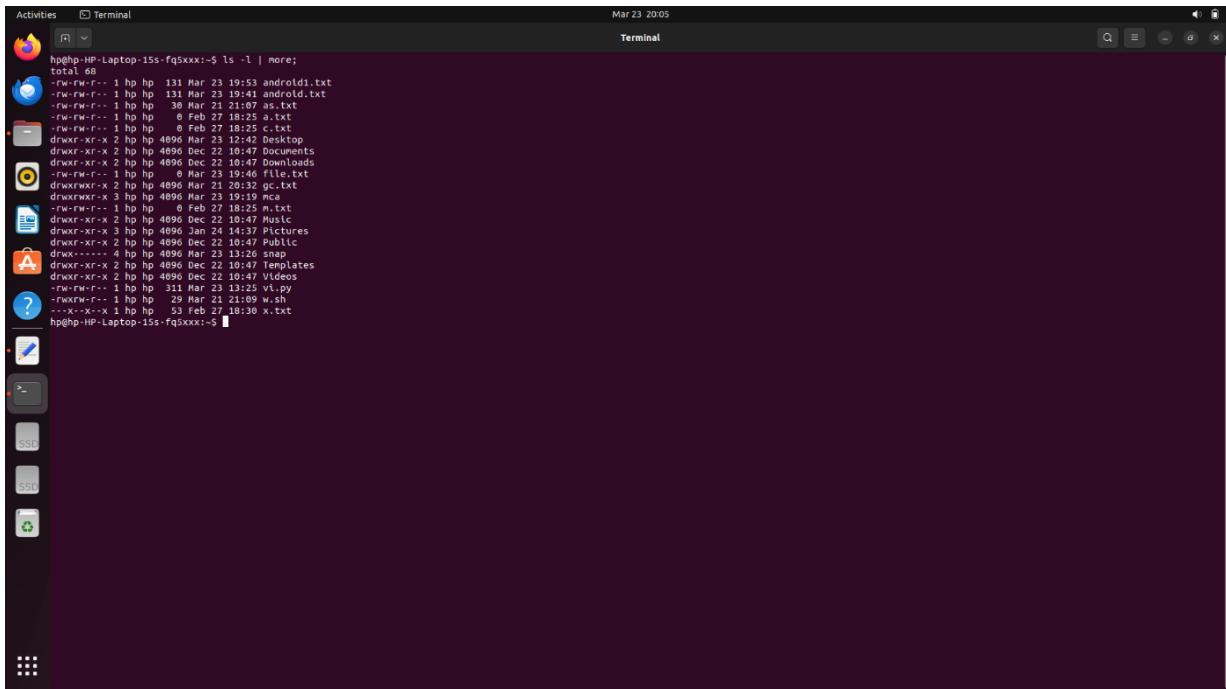


A screenshot of a Linux desktop environment. On the left is a vertical dock with icons for a browser, terminal, file manager, and other system tools. The main window is a terminal window titled 'Terminal' with the text 'Mar 28 12:57'. The terminal content shows the following command sequence:

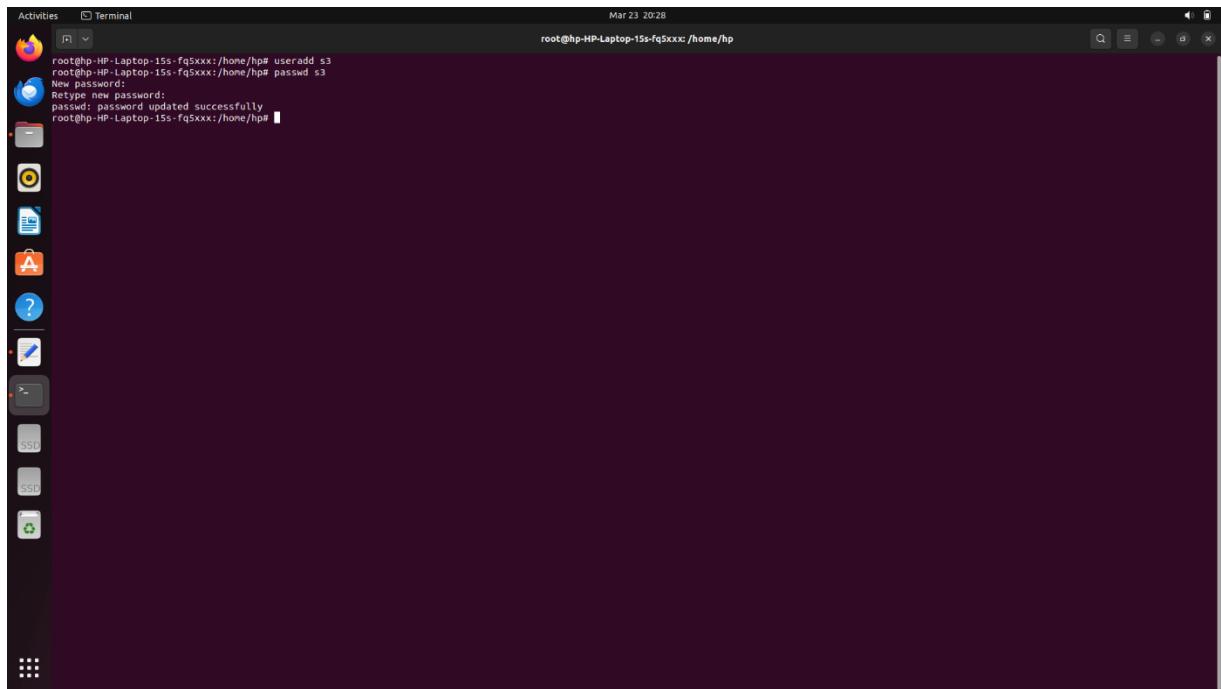
```
hp@hp-HP-Laptop-15s-fq5xxx:/Desktop$ ls -l
total 0
hp@hp-HP-Laptop-15s-fq5xxx:/Desktop$ chmod u=rwx,g=rwx,o=rwx file1
hp@hp-HP-Laptop-15s-fq5xxx:/Desktop$ ls -l
total 0
-rwxrwxrwx 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:/Desktop$
```

23)chown: It is used to change the files ownership, directory ,or symbolic link for a user or group.

24)redirection and piping: Pipe is used to combine two or more commands and in this the output of one command and act as input to the another command, and this command output may act as input to the next command. Redirection in Linux command refers to the ability of the Linux operating system that allows as to change the standard input and standard output when executing a command on the terminal.

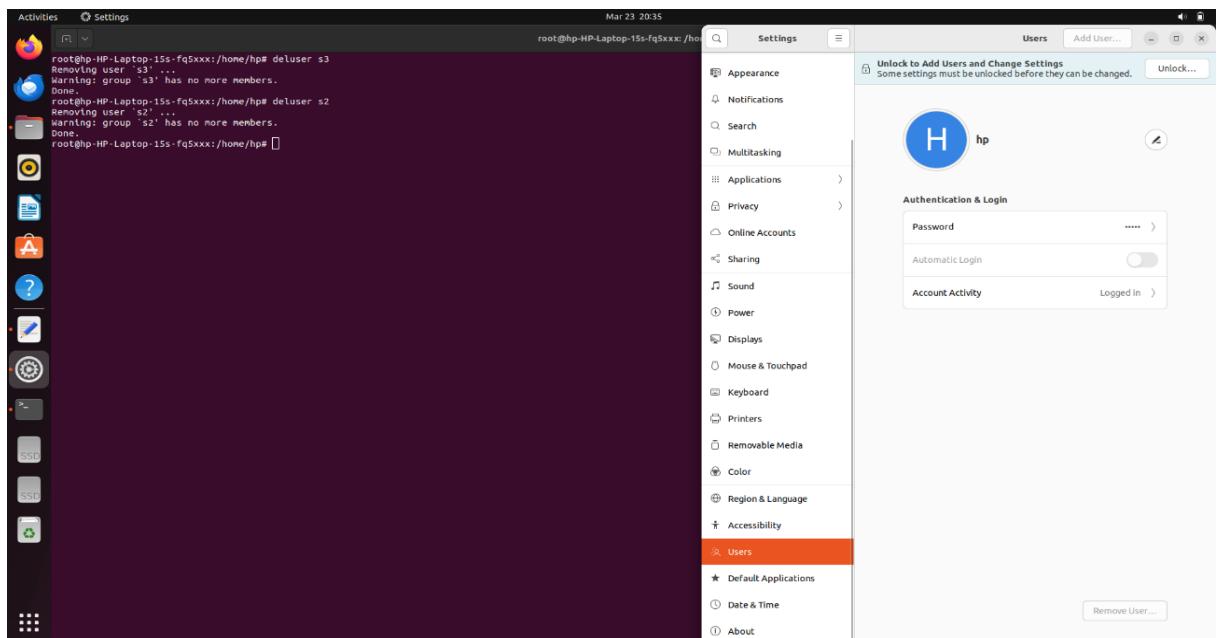


25)useradd: It is used to for adding /creating user accounts in Linux and other Unix-like operating systems.



```
Activities Terminal Mar 23 20:28
root@hp-HP-Laptop-15s-fq5xxx:/home/hp# useradd s3
root@hp-HP-Laptop-15s-fq5xxx:/home/hp# passwd s3
New password:
Retype new password:
passwd: password updated successfully
root@hp-HP-Laptop-15s-fq5xxx:/home/hp#
```

27)userdel: It is used to for deleting/removing the user accounts in Linux and other Unix-like operating systems.

