



National Textile University

Department of Computer Science

Subject:

Operating System

Submitted to:

Dr. Nasir Mehmood

Submitted by:

Ghulam Mohyuddin

Reg number:

23-NTU-CS-FL-1158

Lab number:

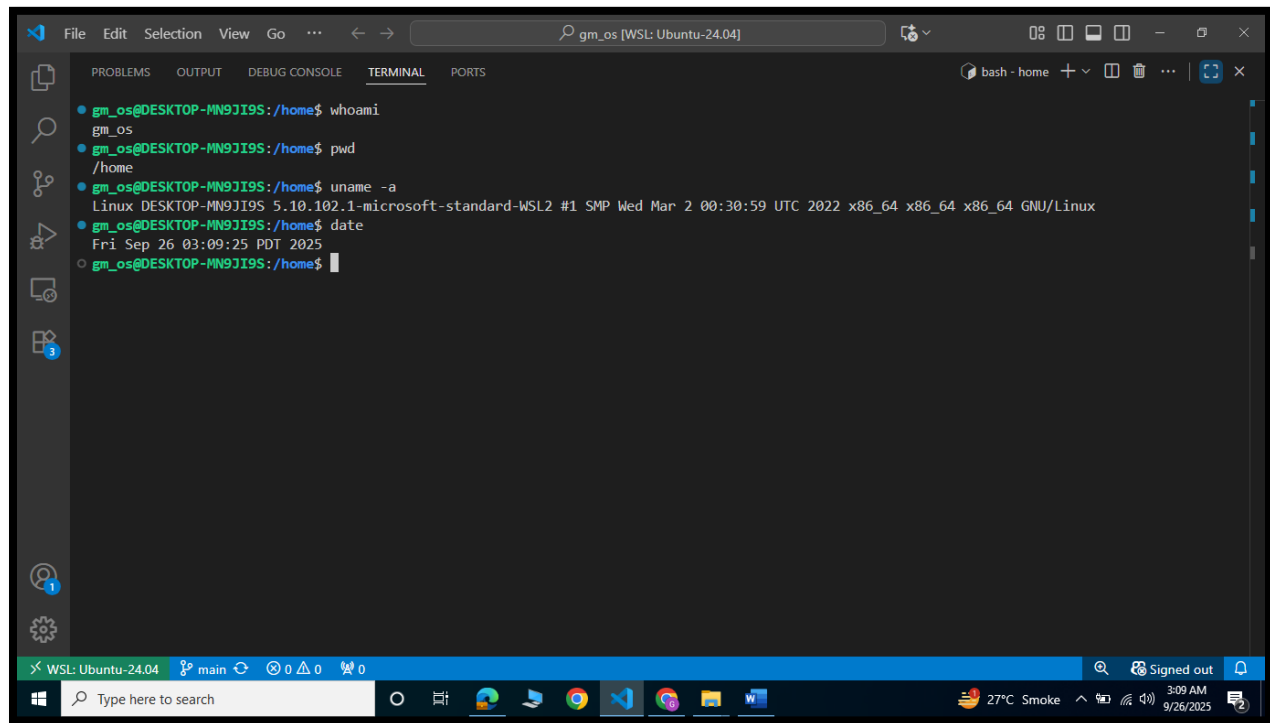
2nd

Semester:

4th

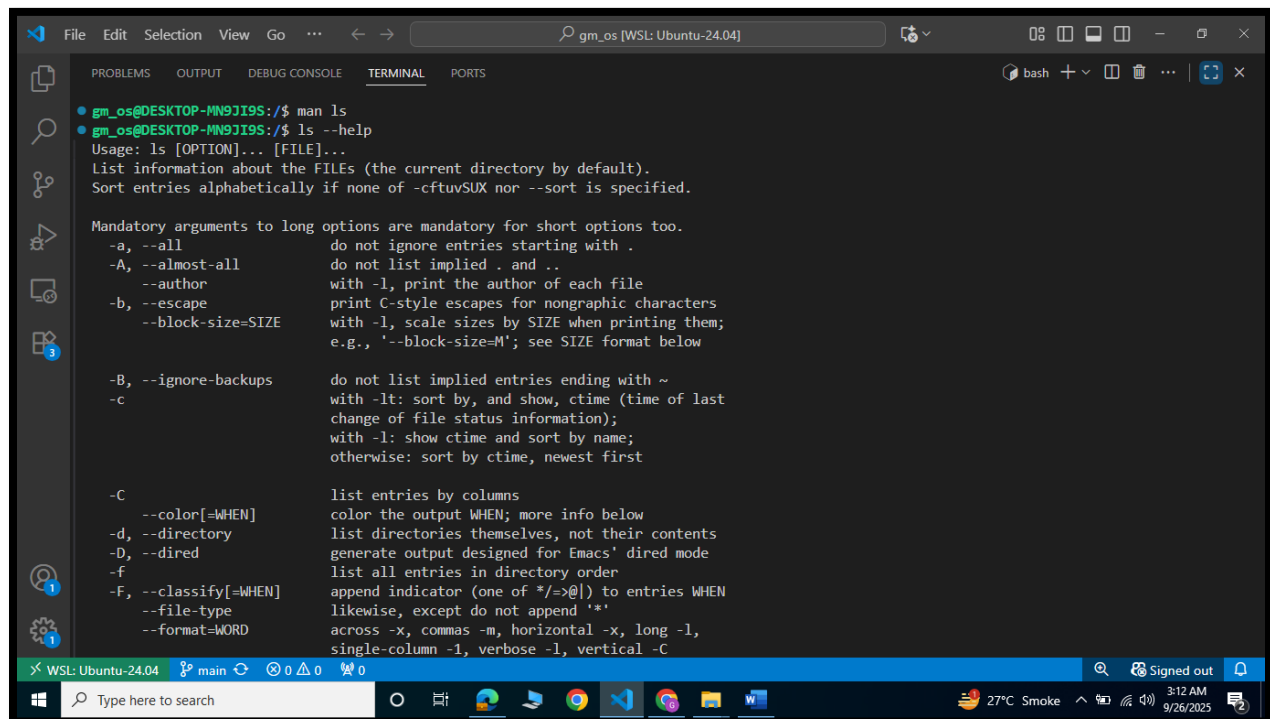
Part 1: Linux Environment Orientation

1.1: Understanding the Linux Environment



```
gm_os@DESKTOP-MN9JI9S:/home$ whoami
gm_os
gm_os@DESKTOP-MN9JI9S:/home$ pwd
/home
gm_os@DESKTOP-MN9JI9S:/home$ uname -a
Linux DESKTOP-MN9JI9S 5.10.102.1-microsoft-standard-WSL2 #1 SMP Wed Mar 2 00:30:59 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
gm_os@DESKTOP-MN9JI9S:/home$ date
Fri Sep 26 03:09:25 PDT 2025
gm_os@DESKTOP-MN9JI9S:/home$
```

1.2: Getting help in Linux



```
gm_os@DESKTOP-MN9JI9S:/home$ man ls
gm_os@DESKTOP-MN9JI9S:/home$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

Mandatory arguments to long options are mandatory for short options too.
  -a, --all                do not ignore entries starting with .
  -A, --almost-all        do not list implied . and ..
  -l, --long               with -l, print the author of each file
  -b, --escape             print C-style escapes for nongraphic characters
  -B, --ignore-backups     do not list implied entries ending with ~
  -c, --sort=CTIME          with -lt: sort by, and show, ctime (time of last
                           change of file status information);
                           with -l: show ctime and sort by name;
                           otherwise: sort by ctime, newest first

  -C, --sort=COLS           list entries by columns
  -C, --color[=WHEN]       color the output WHEN; more info below
  -d, --directory          list directories themselves, not their contents
  -D, --dired              generate output designed for Emacs' dired mode
  -f, --sort=NAME           list all entries in directory order
  -F, --classify[=WHEN]    append indicator (one of */=>@|) to entries WHEN
  -l, --long               likewise, except do not append '*'
  -s, --file-type           across -x, commas -m, horizontal -x, long -l,
  -S, --sort=SIZE           single-column -1, verbose -l, vertical -C
```

The screenshot shows a VS Code terminal window with the title bar 'gm_os [WSL: Ubuntu-24.04]'. The terminal output is as follows:

```
gm_os@DESKTOP-MN9JI9S:/$ which ls
/usr/bin/ls
gm_os@DESKTOP-MN9JI9S:/$ type ls
ls is aliased to `ls --color=auto`
gm_os@DESKTOP-MN9JI9S:/$
```

The terminal window includes a sidebar with icons for Explorer, Search, Source Control, and Run and Debug. The status bar at the bottom shows 'WSL: Ubuntu-24.04', 'main', and system information like '27°C Smoke' and '3:12 AM 9/26/2025'.

