



# National Textile University

## Department of Computer Science

Subject:

Operating System

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Submitted to:

Sir Nasir Mehmood

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Submitted by:

Eman Marium Tariq Rao

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Reg number:

23-NTU-CS-1150

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Semester:

05

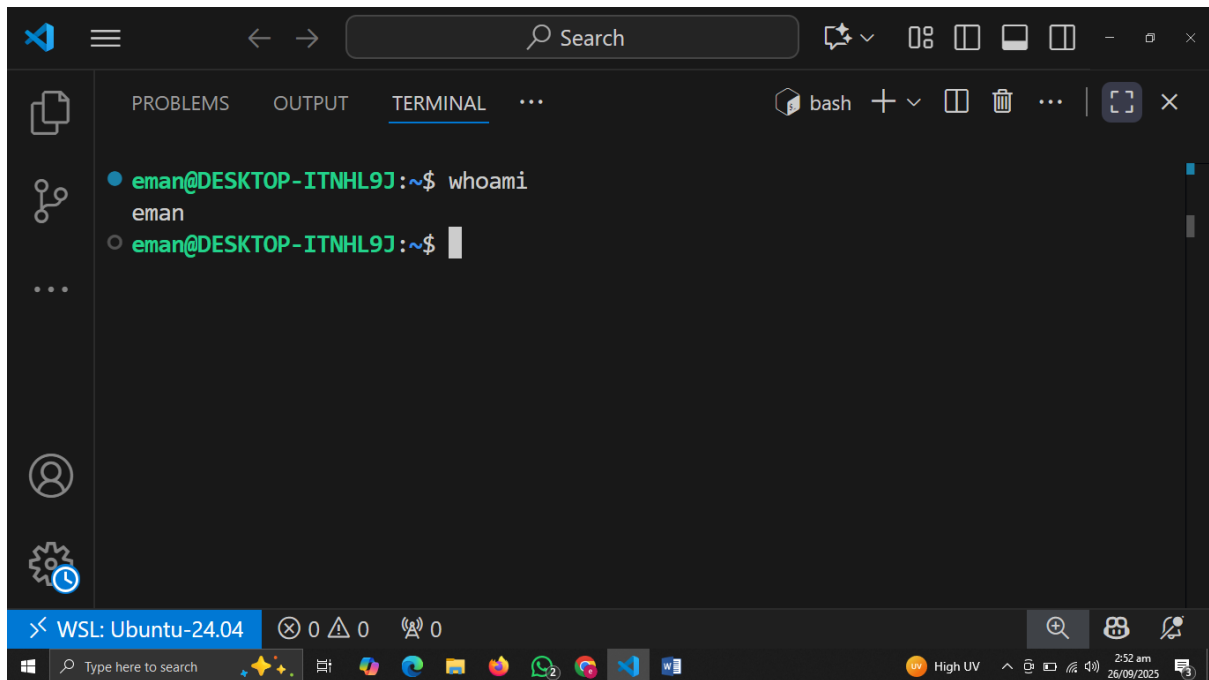
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## Part 1: Linux Environment Orientation

### 1.1 Understanding the Linux Environment

Commands:

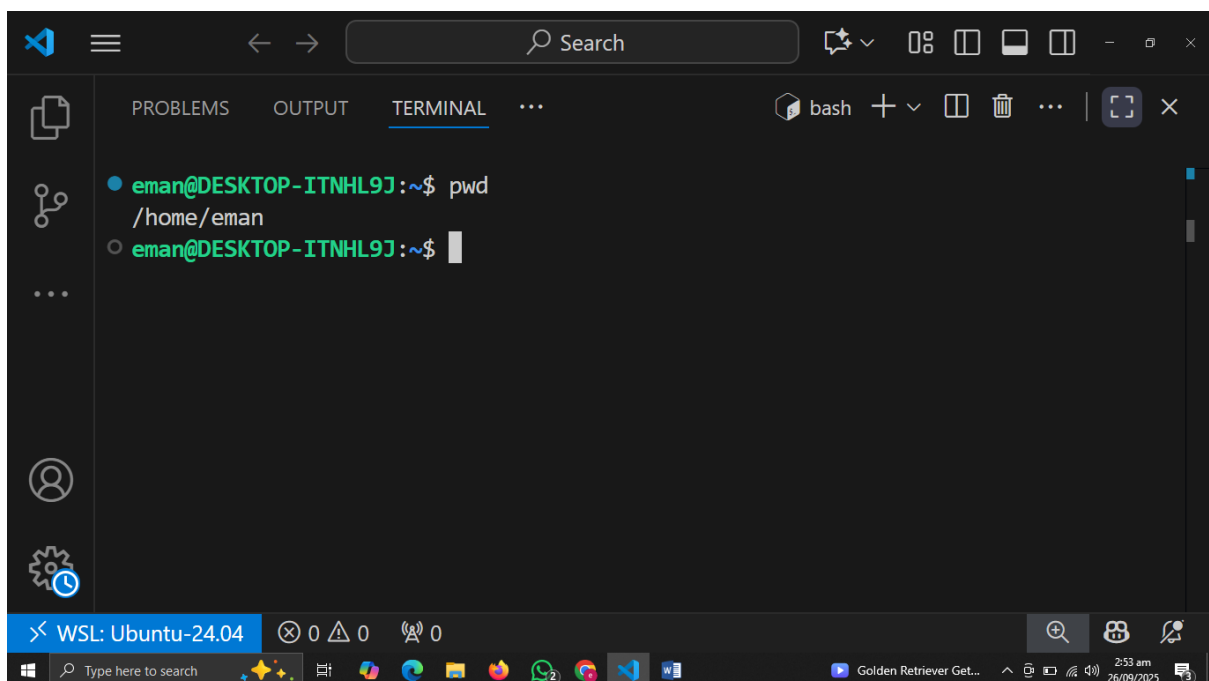
- Whoami



A screenshot of a Visual Studio Code terminal window. The terminal is titled 'bash' and shows the command 'whoami' being executed. The output is 'eman'. The prompt is 'eman@DESKTOP-ITNHL9J:~\$'. The terminal is part of a WSL (Windows Subsystem for Linux) environment, as indicated by the status bar at the bottom which says 'WSL: Ubuntu-24.04'. The taskbar at the bottom shows various application icons and the system clock indicating 2:52 am on 26/09/2025.

```
eman@DESKTOP-ITNHL9J:~$ whoami
eman
eman@DESKTOP-ITNHL9J:~$
```