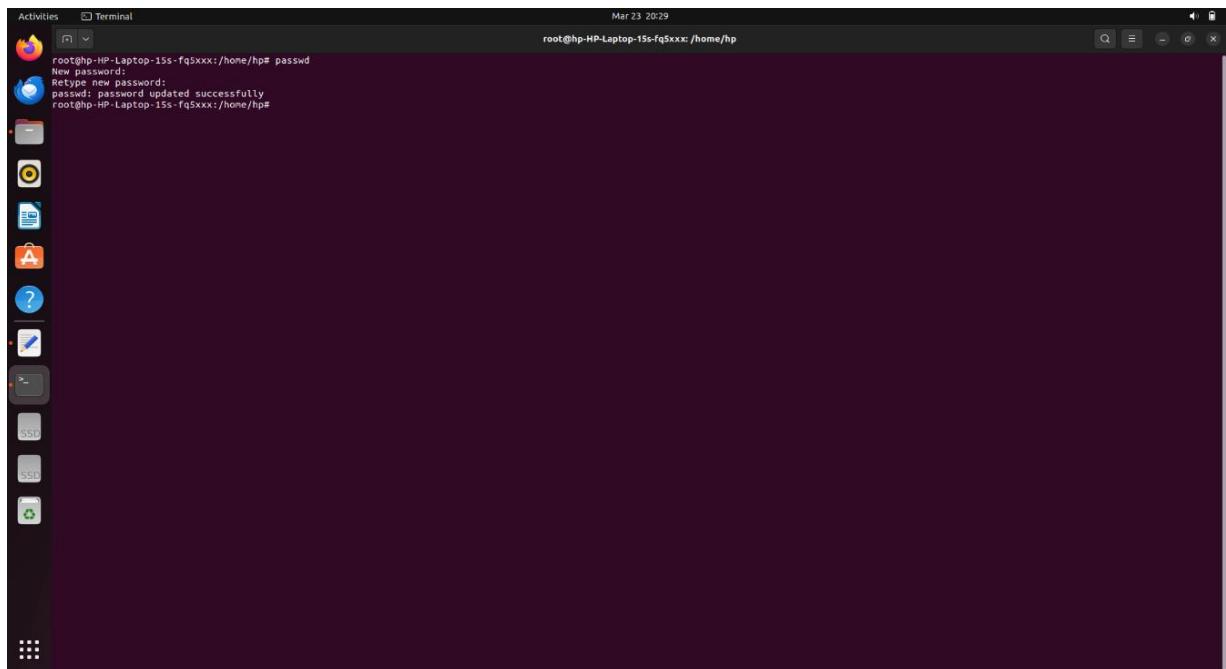


```
Activities Settings Mar 23 20:35
root@hp-HP-Laptop-15s-fq5xxx:/home/hp# deluser s3
Removing user 's3' ...
warning: group 's3' has no more members.
Done.
root@hp-HP-Laptop-15s-fq5xxx:/home/hp# deluser s2
Removing user 's2' ...
warning: group 's2' has no more members.
Done.
root@hp-HP-Laptop-15s-fq5xxx:/home/hp#
```

The Settings application window is open, showing the 'Users' tab. A modal dialog box is displayed with the message: "Unlock to Add Users and Change Settings. Some settings must be unlocked before they can be changed." The 'Unlock...' button is visible. The 'Users' tab is selected, and a 'Remove User...' button is located in the bottom right corner of the user list area.

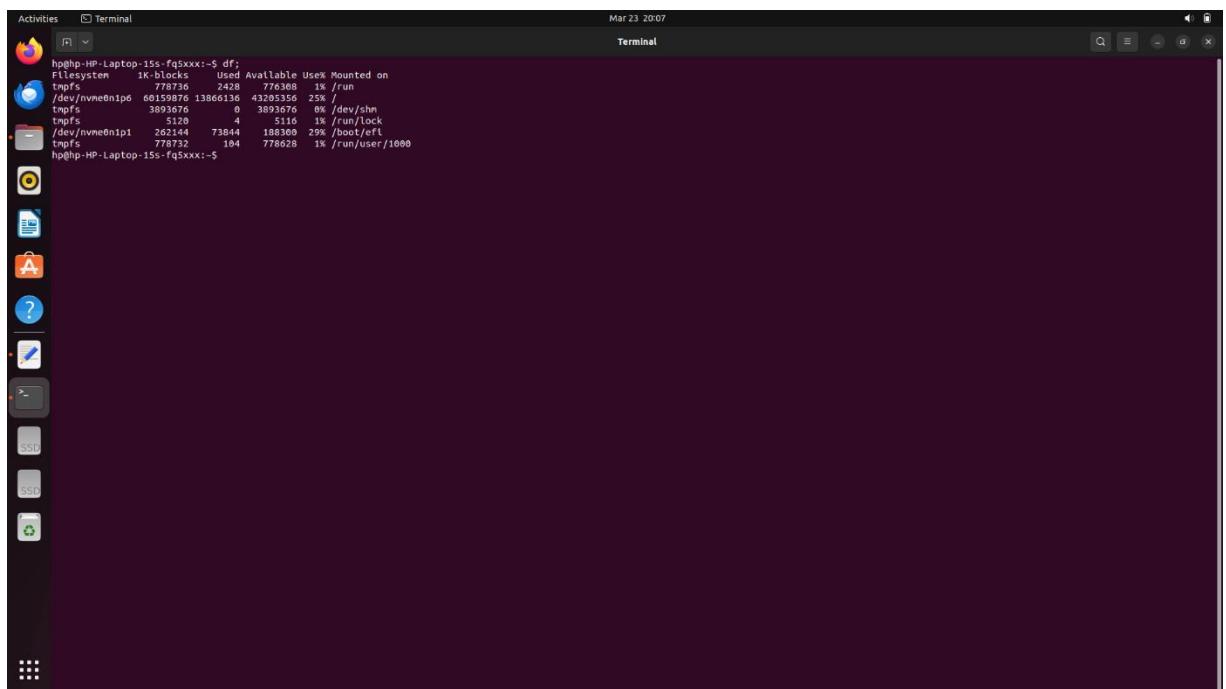
26)usermod: It is used to modify existing user account details ,username ,password ,home directory location ,default shell ,and more.

28)passwd: Passwd command used to change password for user accounts.



```
Activities Terminal Mar 23 20:29
root@hp-HP-Laptop-15s-fq5xxx:/home/hp# passwd
New password:
Retype new password:
passwd: password updated successfully
root@hp-HP-Laptop-15s-fq5xxx:/home/hp#
```

29)df: It is used to display the disk space used in the file system.



```
Activities Terminal Mar 23 20:07
root@hp-HP-Laptop-15s-fq5xxx:~$ df
Filesystem 1K-blocks Used Available Use% Mounted on
tmpfs 778736 2428 776308 1% /run
/dev/nvme0n1p6 6818575 1386130 4932000 2% /
tmpfs 3893676 0 3893676 0% /dev/shm
tmpfs 5120 4 5116 1% /run/lock
/dev/nvme0n1p1 262144 73844 188300 29% /boot/efi
tmpfs 778732 184 778628 1% /run/user/1000
root@hp-HP-Laptop-15s-fq5xxx:~$
```