Part 2: File System Navigation

2.1: Understanding Linux directory Structure

The screenshot shows a VS Code terminal window with the title bar 'gm_os [WSL: Ubuntu-24.04]'. The terminal output is as follows:

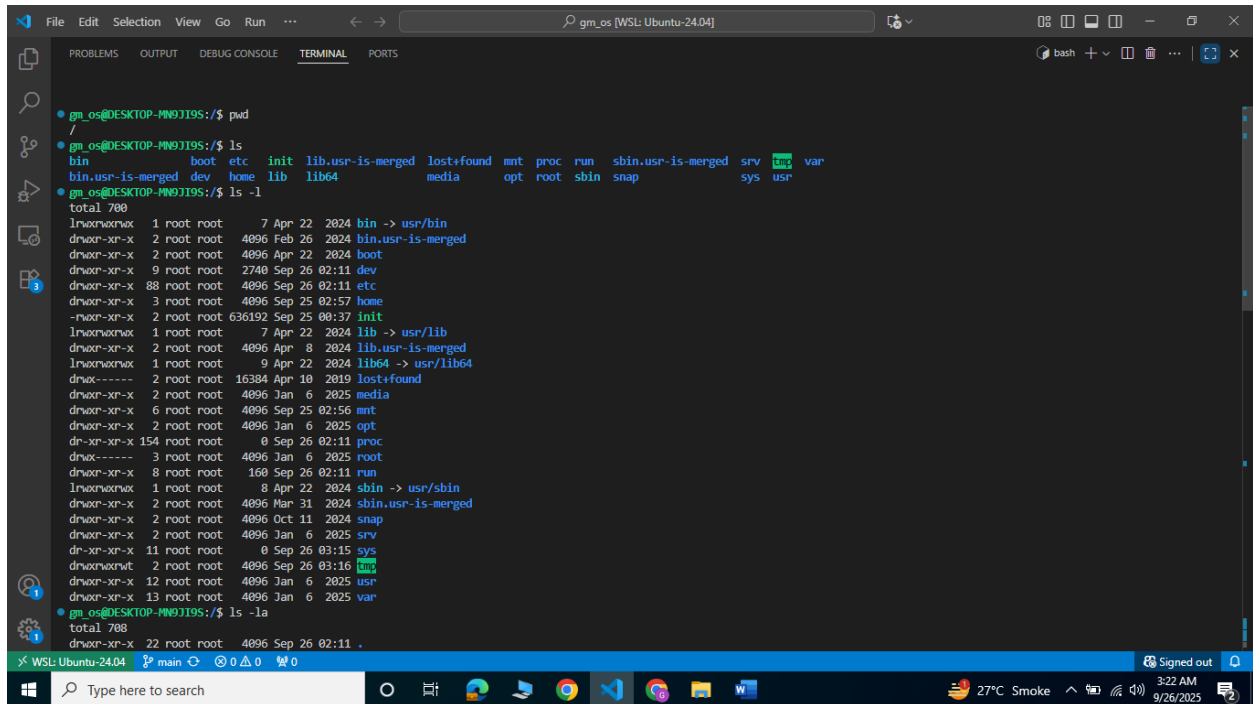
```
gm_os@DESKTOP-MN9JI9S:~$ ls /
bin      boot  etc  init  lib.usr-is-merged  lost+found  mnt  proc  run  sbin.usr-is-merged  srv  tmp  var
bin.usr-is-merged  dev  home  lib  lib64          media  opt  root  sbin  snap  sys  usr

gm_os@DESKTOP-MN9JI9S:~$ ls -la
total 60
drwxr-x--- 9 gm_os gm_os 4096 Sep 26 03:11 .
drwxr-xr-x 3 root  root  4096 Sep 25 02:57 ..
-rw-r----- 1 gm_os gm_os 1125 Sep 26 03:16 .bash_history
-rw-r--r-- 1 gm_os gm_os 220 Sep 25 02:57 .bash_logout
-rw-r--r-- 1 gm_os gm_os 3771 Sep 25 02:57 .bashrc
drwxr-xr-x 3 gm_os gm_os 4096 Sep 25 03:25 .cache
drwxr-xr-x 3 gm_os gm_os 4096 Sep 25 03:26 .dotnet
-rw-r--r-- 1 gm_os gm_os 64 Sep 25 10:10 .gitconfig
drwxr-xr-x 2 gm_os gm_os 4096 Sep 25 02:57 .landscape
-rw-r----- 1 gm_os gm_os 20 Sep 26 03:11 .lessht
drwxr-xr-x 3 gm_os gm_os 4096 Sep 26 02:22 .local
-rw-r--r-- 1 gm_os gm_os 0 Sep 26 02:11 .motd_shown
-rw-r--r-- 1 gm_os gm_os 807 Sep 25 02:57 .profile
drwx----- 3 gm_os gm_os 4096 Sep 25 10:26 .ssh
-rw-r--r-- 1 gm_os gm_os 0 Sep 25 02:57 .sudo_as_admin_successful
drwxr-xr-x 5 gm_os gm_os 4096 Sep 25 03:25 .vscode-server
drwxr-xr-x 3 gm_os gm_os 4096 Sep 26 02:22 folder1
-rw-r--r-- 1 gm_os gm_os 0 Sep 26 02:14 hello.c

gm_os@DESKTOP-MN9JI9S:~$ cd /home
gm_os@DESKTOP-MN9JI9S:/home$ cd ~
gm_os@DESKTOP-MN9JI9S:~$ cd -
/home
gm_os@DESKTOP-MN9JI9S:/home$
```