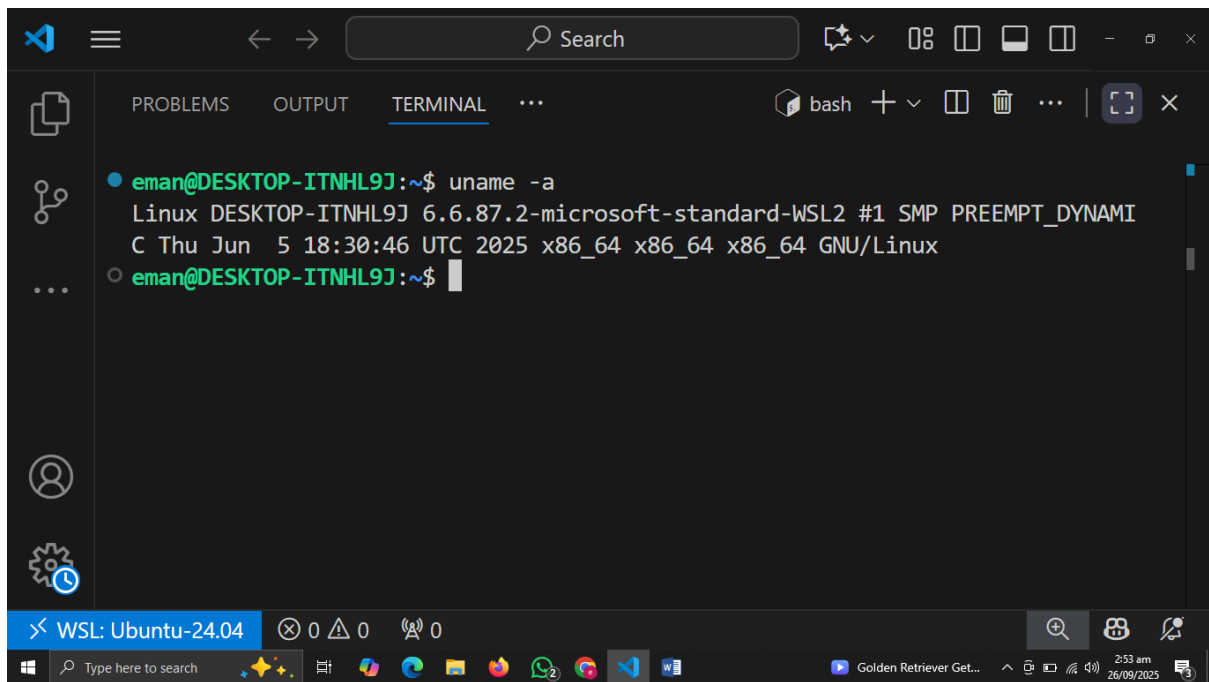
- Pwd



A screenshot of a Visual Studio Code terminal window. The terminal is titled 'bash' and shows the command 'pwd' being executed. The output is '/home/eman'. The prompt is 'eman@DESKTOP-ITNHL9J:~\$'. The terminal is part of a WSL (Windows Subsystem for Linux) environment, as indicated by the status bar at the bottom which says 'WSL: Ubuntu-24.04'. The taskbar at the bottom shows various application icons and the system clock indicating 2:53 am on 26/09/2025.

```
eman@DESKTOP-ITNHL9J:~$ pwd
/home/eman
eman@DESKTOP-ITNHL9J:~$
```