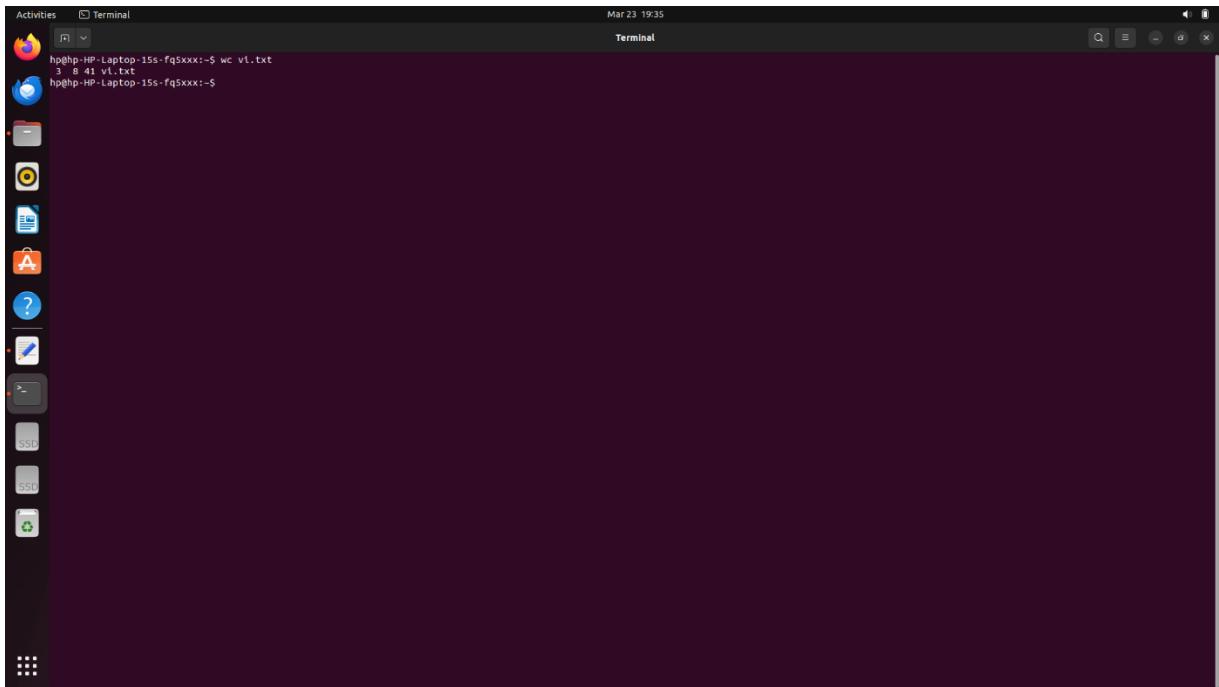
30)top: It shows the real-time view of running process in Linux and displays and kernel managed tasks.

```
Activities Terminal Mar 23 20:08:33 up 59 min, 1 user, load average: 0.13, 0.06, 0.06
Tasks: 273 total, 20 running, 251 sleeping, 0 stopped, 0 zombie
CPU states: 0.1% user, 0.1% nice, 9.1% sys, 8.0% idle, 8.0% iowait, 5.0% softirq, 0.0% si, 0.0% st
MB Mem : 7604.8 total, 5481.1 free, 890.5 used, 1233.3 buff/cache
MB Swap : 2048.0 total, 2048.0 free, 0.0 used. 6151.8 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1657 hp 20 0 57637 317664 139680 3 0.0 0.0 0:00.00 gnome-terminal
1166 hp 20 0 561180 589760 45228 0 0.7 0.8 0:20.48 gnome-terminal
212 root -51 0 0 0 0 0 0.0 0.0 0:05.18 irq/126-ELAN01:00
137 root 0 -20 0 0 0 0 1.0 0.0 0:05.18 irq/126-ELAN01:00
2848 root 20 0 0 0 0 0 0.3 0.0 0:02.98 kworker/u25:0-1915_fltip
3248 hp 20 0 13316 4224 3328 R 0.1 0.0 0:01.15 top
4 root 20 0 166332 11228 8024 0 0.0 0.0 0:00.00 kthreadd
2 root 0 0 0 0 0 0 0.0 0.0 0:00.00 kthreadd
3 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 rcu_gp
4 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 rcu_par_gp
5 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 slub_flushwq
6 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 netns
8 root 0 -20 0 0 0 0 0.0 0.0 0:00.00 kworker/1:0H-events_highpri
10 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 kworker/wq
11 root 20 0 0 0 0 0 0.0 0.0 0:00.00 rcu_tasks_kthread
12 root 20 0 0 0 0 0 0.1 0.0 0:00.00 rcu_tasks_rude_kthread
13 root 20 0 0 0 0 0 0.1 0.0 0:00.00 rcu_tasks_trace_kthread
14 root 20 0 0 0 0 0 0.0 0.0 0:00.00 ksoftirqd/0
15 root 20 0 0 0 0 0 0.0 0.0 0:00.00 preempt
16 root rt 0 0 0 0 0 0.5 0.0 0:00.03 migration/0
17 root -51 0 0 0 0 0 0.5 0.0 0:00.00 idle_inject/0
19 root 20 0 0 0 0 0 0.5 0.0 0:00.00 cpuhp/0
20 root 20 0 0 0 0 0 0.5 0.0 0:00.00 cpuhp/1
21 root -51 0 0 0 0 0 0.5 0.0 0:00.00 idle_inject/1
22 root rt 0 0 0 0 0 0.5 0.0 0:00.00 migration/1
23 root 20 0 0 0 0 0 0.5 0.0 0:00.00 ksoftirqd/1
25 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 kworker/1:0H-events_highpri
26 root 20 0 0 0 0 0 0.5 0.0 0:00.00 cpuhp/2
27 root -51 0 0 0 0 0 0.5 0.0 0:00.00 idle_inject/2
28 root rt 0 0 0 0 0 0.5 0.0 0:00.00 migration/2
29 root 20 0 0 0 0 0 0.5 0.0 0:00.04 ksoftirqd/2
31 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 kworker/2:0H-events_highpri
32 root 20 0 0 0 0 0 0.5 0.0 0:00.00 cpuhp/3
33 root -51 0 0 0 0 0 0.5 0.0 0:00.00 idle_inject/3
34 root rt 0 0 0 0 0 0.5 0.0 0:00.00 migration/3
35 root 20 0 0 0 0 0 0.5 0.0 0:00.00 ksoftirqd/3
37 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 kworker/3:0H-events_highpri
38 root 20 0 0 0 0 0 0.5 0.0 0:00.00 cpuhp/4
39 root -51 0 0 0 0 0 0.5 0.0 0:00.00 idle_inject/4
40 root rt 0 0 0 0 0 0.5 0.0 0:00.25 migration/4
41 root 20 0 0 0 0 0 0.5 0.0 0:00.00 ksoftirqd/4
42 root 20 0 0 0 0 0 0.1 0.0 0:00.00 kworker/4:0H-events_highpri
43 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 kworker/4:0H-events_highpri
44 root 20 0 0 0 0 0 0.5 0.0 0:00.00 cpuhp/5
45 root -51 0 0 0 0 0 0.5 0.0 0:00.00 idle_inject/5
46 root rt 0 0 0 0 0 0.5 0.0 0:00.05 migration/5
47 root 20 0 0 0 0 0 0.5 0.0 0:00.04 ksoftirqd/5
48 root 20 0 0 0 0 0 0.1 0.0 0:00.14 kworker/5:0H-events_highpri
```

31)ps: It is used to list the currently running processes and their PIDs along with some other information depends on different option.

32)wc: word count. It is mainly used for counting purpose.



33)ssh: It instructs the system to establish an encrypted secure connection with the host machine.

To check the system containing ssh using the command;

```
$ “ssh”
```

The installation command on ssh is:

```
$ “sudo apt-get install open ssh-server”
```

To check the system IP address using the command:

```
$ “ifconfig”
```

Ping command using to check working:

```
$ “ping second system IP”
```

To login second system using the given command:

```
$ “ssh second system user@second system IP”
```

```
$ “cd Desktop”
```

```
$ “ls”
```

34)scp: It is used to copy files between servers in a secure way.

Command:

`$ “scp 2nd system file path 1st system user@1st system IP:2nd system path”`

To logout the connection using:

`$ “logout/cntrl+D”`

35)ssh-keygen: It is used to generate, manage, and convert authentication keys for “ssh”.

36)ssh-copy-id: It uses the “ssh” protocol to connect to the target host and upload the “ssh” user key.

RESULT

Linux text editors can be used for editing text files, writing codes, updating user instruction files, and more.

A text editor plays an important role while coding. So, it is important to select the best text editor. A text editor should not only be simple but also functional and should be good to work with.

A Linux command is a program or utility that runs on the command line. A command line is an interface that accepts lines of text and processes them into instructions for your computer.

EXPERIMENT 3

Aim : File system hierarchy is a common Linux distribution, file and device permissions ,study of the system configuration files in /etc ,familiarizing log files for system events, user activity, network events.

FILE SYSTEM HIERARCHY

The Linux File Hierarchy Structure or the Filesystem Hierarchy Standard (FHS) defines the directory structure and directory contents in Unix-like operating systems. It is maintained by the Linux Foundation.

LOG FILES AND CONFIGURATION FILES

Linux uses a set of configuration files, directories, programs, commands and daemons to create, store and recycle these log messages. Knowing where the system keeps its log files and how to make use of related commands can therefore help save valuable time during troubleshooting.

USER TYPES

- **Root User:** Access to all the file on the system.
- **Regular User:** This is the normal user account.
- **Service User:** Using service to run process and execute functions

DIRECTORY STRUCTURE

- **/bin:** Binary or executable program.
- **/etc:** System configuration files
- **/home:** Home directory.
- **/opt:** Optional or third party software.
- **/tmp:** temporary space.
- **/usr:** user related programs.
- **/var:** log files.