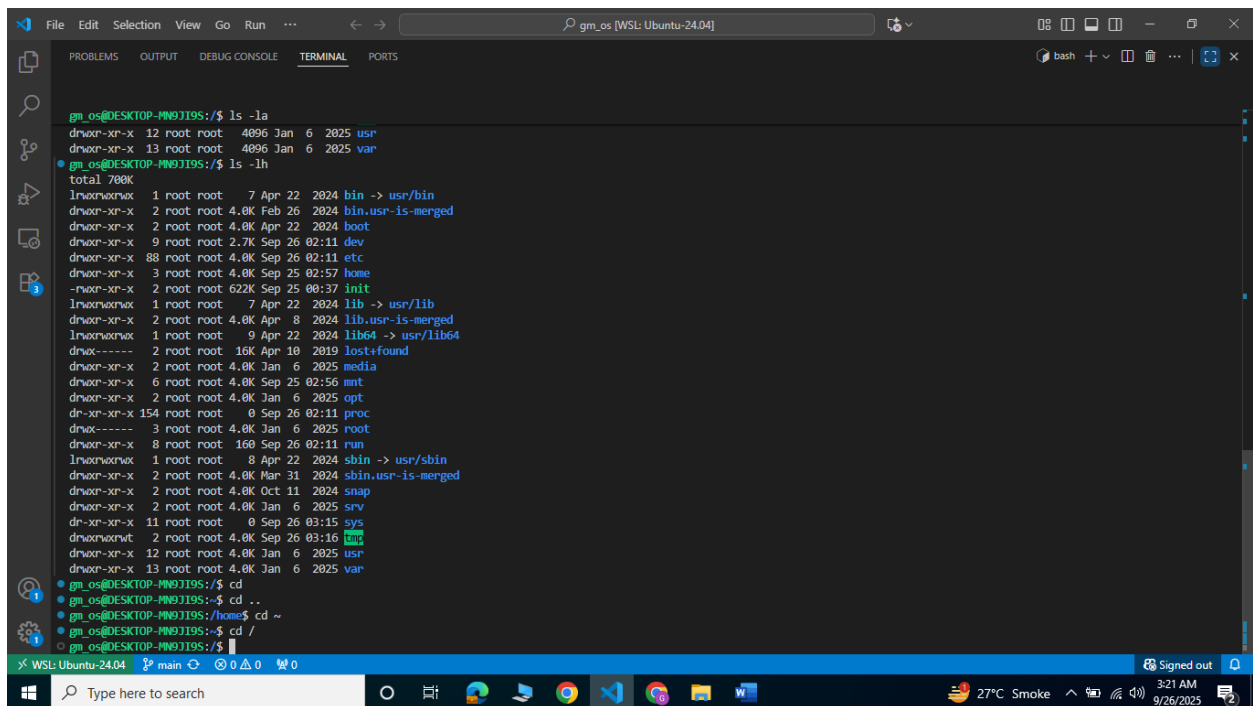
The terminal window includes a sidebar with icons for Explorer, Search, Source Control, and Run and Debug. The status bar at the bottom shows 'WSL: Ubuntu-24.04', 'main', and system information like '27°C Smoke' and '3:18 AM 9/26/2025'.