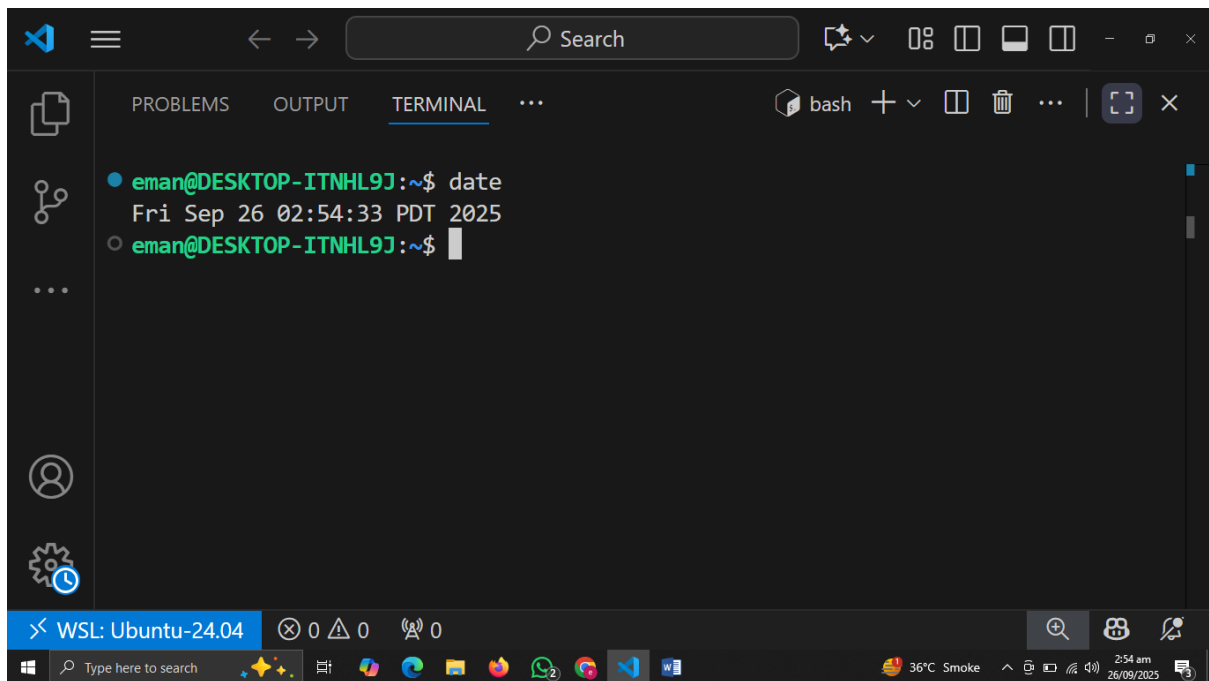
- Uname -a



The screenshot shows a Windows terminal window with a dark theme. The title bar at the top indicates the window is titled 'WSL: Ubuntu-24.04'. The terminal interface includes a search bar and tabs for 'PROBLEMS', 'OUTPUT', and 'TERMINAL'. The 'TERMINAL' tab is active, showing a bash shell prompt. The user 'eman@DESKTOP-ITNHL9J' has entered the command 'uname -a'. The output of the command is displayed on the next line: 'Linux DESKTOP-ITNHL9J 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT\_DYNAMIC Thu Jun 5 18:30:46 UTC 2025 x86\_64 x86\_64 x86\_64 GNU/Linux'. The terminal window is part of a taskbar at the bottom, which shows various application icons and system status information including the time '2:53 am' and date '26/09/2025'.

```
eman@DESKTOP-ITNHL9J:~$ uname -a
Linux DESKTOP-ITNHL9J 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC
C Thu Jun 5 18:30:46 UTC 2025 x86_64 x86_64 x86_64 GNU/Linux
eman@DESKTOP-ITNHL9J:~$
```

- Date



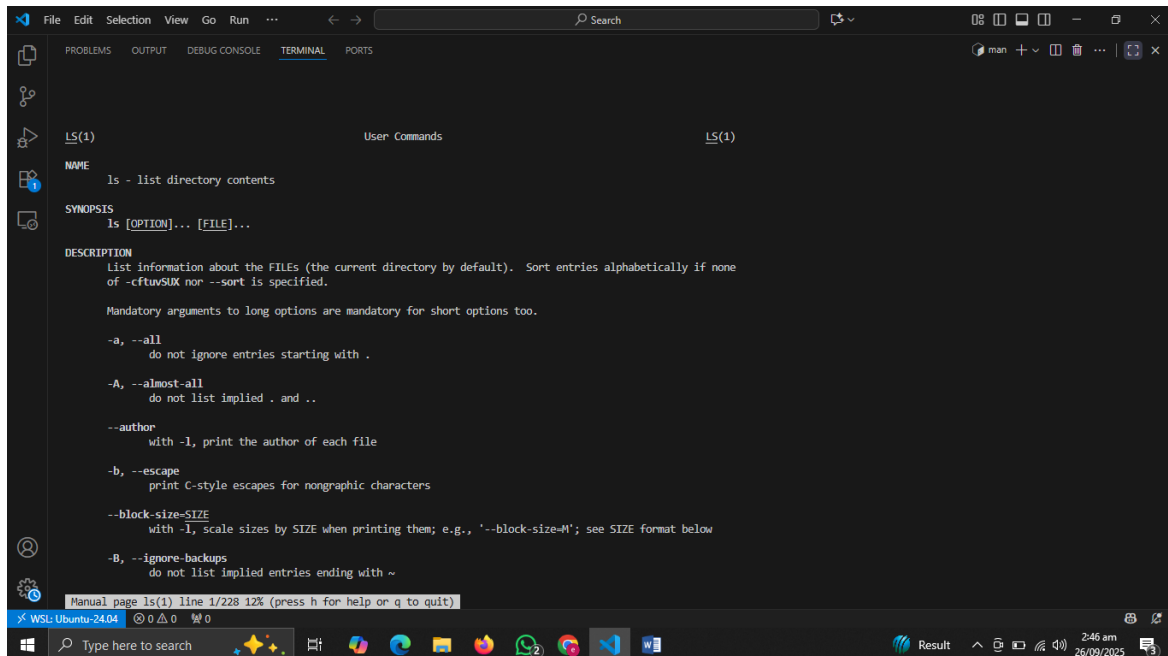
The screenshot shows a Windows terminal window with a dark theme, similar to the one above. The title bar indicates the window is titled 'WSL: Ubuntu-24.04'. The terminal interface includes a search bar and tabs for 'PROBLEMS', 'OUTPUT', and 'TERMINAL'. The 'TERMINAL' tab is active, showing a bash shell prompt. The user 'eman@DESKTOP-ITNHL9J' has entered the command 'date'. The output of the command is displayed on the next line: 'Fri Sep 26 02:54:33 PDT 2025'. The terminal window is part of a taskbar at the bottom, which shows various application icons and system status information including the time '2:54 am' and date '26/09/2025'.

```
eman@DESKTOP-ITNHL9J:~$ date
Fri Sep 26 02:54:33 PDT 2025
eman@DESKTOP-ITNHL9J:~$
```

## 1.2 Getting Help in Linux

Commands to demonstrate:

- `man ls`



The screenshot shows a Windows terminal window with the Visual Studio Code interface. The terminal is displaying the manual page for the `ls` command, accessed via `man ls`. The page is titled "User Commands" and "ls(1)". It includes sections for NAME, SYNOPSIS, DESCRIPTION, and a list of options. The DESCRIPTION section explains that `ls` lists information about files in the current directory by default, sorting entries alphabetically. The options listed include `-a` (do not ignore entries starting with .), `-A` (do not list implied . and ..), `--author` (with -l, print the author of each file), `-b` (print C-style escapes for nongraphic characters), `--block-size=SIZE` (with -l, scale sizes by SIZE when printing them; e.g., '--block-size=M'; see SIZE format below), and `-B` (do not list implied entries ending with ~). The terminal window has a status bar at the bottom showing "WSL: Ubuntu-24.04" and the time "2:46 am 26/09/2025".

```
ls(1) User Commands ls(1)
NAME
  ls - list directory contents

SYNOPSIS
  ls [OPTION]... [FILE]...

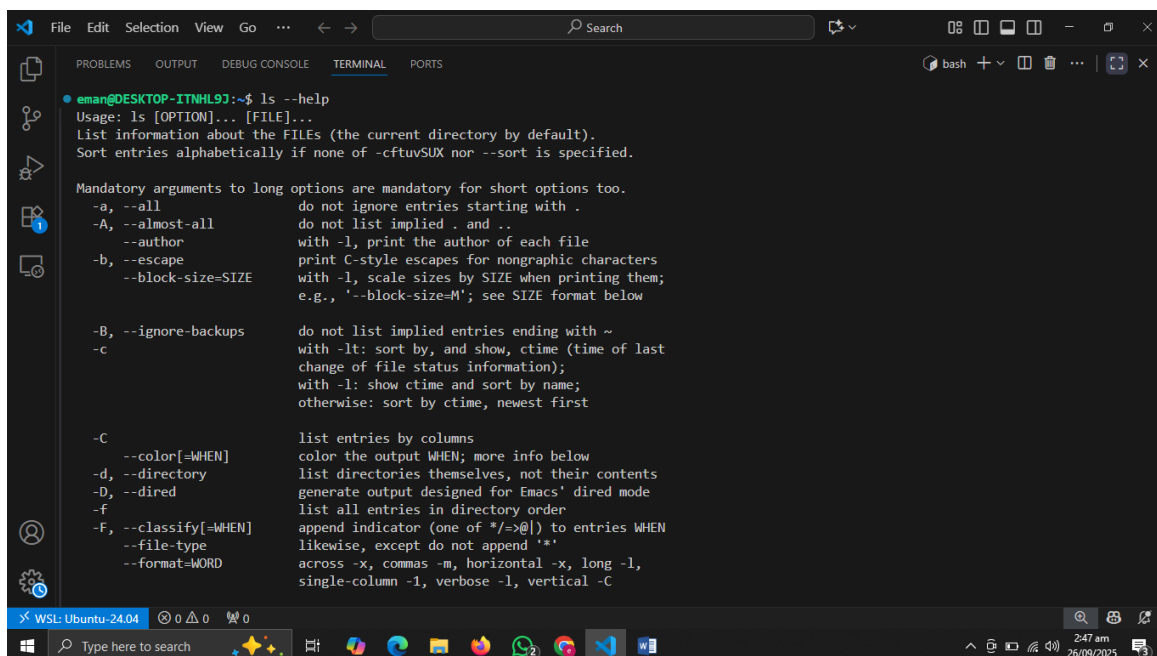
DESCRIPTION
  List information about the FILES (the current directory by default). Sort entries alphabetically if none
  of -cftuvSUX nor --sort is specified.

  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 ..
  --author           with -l, print the author of each file
  -b, --escape       print C-style escapes for nongraphic characters
  --block-size=SIZE  with -l, scale sizes by SIZE when printing them; e.g., '--block-size=M'; see SIZE format below
  -B, --ignore-backups do not list implied entries ending with ~

Manual page ls(1) line 1/228 12% (press h for help or q to quit)
```

- `ls --help`



The screenshot shows a Windows terminal window with the Visual Studio Code interface. The terminal is displaying the output of the `ls --help` command. The output includes the usage information: `Usage: ls [OPTION]... [FILE]...`, followed by a description of the command and a list of options. The options listed include `-a` (do not ignore entries starting with .), `-A` (do not list implied . and ..), `--author` (with -l, print the author of each file), `-b` (print C-style escapes for nongraphic characters), `--block-size=SIZE` (with -l, scale sizes by SIZE when printing them; e.g., '--block-size=M'; see SIZE format below), `-B` (do not list implied entries ending with ~), `-c` (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` (list entries by columns), `--color[=WHEN]` (color the output WHEN; more info below), `-d` (list directories themselves, not their contents), `-D` (generate output designed for Emacs' dired mode), `-f` (list all entries in directory order), `-F` (append indicator (one of \*/=>@|) to entries WHEN likewise, except do not append '\*'), `--file-type` (across -x, commas -m, horizontal -x, long -l, single-column -1, verbose -l, vertical -C), and `--format=WORD` (single-column -1, verbose -l, vertical -C). The terminal window has a status bar at the bottom showing "WSL: Ubuntu-24.04" and the time "2:47 am 26/09/2025".

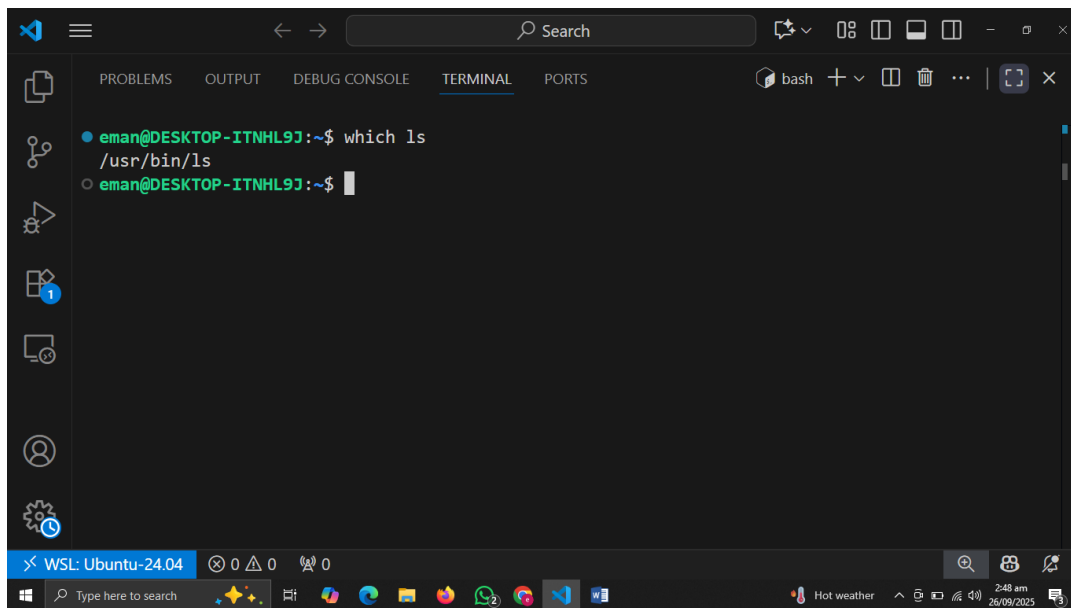
```
eman@DESKTOP-ITNHL93:~$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

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 ..
  --author           with -l, print the author of each file
  -b, --escape       print C-style escapes for nongraphic characters
  --block-size=SIZE  with -l, scale sizes by SIZE when printing them;
                    e.g., '--block-size=M'; see SIZE format below

  -B, --ignore-backups do not list implied entries ending with ~
  -c                  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                  list entries by columns
  --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                  list all entries in directory order
  -F, --classify[=WHEN] append indicator (one of */=>@|) to entries WHEN
                    likewise, except do not append '*'
  --file-type         across -x, commas -m, horizontal -x, long -l,
                    single-column -1, verbose -l, vertical -C
  --format=WORD       single-column -1, verbose -l, vertical -C
```