- **/boot:** It contain all the boot related information files and folders such as conf,grub,etc.
- **/dev:** It is the location of the device files such as dev/sda1, dev/sda2,etc.
- **/lib:** It contain kernel modules and a shared library.
- **/media:** It contains subdirectories where removal media devices inserted.
- **/mnt:** It contain temporary mount directories for mounting the file system.
- **/proc:** It is the virtual pseudo file system to contains info about the running processes with a specific process ID or PID.
- **/run:** It stores volatile runtime data.
- **/sbin:** Binary executable program for an administrator.
- **/srv:** It contain server specific and server related files.
- **/sys:** It is a virtual file system for modern Linux distribution to store and allows modification of the devices connected to the system. To create a new file using “touch”.

Setting file permission

1. User owner permission
2. Group permission
3. Other's permission

Eg: - r w-r w -r—x

Here ,

User → permission to read ,write only
 Group → permission to read ,write only
 Other's → permission to read ,write only

Permission set method

- **Symbolic method**
- **Absolute method**

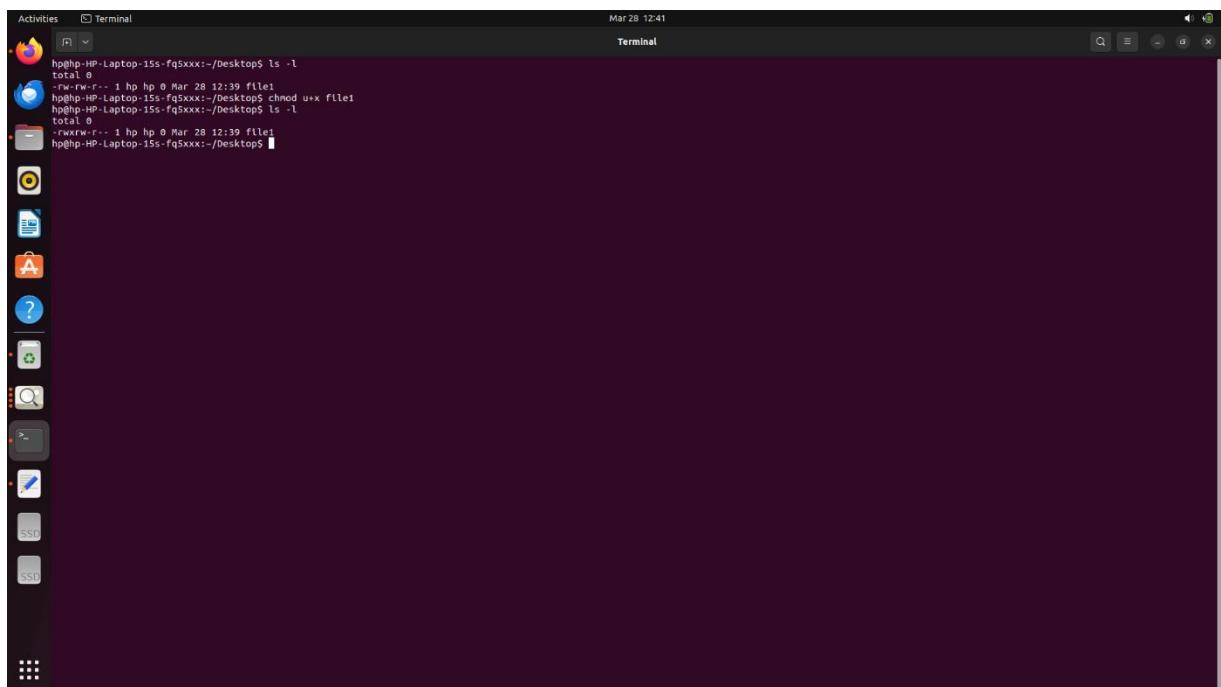
Symbolic method

Operators are used

- + permission adding
- - permission removing
- = permission assigning

USER: A user is the one who created the file. By default, whosoever, creates the file become the owner of the file. A user can create, delete, or modify the file. [Symbol:”u”]

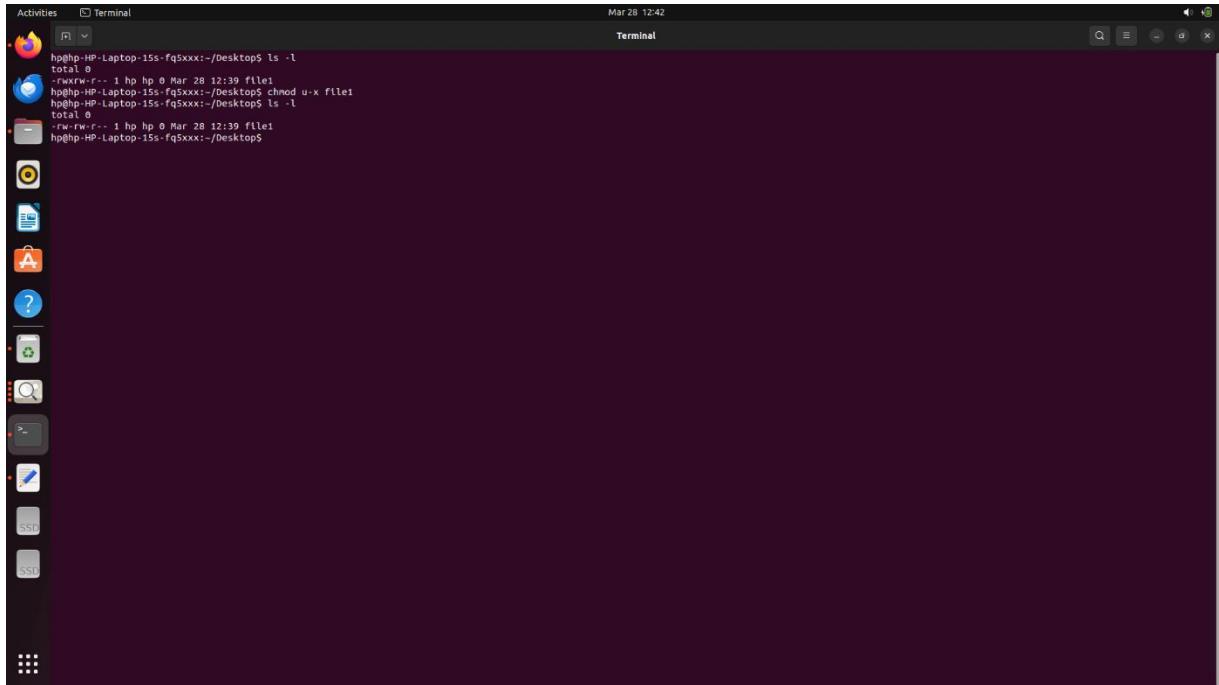
- Permission adding(user)



The screenshot shows a Linux desktop environment with a dark theme. On the left is a vertical dock with icons for a terminal, file manager, and other applications. The main window is a terminal window titled 'Terminal' showing the following command-line session:

```
Activities Terminal Mar 28 12:41
[hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop]$ ls -l
total 0
[hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop]$ touch file1
[hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop]$ chmod u+x file1
[hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop]$ ls -l
total 0
[hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop]$
```

- permission removing(user)