2.2: Basic Navigations Commands



The screenshot shows a Windows terminal window with the title bar "gm_os [WSL: Ubuntu-24.04]". The terminal interface includes a menu bar (File, Edit, Selection, View, Go, Run, ...), a toolbar with icons for file operations, and a tab bar with "PROBLEMS", "OUTPUT", "DEBUG CONSOLE", "TERMINAL", and "PORTS". The "TERMINAL" tab is active, showing a bash prompt "gm_os@DESKTOP-MN9J19S:/\$". The user has entered the command "ls", and the output displays a directory listing of the root directory. The output is color-coded, with file names in green and permissions in blue. The listing shows various system directories and files, including bin, boot, etc, init, lib, usr, and var. The user has then entered the command "ls -l", and the output shows a detailed listing of the same directory, including file permissions, owner, group, size, and date. The terminal window is running on a Windows 11 desktop, as indicated by the taskbar and system tray.

```
gm_os@DESKTOP-MN9J19S:/$ pwd
/
gm_os@DESKTOP-MN9J19S:/$ ls
bin      boot     etc      init     lib.usr-is-merged  lost+found  mnt      proc      run     /sbin.usr-is-merged  srv      sys      var
bin.usr-is-merged  dev      home     lib      lib64      media      opt      root     /sbin      snap      sys      usr
gm_os@DESKTOP-MN9J19S:/$ ls -l
total 780
lrwxrwxrwx 1 root root    7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 9 root root 2740 Sep 26 02:11 dev
drwxr-xr-x 88 root root 4096 Sep 26 02:11 etc
drwxr-xr-x 3 root root 4096 Sep 25 02:57 home
-rwxr-xr-x 2 root root 636192 Sep 25 00:37 init
lrwxrwxrwx 1 root root    7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4096 Apr  8 2024 lib.usr-is-merged
lrwxrwxrwx 1 root root    9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16384 Apr 10 2019 lost+found
drwxr-xr-x 2 root root 4096 Jan  6 2025 media
drwxr-xr-x 6 root root 4096 Sep 25 02:56 mnt
drwxr-xr-x 2 root root 4096 Jan  6 2025 opt
dr-xr-xr-x 154 root root    0 Sep 26 02:11 proc
drwx----- 3 root root 4096 Jan  6 2025 root
drwxr-xr-x 8 root root 160 Sep 26 02:11 run
lrwxrwxrwx 1 root root    8 Apr 22 2024/sbin -> usr/sbin
drwxr-xr-x 2 root root 4096 Mar 31 2024/sbin.usr-is-merged
drwxr-xr-x 2 root root 4096 Oct 11 2024 snap
drwxr-xr-x 2 root root 4096 Jan  6 2025 srv
dr-xr-xr-x 11 root root    0 Sep 26 03:15 sys
drwxrwxrwt 2 root root 4096 Sep 26 03:16 tmp
drwxr-xr-x 12 root root 4096 Jan  6 2025 usr
drwxr-xr-x 13 root root 4096 Jan  6 2025 var
gm_os@DESKTOP-MN9J19S:/$ ls -la
total 780
drwxr-xr-x 22 root root 4096 Sep 26 02:11 .
```