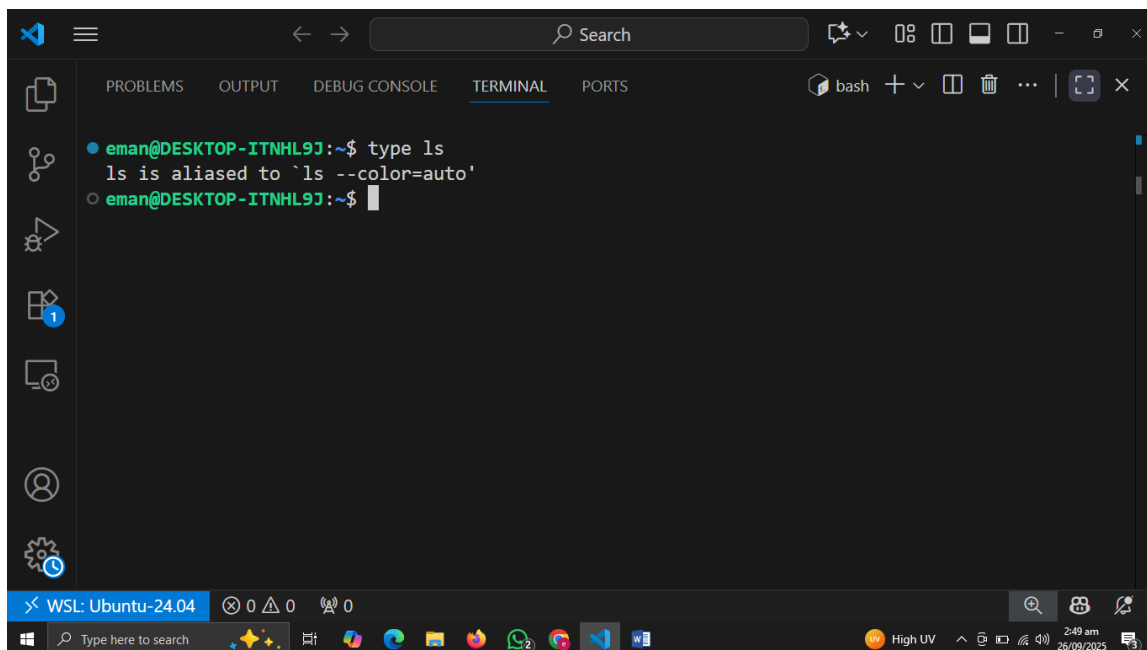
- which ls



A screenshot of a terminal window within a Visual Studio Code editor. The terminal is titled 'bash' and shows the command 'which ls' being executed. The output is '/usr/bin/ls'. The prompt is 'eman@DESKTOP-ITNHL9J:~\$'. The terminal is part of a WSL (Windows Subsystem for Linux) environment, as indicated by the status bar at the bottom which says 'WSL: Ubuntu-24.04'.

```
eman@DESKTOP-ITNHL9J:~$ which ls
/usr/bin/ls
eman@DESKTOP-ITNHL9J:~$
```

- type ls



A screenshot of a terminal window within a Visual Studio Code editor. The terminal is titled 'bash' and shows the command 'type ls' being executed. The output is 'ls is aliased to `ls --color=auto`'. The prompt is 'eman@DESKTOP-ITNHL9J:~\$'. The terminal is part of a WSL (Windows Subsystem for Linux) environment, as indicated by the status bar at the bottom which says 'WSL: Ubuntu-24.04'.

```
eman@DESKTOP-ITNHL9J:~$ type ls
ls is aliased to `ls --color=auto`
eman@DESKTOP-ITNHL9J:~$
```

## Part 2: File System Navigation

### 2.1 Understanding Linux Directory Structure

Demonstration:

- ls /

```

eman@DESKTOP-ITNHL9J:~$ ls /
bin          etc          lib.usr-is-merged  mnt          run          srv          var
bin.usr-is-merged  home        lib64            opt          sbin         sys
boot         init         lost+found       proc         sbin.usr-is-merged  tmp
dev          lib          media            root         snap         usr