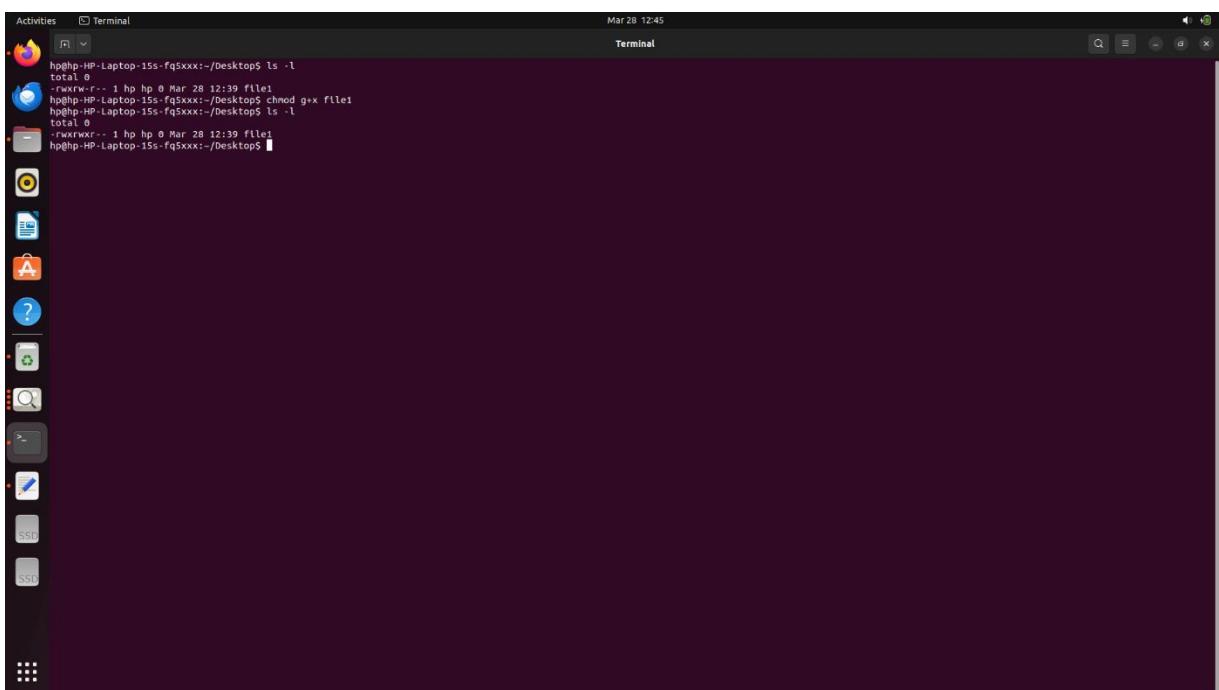


A screenshot of a Linux desktop environment. On the left is a vertical dock with icons for a browser, file manager, terminal, and other system applications. The main window is a terminal titled 'Terminal' with the status bar showing 'Mar 28 12:42'. The terminal window contains the following text:

```
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rwxr--r-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ chmod u+x file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rw-rw-r-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

GROUP: A group can contain multiple users. All the users belonging to a group have same access permission for a file. [Symbol:"g"]

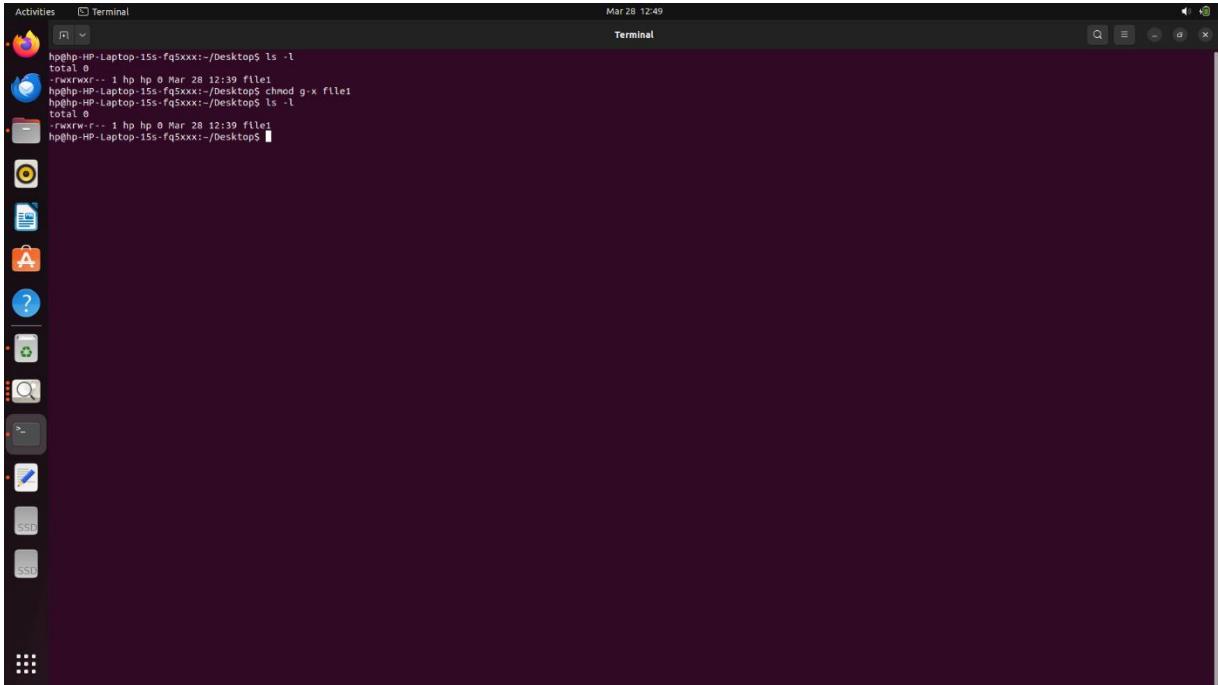
- Permission adding(group)



A screenshot of a Linux desktop environment. On the left is a vertical dock with icons for a browser, file manager, terminal, and other system applications. The main window is a terminal titled 'Terminal' with the status bar showing 'Mar 28 12:45'. The terminal window contains the following text:

```
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rwxr--r-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ chmod g+x file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rwxrwxr-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

- Permission removing(user)



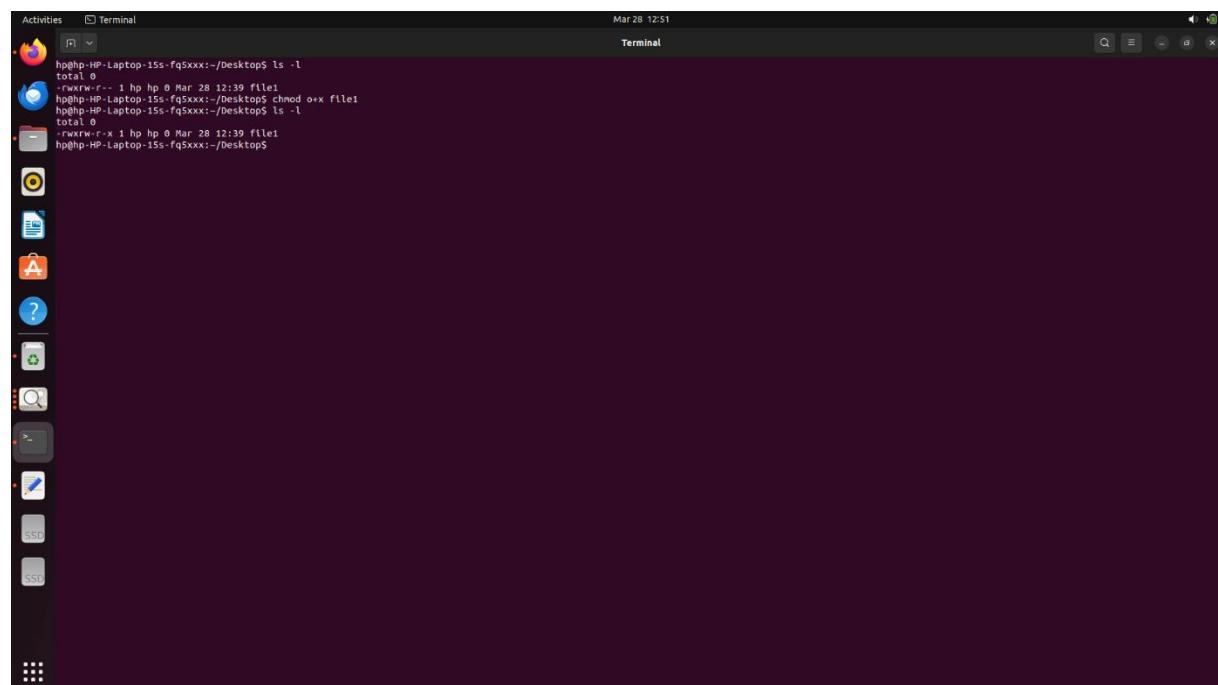
A screenshot of a Linux desktop environment. On the left is a vertical dock with icons for various applications like a web browser, file manager, and system tools. The main window is a terminal window titled 'Terminal' with the status bar showing 'Mar 28 12:49'. The terminal content is as follows:

```
Activities Terminal
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rwxr-xr-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ chmod g-x file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rw-rw-r-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

OTHER: Any one who has access to the file other than user and group comes in the category of other.

Other has neither created the file nor is a group member.[Symbol :"o"]

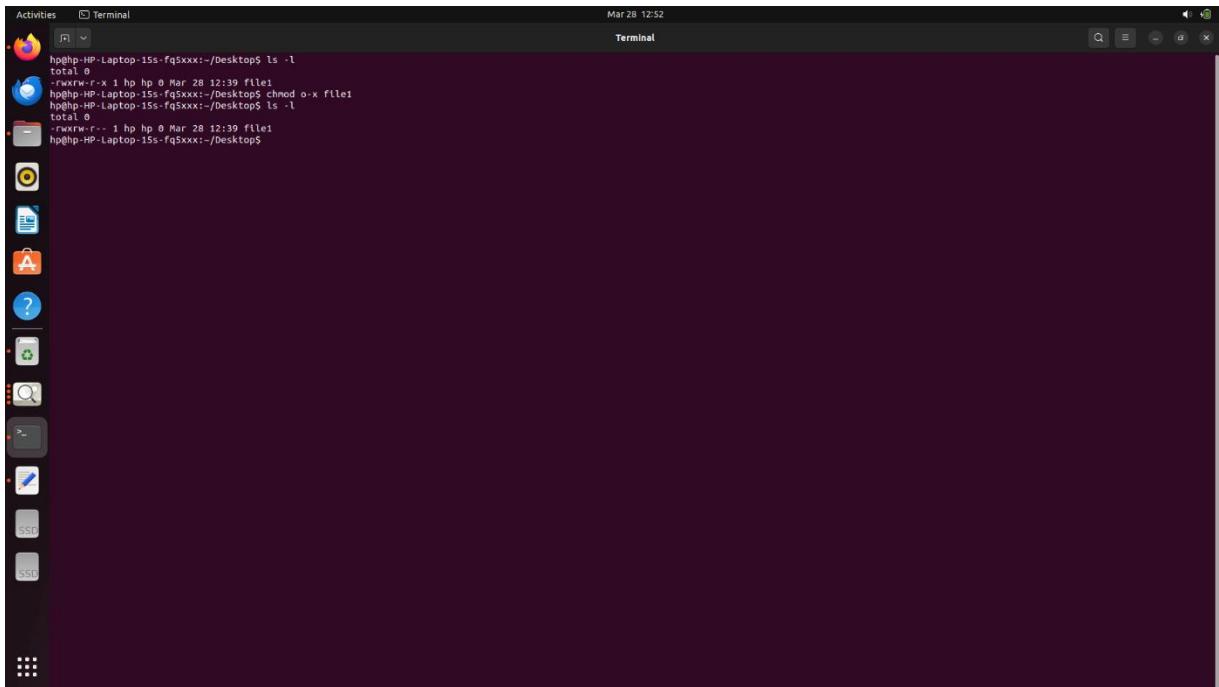
- Permission adding(user)



A screenshot of a Linux desktop environment, similar to the previous one. The terminal window is titled 'Terminal' with the status bar showing 'Mar 28 12:51'. The terminal content is as follows:

```
Activities Terminal
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rwxr-xr-- 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ chmod o+x file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 0
-rwxrwxr-x 1 hp hp 0 Mar 28 12:39 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

- Permission removing(user)



```

Activities Terminal Mar 28 12:52
hp@HP-Laptop:~$ ls -l
total 0
-rwxr-x 1 hp hp 0 Mar 28 12:39 file1
hp@HP-Laptop:~$ chmod o-x file1
hp@HP-Laptop:~$ ls -l
total 0
-rwxr--r-- 1 hp hp 0 Mar 28 12:39 file1
hp@HP-Laptop:~$
```

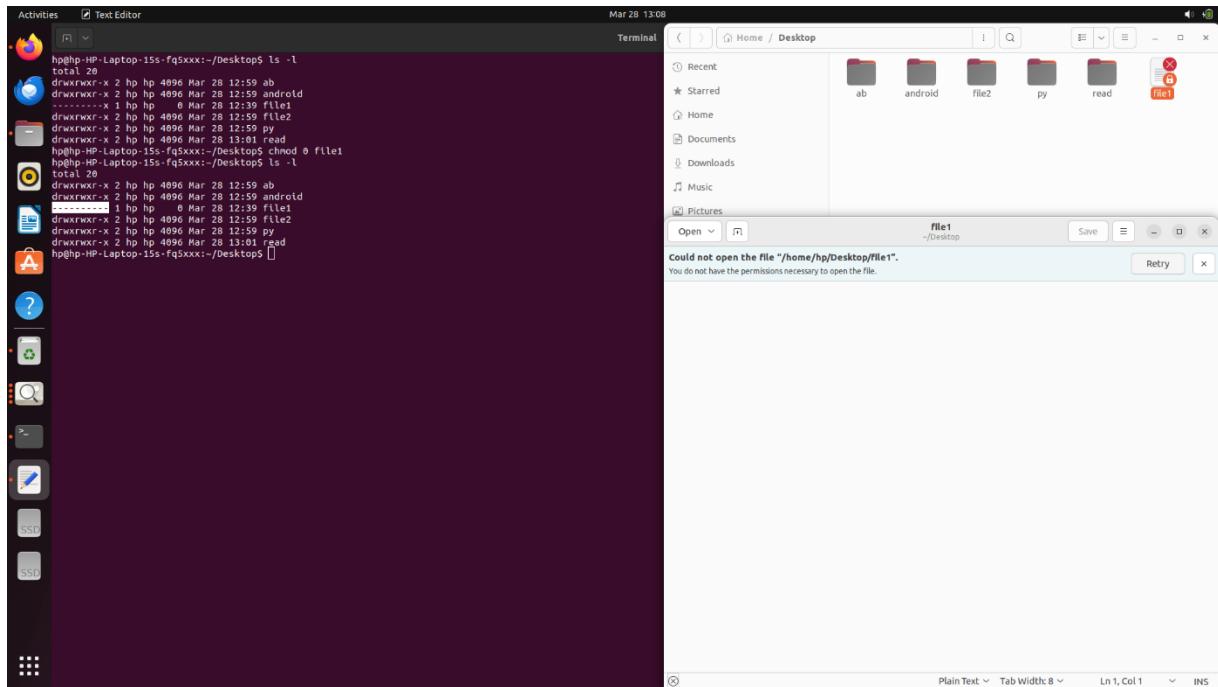
FILE PERMISSIONS

- **READ:** The read permission refers to a users capability to read the contents of the file.
- **WRITE:** The write permission refers to a users capability to write or modify a file or directory
- **EXECUTE:** The execute permission affects a users capability to execute a file or view the content of a directory
-

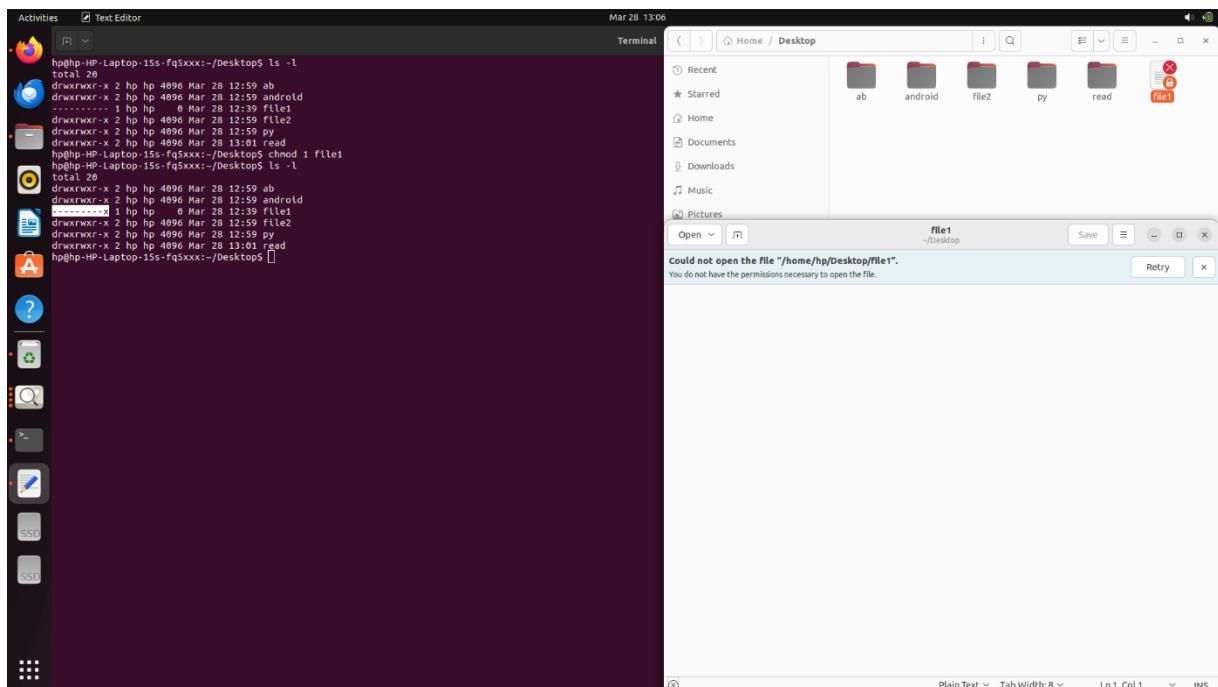
ABSOLUTE METHOD

	READ	WRITE	EXECUTE	PERMISSIONS
1	0	0	0	No permission
2	0	0	1	Execute permission only
3	0	1	0	Write permission only
4	1	0	0	Read permission only
5	1	0	1	Read and Execute permission
6	1	1	0	Read and Write permission
7	1	1	1	Read ,Write, Execute permission