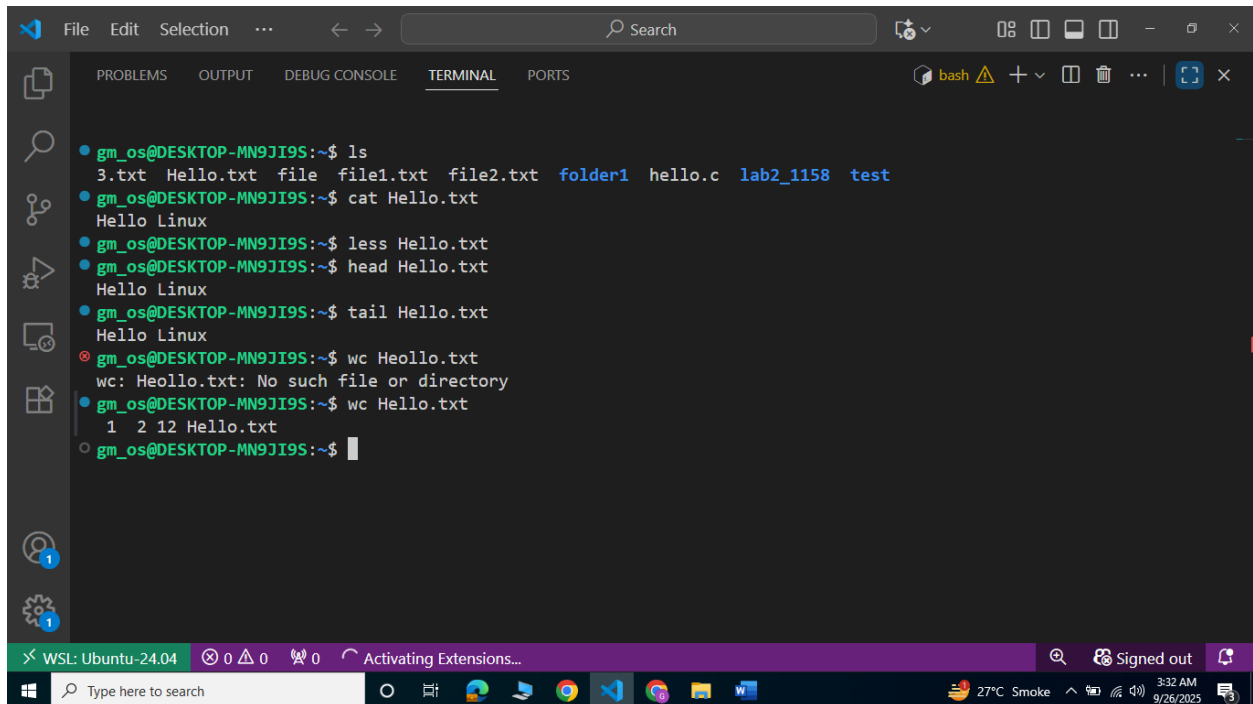


The screenshot shows a Windows terminal window with the title bar "gm_os [WSL: Ubuntu-24.04]". The terminal interface is the same as the previous screenshot. The user has entered the command "ls -la", and the output shows a detailed listing of the root directory, including file permissions, owner, group, size, and date. The user has then entered the command "ls -lh", and the output shows a human-readable listing of the same directory, including file permissions, owner, group, size, and date. The terminal window is running on a Windows 11 desktop, as indicated by the taskbar and system tray.

```
gm_os@DESKTOP-MN9J19S:/$ ls -la
drwxr-xr-x 12 root root 4096 Jan  6 2025 usr
drwxr-xr-x 13 root root 4096 Jan  6 2025 var
gm_os@DESKTOP-MN9J19S:/$ ls -lh
total 780K
lrwxrwxrwx 1 root root    7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4.0K Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4.0K Apr 22 2024 boot
drwxr-xr-x 9 root root 2.7K Sep 26 02:11 dev
drwxr-xr-x 88 root root 4.0K Sep 26 02:11 etc
drwxr-xr-x 3 root root 4.0K Sep 25 02:57 home
-rwxr-xr-x 2 root root 622K Sep 25 00:37 init
lrwxrwxrwx 1 root root    7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4.0K Apr  8 2024 lib.usr-is-merged
lrwxrwxrwx 1 root root    9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16K Apr 10 2019 lost+found
drwxr-xr-x 2 root root 4.0K Jan  6 2025 media
drwxr-xr-x 6 root root 4.0K Sep 25 02:56 mnt
drwxr-xr-x 2 root root 4.0K Jan  6 2025 opt
dr-xr-xr-x 154 root root    0 Sep 26 02:11 proc
drwx----- 3 root root 4.0K Jan  6 2025 root
drwxr-xr-x 8 root root 160 Sep 26 02:11 run
lrwxrwxrwx 1 root root    8 Apr 22 2024/sbin -> usr/sbin
drwxr-xr-x 2 root root 4.0K Mar 31 2024/sbin.usr-is-merged
drwxr-xr-x 2 root root 4.0K Oct 11 2024 snap
drwxr-xr-x 2 root root 4.0K Jan  6 2025 srv
dr-xr-xr-x 11 root root    0 Sep 26 03:15 sys
drwxrwxrwt 2 root root 4.0K Sep 26 03:16 tmp
drwxr-xr-x 12 root root 4.0K Jan  6 2025 usr
drwxr-xr-x 13 root root 4.0K Jan  6 2025 var
gm_os@DESKTOP-MN9J19S:/$ cd
gm_os@DESKTOP-MN9J19S:~$ cd ..
gm_os@DESKTOP-MN9J19S:/$ cd ~
gm_os@DESKTOP-MN9J19S:/$ cd /
gm_os@DESKTOP-MN9J19S:/$
```