```

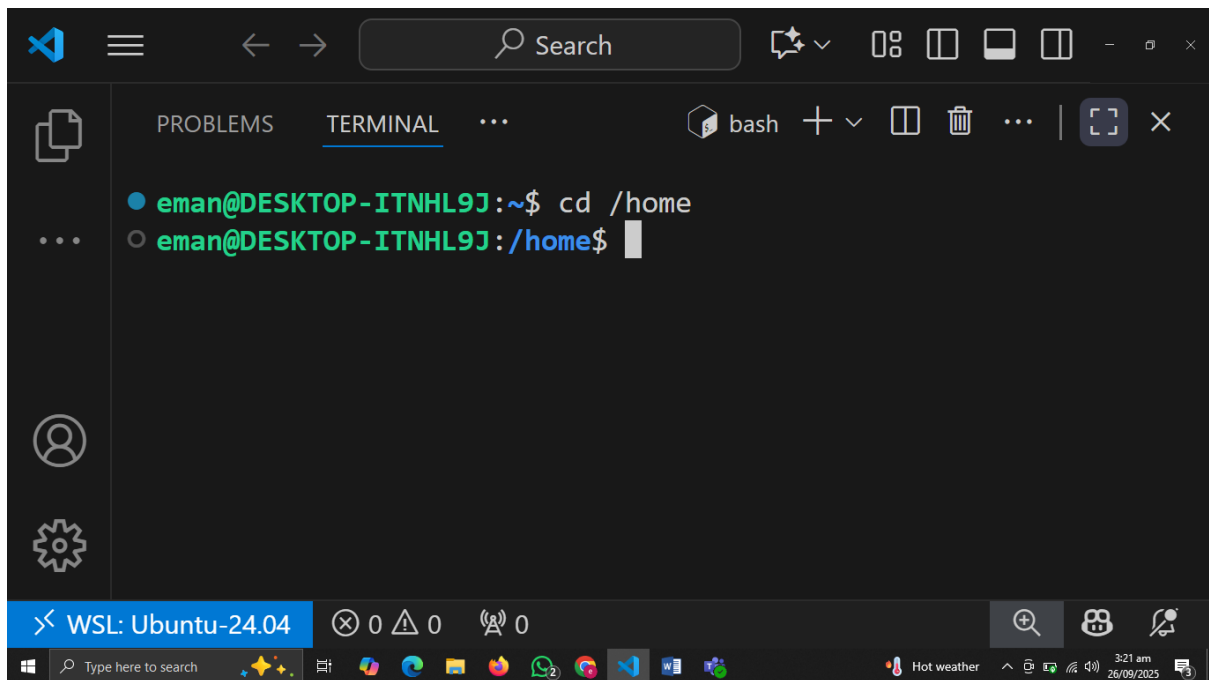
- ls -la

```

eman@DESKTOP-ITNHL9J:~$ ls -la
total 104
drwxr-x--- 9 eman eman 4096 Sep 26 02:47 .
drwxr-xr-x 3 root root 4096 Sep 18 09:43 ..
-rw----- 1 eman eman 2269 Sep 25 02:37 .bash_history
-rw-r--r-- 1 eman eman 220 Sep 18 09:43 .bash_logout
-rw-r--r-- 1 eman eman 3771 Sep 18 09:43 .bashrc
drwx----- 3 eman eman 4096 Sep 18 10:59 .cache
drwxr-xr-x 3 eman eman 4096 Sep 18 11:00 .dotnet
-rw-r--r-- 1 eman eman 52 Sep 25 01:16 .gitconfig
-rw----- 1 eman eman 20 Sep 26 02:47 .lessht
drwxr-xr-x 3 eman eman 4096 Sep 25 01:34 .local
-rw-rw-r-- 1 eman eman 0 Sep 26 02:35 .motd_shown
-rw-r--r-- 1 eman eman 807 Sep 18 09:43 .profile
drwx----- 2 eman eman 4096 Sep 19 04:06 .ssh
-rw-r--r-- 1 eman eman 0 Sep 18 09:47 .sudo_as_admin_successful
drwxr-xr-x 5 eman eman 4096 Sep 18 10:59 .vscode-server
-rw-r--r-- 1 eman eman 183 Sep 19 02:49 .wget-hsts
-rw-r--r-- 1 eman eman 89 Sep 25 01:49 hello.
-rw-r--r-- 1 eman eman 91 Sep 25 01:49 hello..save
-rw-r--r-- 1 eman eman 89 Sep 25 01:54 hello.c
-rw----- 1 eman eman 110 Sep 25 01:39 hello.c.save

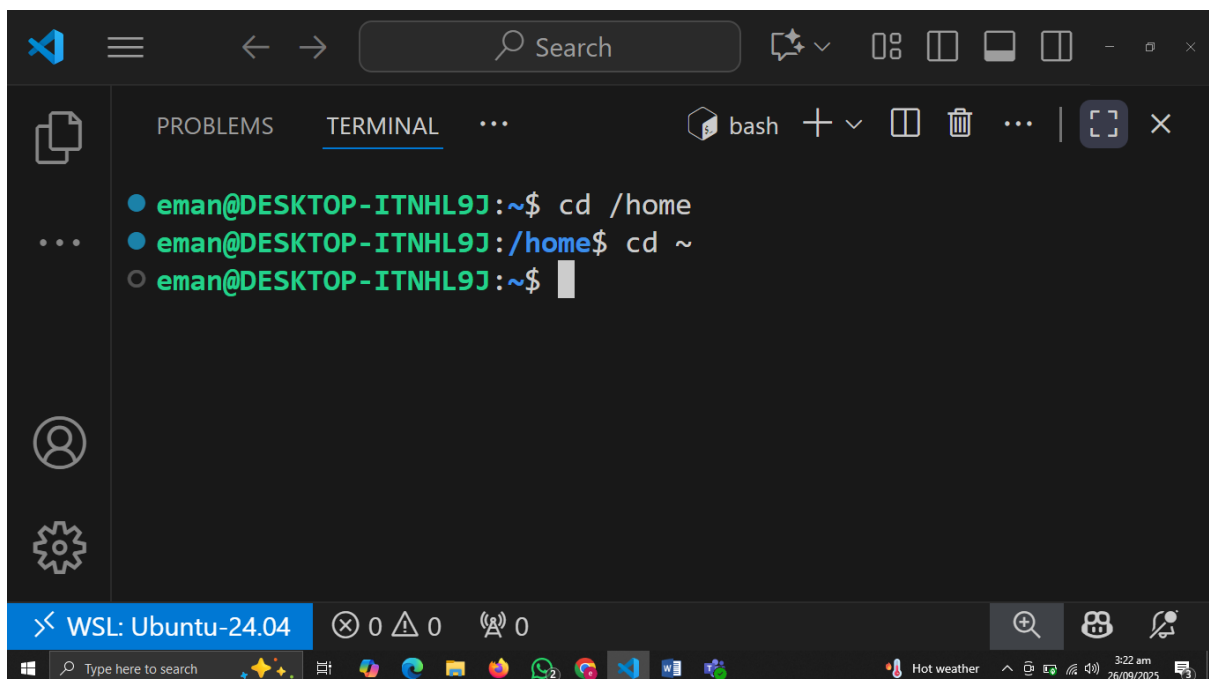
```