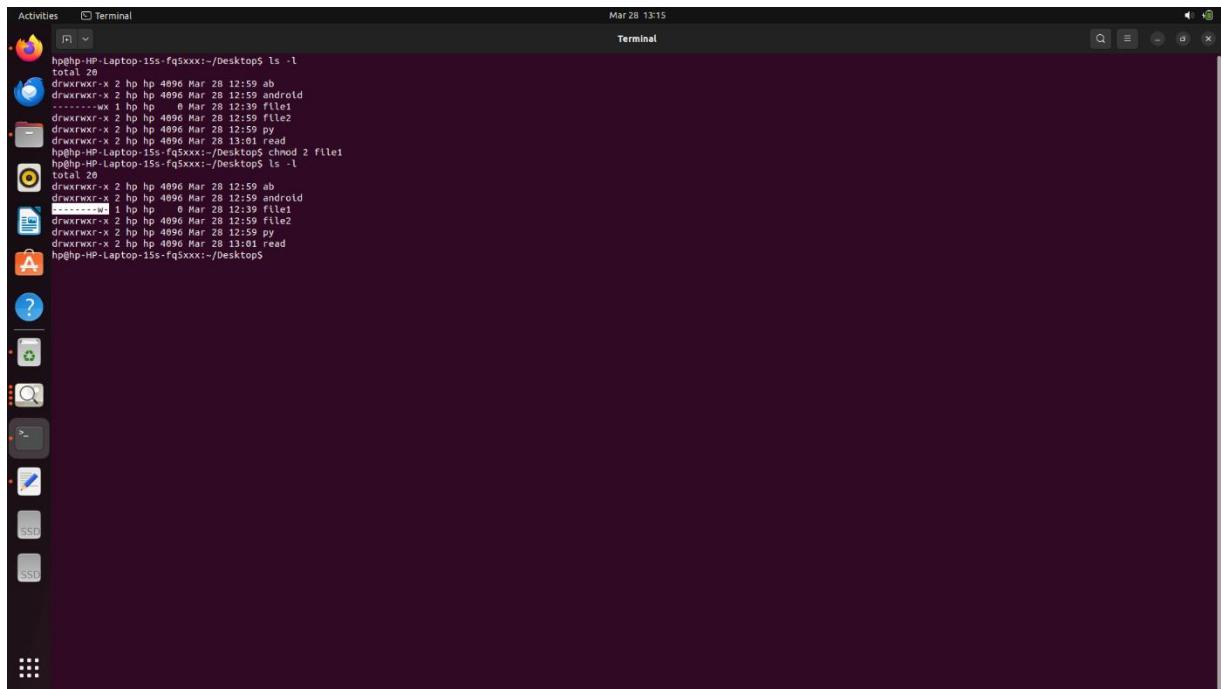
NUMBER =0: NO PERMISSIONS



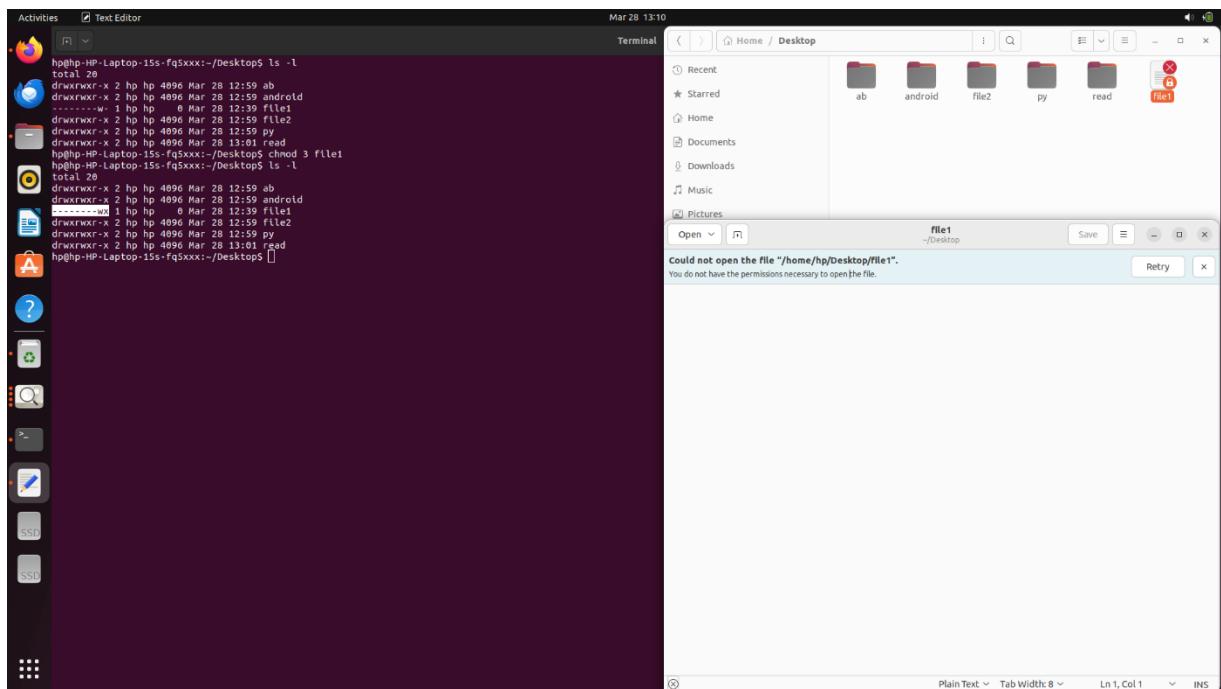
NUMBER=1: EXECUTE



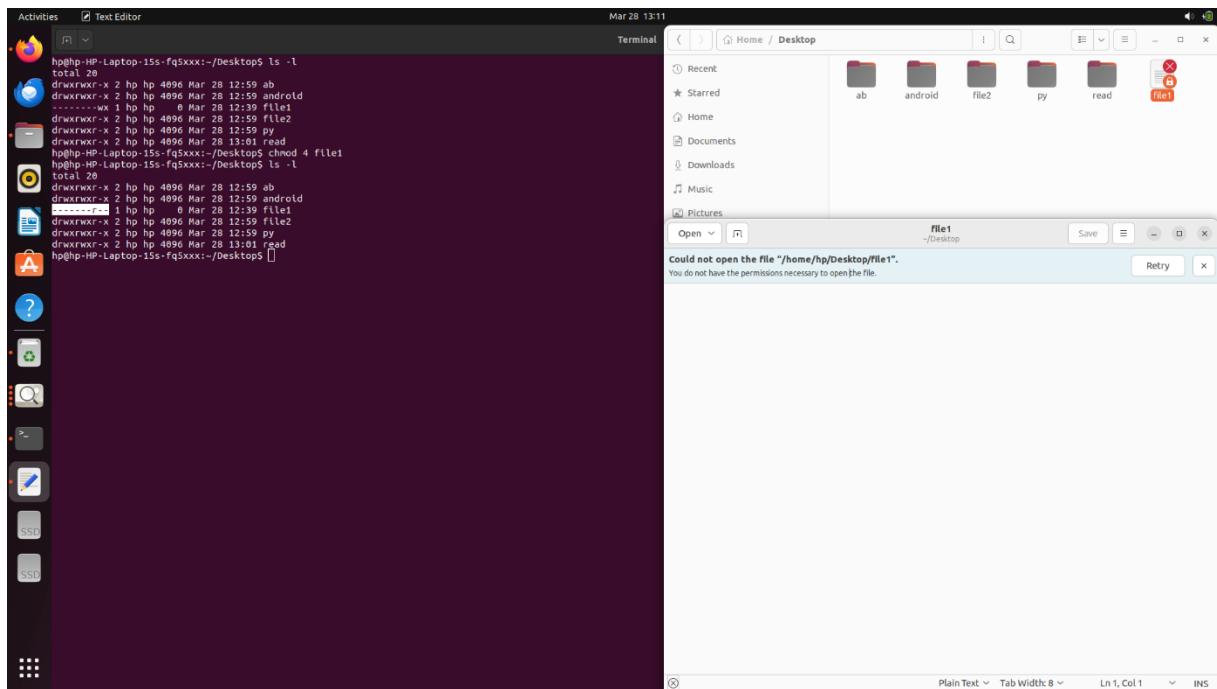
NUMBER =2: WRITE



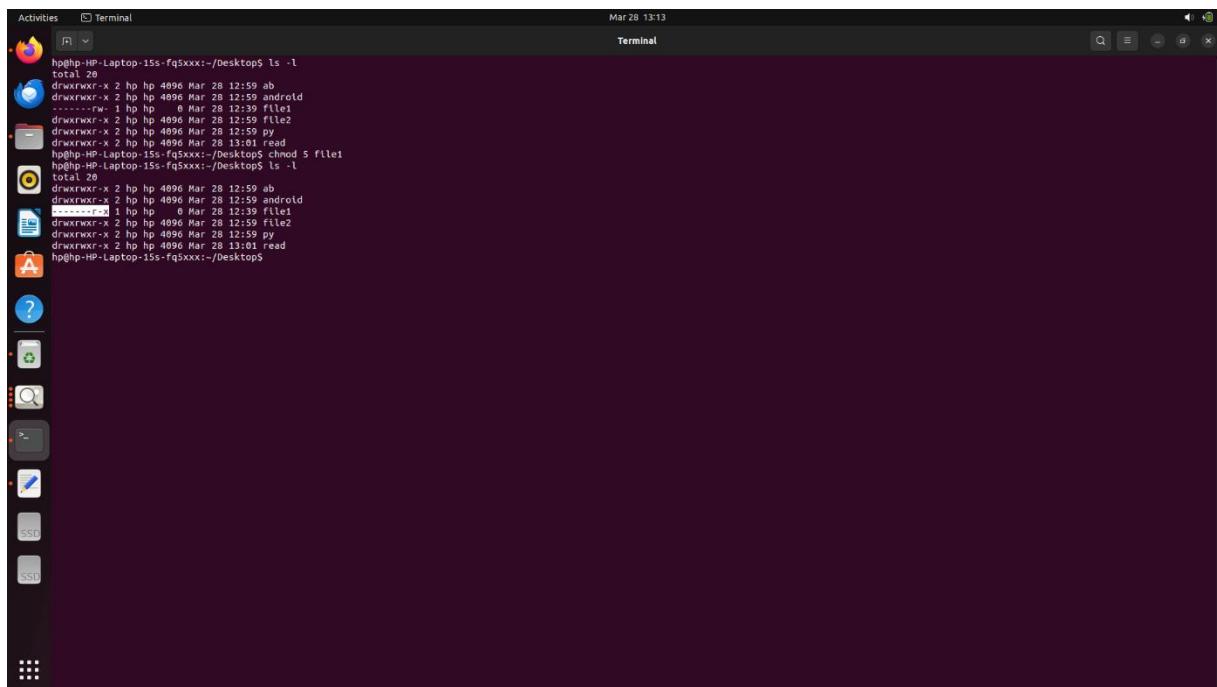
NUMBER 3: EXECUTE + WRITE



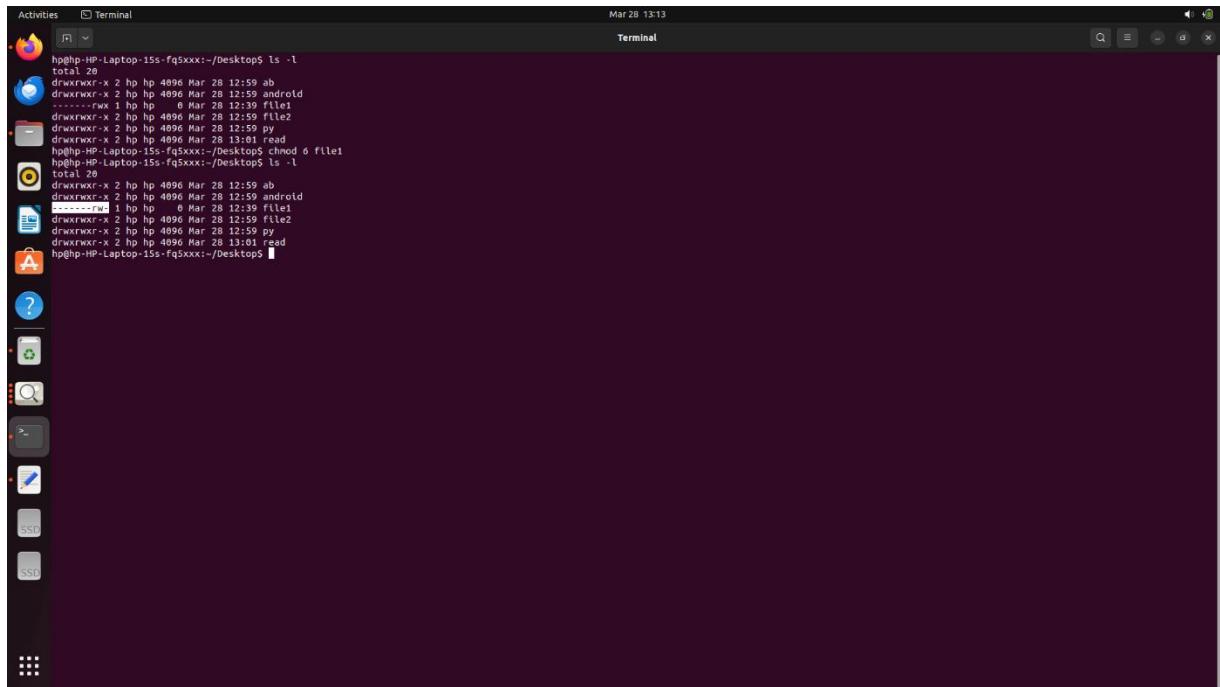
NUMBER =4: READ



NUMBER 5: READ + EXECUTE

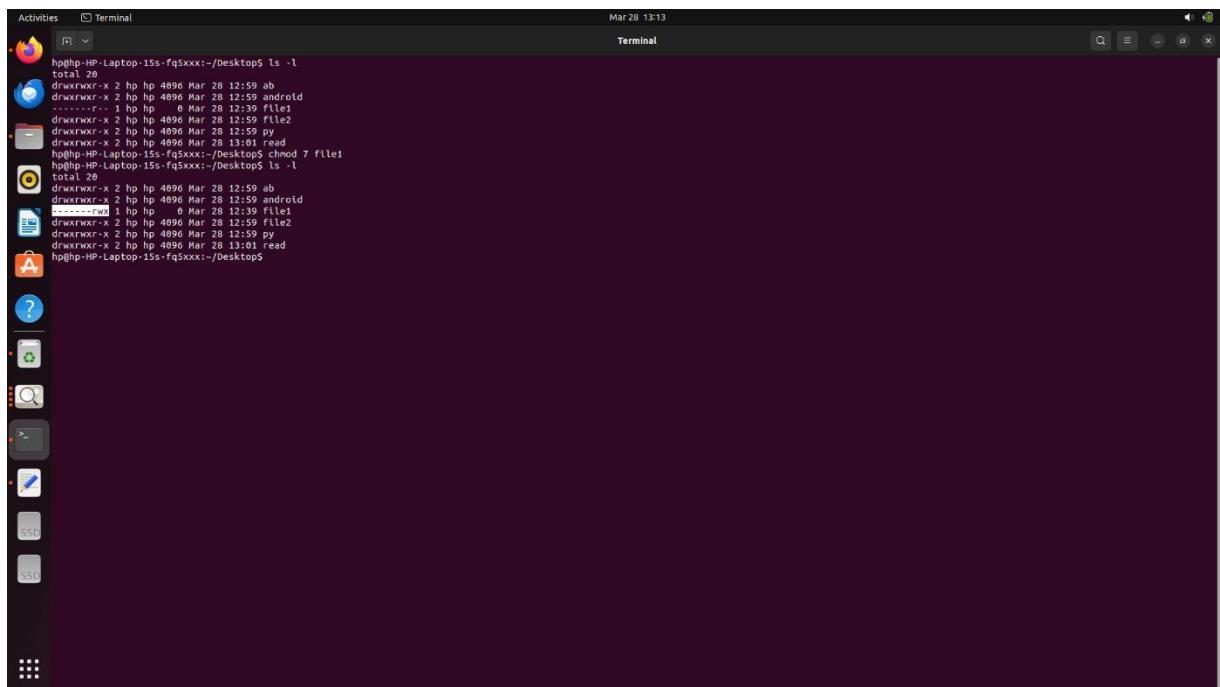


NUMBER =6: READ + WRITE



```
Activities Terminal Mar 28 13:13
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 20
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 ab
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 android
-----rwx 1 hp hp 0 Mar 28 12:39 file1
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file2
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file3
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 py
drwxrwxr-x 2 hp hp 4996 Mar 28 13:01 read
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ chmod 6 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 20
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 ab
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 android
-----rwx 1 hp hp 0 Mar 28 12:39 file1
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file2
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file3
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 py
drwxrwxr-x 2 hp hp 4996 Mar 28 13:01 read
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

NUMBER 7: READ + WRITE + EXECUTE



```
Activities Terminal Mar 28 13:13
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 20
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 ab
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 android
-----rwx 1 hp hp 0 Mar 28 12:39 file1
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file2
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file3
drwxrwxr-x 2 hp hp 4996 Mar 28 13:01 read
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ chmod 7 file1
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$ ls -l
total 20
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 ab
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 android
-----rwx 1 hp hp 0 Mar 28 12:39 file1
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file2
drwxrwxr-x 2 hp hp 4996 Mar 28 12:59 file3
drwxrwxr-x 2 hp hp 4996 Mar 28 13:01 read
hp@hp-HP-Laptop-15s-fq5xxx:~/Desktop$
```

RESULT:

Successfully completed Linux file permissions .Linux divides the file permissions .Linux divides the file permissions into read, write and execute denoted by r ,w and x. This document explains how directory and file permissions on a UNIX or LINUX machine are set and can be changed by the user.