Part 3: File and Directory Operations

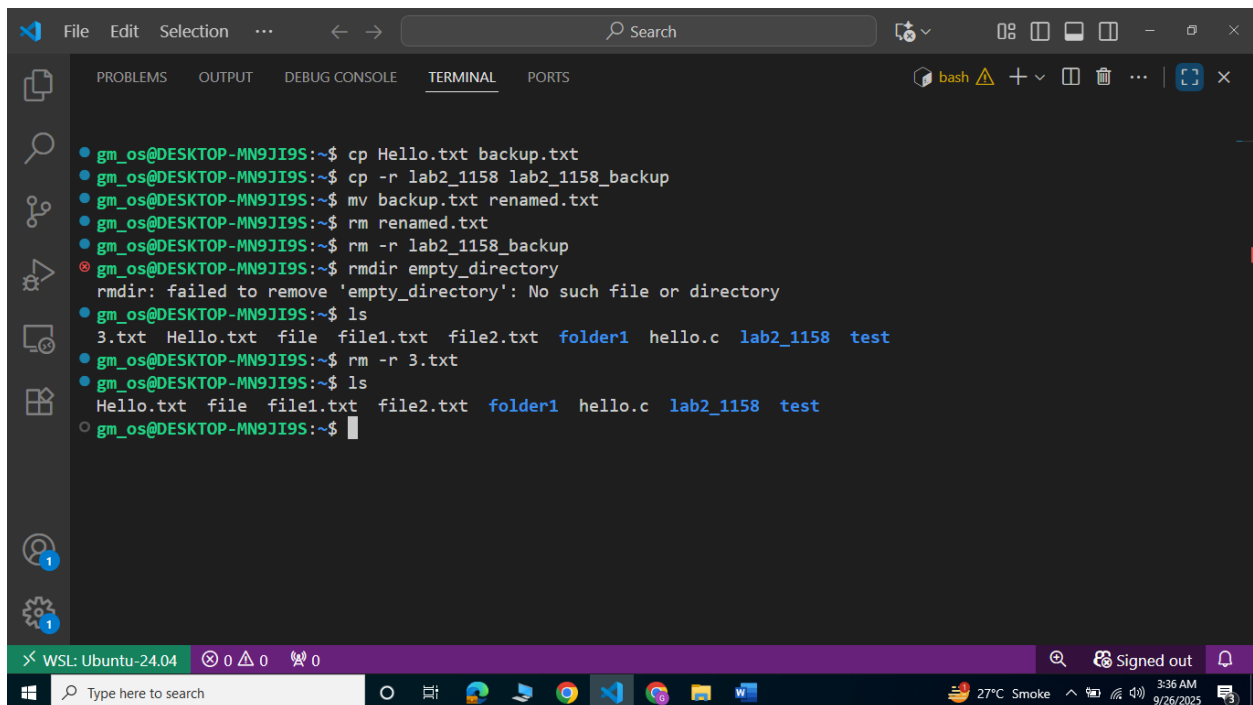
3.1: Creating & Managing Files



```
File Edit Selection ... Search
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
gm_os@DESKTOP-MN9JI9S:~$ ls
3.txt Hello.txt file file1.txt file2.txt folder1 hello.c lab2_1158 test
gm_os@DESKTOP-MN9JI9S:~$ cat Hello.txt
Hello Linux
gm_os@DESKTOP-MN9JI9S:~$ less Hello.txt
gm_os@DESKTOP-MN9JI9S:~$ head Hello.txt
Hello Linux
gm_os@DESKTOP-MN9JI9S:~$ tail Hello.txt
Hello Linux
gm_os@DESKTOP-MN9JI9S:~$ wc Heollo.txt
wc: Heollo.txt: No such file or directory
gm_os@DESKTOP-MN9JI9S:~$ wc Hello.txt
 1  2 12 Hello.txt
gm_os@DESKTOP-MN9JI9S:~$
```