- `cd /home`



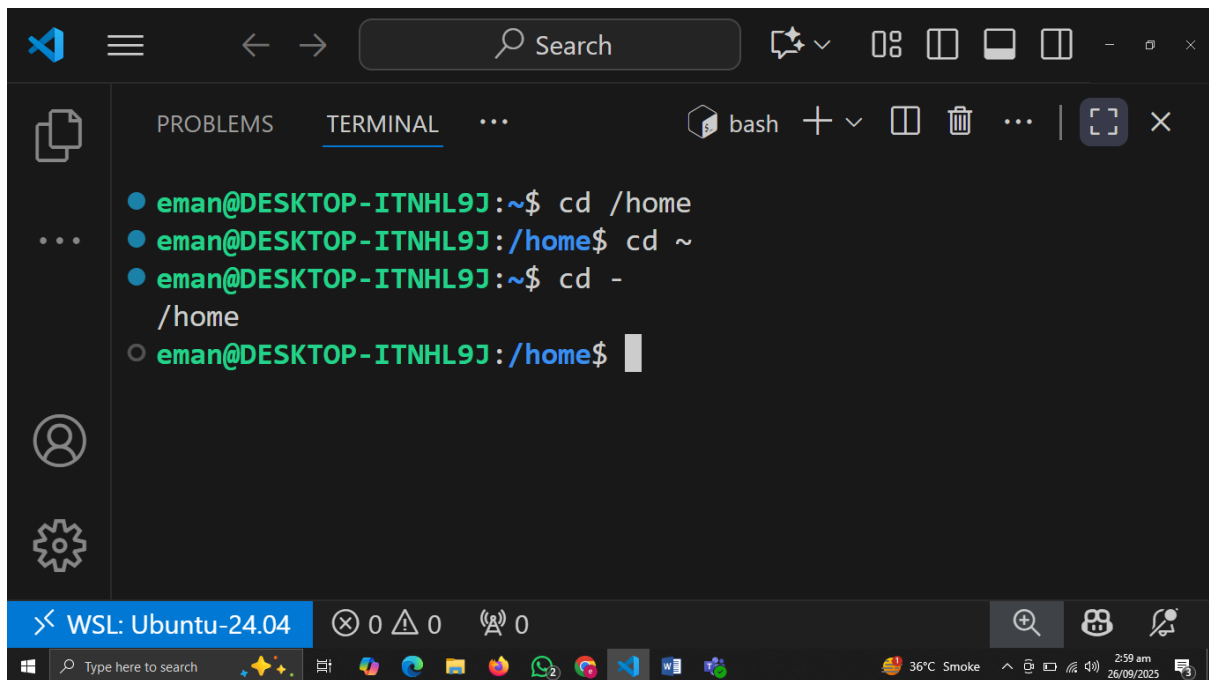
A screenshot of a Visual Studio Code terminal window. The terminal is titled "bash" and shows the command `cd /home` being executed. The prompt is `eman@DESKTOP-ITNHL9J:~$`. The terminal output shows the command being executed and the prompt changing to `eman@DESKTOP-ITNHL9J:~/home$`. The terminal is part of a WSL (Windows Subsystem for Linux) environment, as indicated by the "WSL: Ubuntu-24.04" label in the bottom left corner. The taskbar at the bottom shows various application icons and the system clock.

- `cd ~`



A screenshot of a Visual Studio Code terminal window. The terminal is titled "bash" and shows the command `cd ~` being executed. The prompt is `eman@DESKTOP-ITNHL9J:~$`. The terminal output shows the command being executed and the prompt changing to `eman@DESKTOP-ITNHL9J:~$`. The terminal is part of a WSL (Windows Subsystem for Linux) environment, as indicated by the "WSL: Ubuntu-24.04" label in the bottom left corner. The taskbar at the bottom shows various application icons and the system clock.

- `cd -`



The screenshot shows a Visual Studio Code window with the 'TERMINAL' tab active. The terminal is running a bash shell. The user 'eman@DESKTOP-ITNHL9J' has entered the following commands:

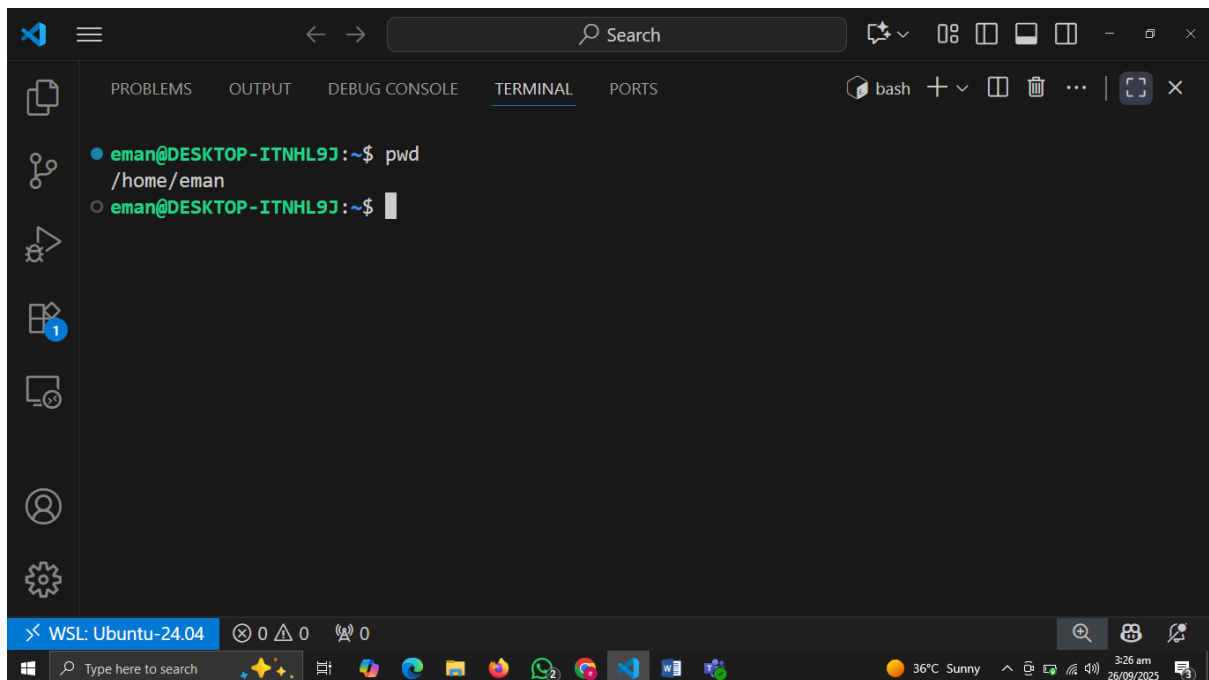
```
eman@DESKTOP-ITNHL9J:~$ cd /home
eman@DESKTOP-ITNHL9J:/home$ cd ~
eman@DESKTOP-ITNHL9J:~$ cd -
/home
eman@DESKTOP-ITNHL9J:/home$
```

The terminal output shows the current directory changing from '~' to '/home' and then back to '~' (displayed as '/home' in the prompt). The status bar at the bottom indicates 'WSL: Ubuntu-24.04'.