WSL: Ubuntu-24.04 0 0 0 Activating Extensions... Signed out 3:32 AM 9/26/2025

3.2: Copying, Moving, Deleting

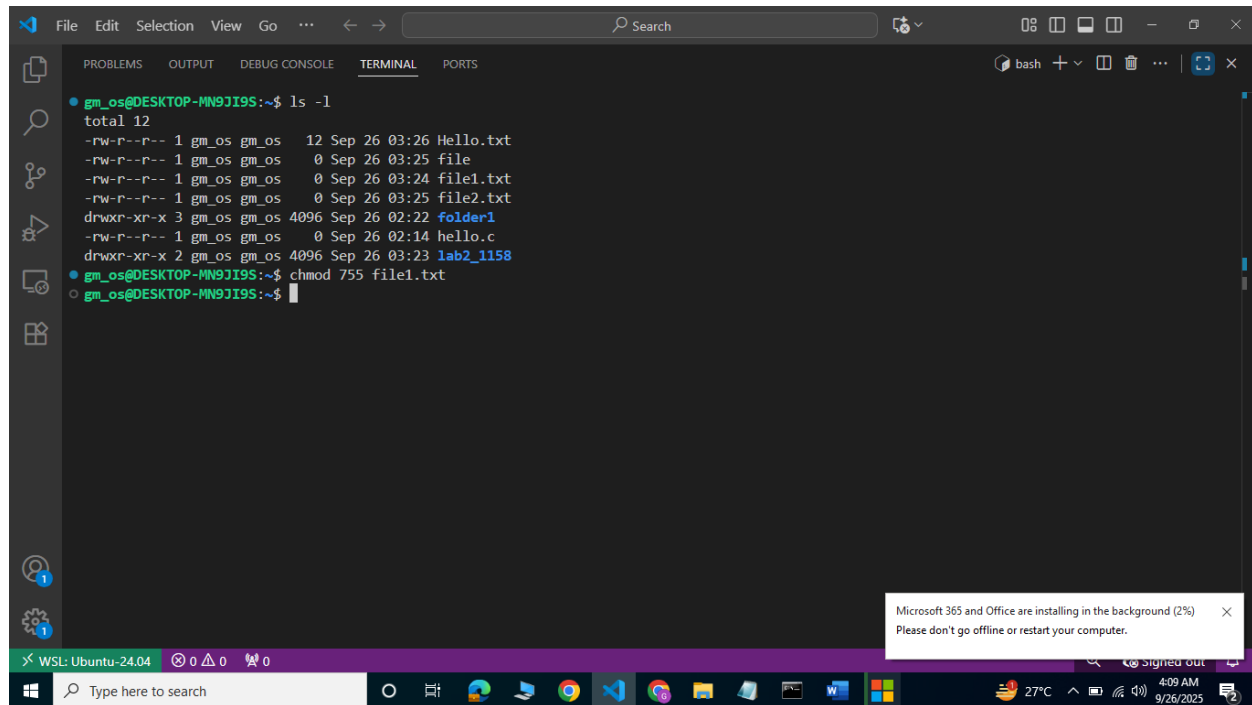


```
File Edit Selection ... Search
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
gm_os@DESKTOP-MN9JI9S:~$ cp Hello.txt backup.txt
gm_os@DESKTOP-MN9JI9S:~$ cp -r lab2_1158 lab2_1158_backup
gm_os@DESKTOP-MN9JI9S:~$ mv backup.txt renamed.txt
gm_os@DESKTOP-MN9JI9S:~$ rm renamed.txt
gm_os@DESKTOP-MN9JI9S:~$ rm -r lab2_1158_backup
gm_os@DESKTOP-MN9JI9S:~$ rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
gm_os@DESKTOP-MN9JI9S:~$ ls
3.txt Hello.txt file file1.txt file2.txt folder1 hello.c lab2_1158 test
gm_os@DESKTOP-MN9JI9S:~$ rm -r 3.txt
gm_os@DESKTOP-MN9JI9S:~$ ls
Hello.txt file file1.txt file2.txt folder1 hello.c lab2_1158 test
gm_os@DESKTOP-MN9JI9S:~$
```

WSL: Ubuntu-24.04 0 0 0 Signed out 3:36 AM 9/26/2025

Part 4: File Permissions and Ownership

4.1: Understanding File Permissions



The screenshot shows a Visual Studio Code editor window with a terminal pane open. The terminal is running a Linux environment (Ubuntu 24.04) and displays the output of the `ls -l` command. The output shows a directory listing with permissions, ownership, size, and file names. The permissions are `-rw-r--r--` for files and `drwxr-xr-x` for directories. The ownership is `gm_os gm_os`. The files are `Hello.txt`, `file`, `file1.txt`, `file2.txt`, `hello.c`, and `lab2_1158`. The directories are `folder1` and `lab2_1158`. The terminal also shows the command `chmod 755 file1.txt` being executed.

```
gm_os@DESKTOP-MN9JI9S:~$ ls -l
total 12
-rw-r--r-- 1 gm_os gm_os 12 Sep 26 03:26 Hello.txt
-rw-r--r-- 1 gm_os gm_os 0 Sep 26 03:25 file
-rw-r--r-- 1 gm_os gm_os 0 Sep 26 03:24 file1.txt
-rw-r--r-- 1 gm_os gm_os 0 Sep 26 03:25 file2.txt
drwxr-xr-x 3 gm_os gm_os 4096 Sep 26 02:22 folder1
-rw-r--r-- 1 gm_os gm_os 0 Sep 26 02:14 hello.c
drwxr-xr-x 2 gm_os gm_os 4096 Sep 26 03:23 lab2_1158
gm_os@DESKTOP-MN9JI9S:~$ chmod 755 file1.txt
gm_os@DESKTOP-MN9JI9S:~$
```

A notification bubble in the bottom right corner of the terminal window states: "Microsoft 365 and Office are installing in the background (2%) Please don't go offline or restart your computer."