## 2.2 Basic Navigation Commands

Comands to practice

- `pwd`



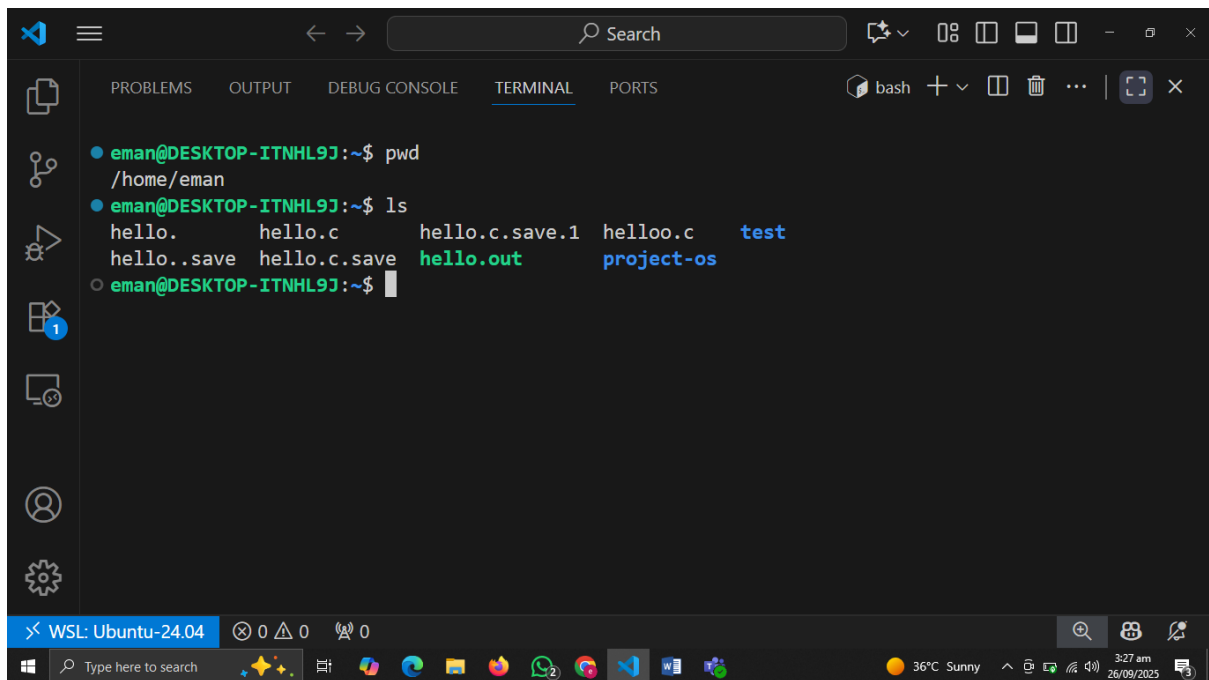
The screenshot shows a Visual Studio Code window with the 'TERMINAL' tab active. The terminal is running a bash shell. The user 'eman@DESKTOP-ITNHL9J' has entered the following commands:

```
eman@DESKTOP-ITNHL9J:~$ pwd
/home/eman
eman@DESKTOP-ITNHL9J:~$
```

The terminal output shows the full path of the current directory, '/home/eman'. The status bar at the bottom indicates 'WSL: Ubuntu-24.04'.



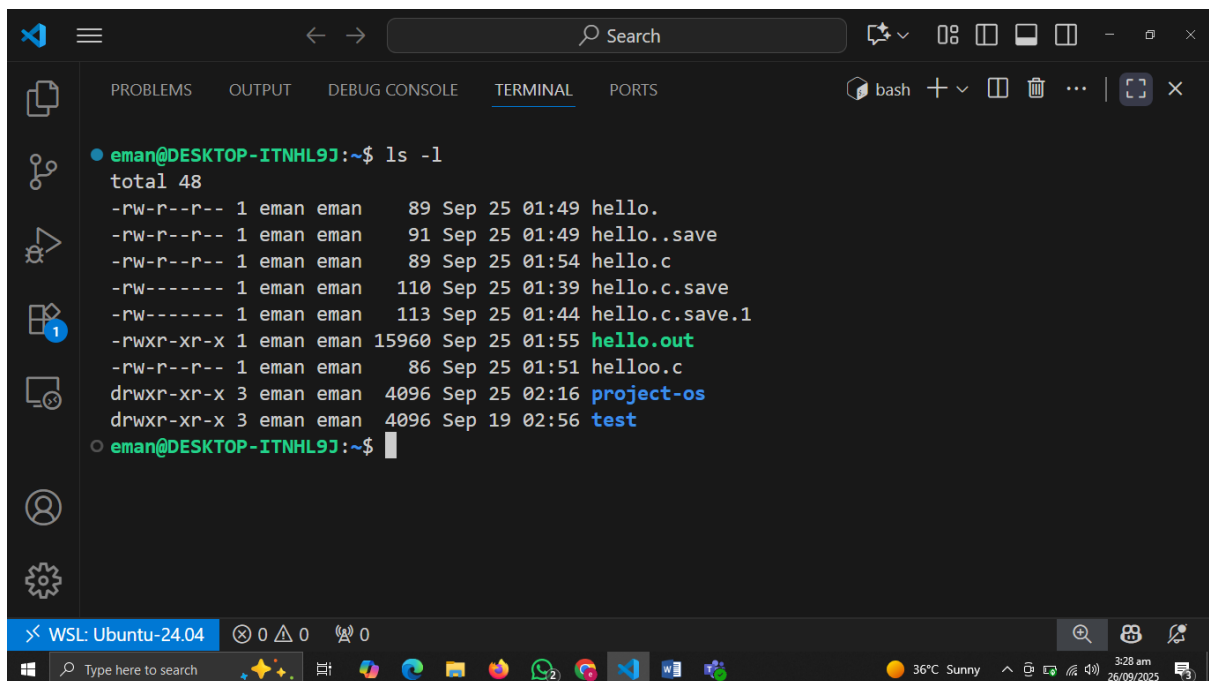
- ls



The screenshot shows a Visual Studio Code window with a terminal pane open. The terminal is running a bash shell in a WSL Ubuntu 24.04 environment. The user 'eman' has executed the 'ls' command, which lists the files in the current directory. The output shows several files with their permissions, sizes, and names. The files are: 'hello.', 'hello.c', 'hello.c.save.1', 'helloo.c', and 'test'. The file 'hello.out' is also listed, along with 'hello..save' and 'hello.c.save'. The file 'project-os' is listed with blue text, and 'test' is listed with blue text. The terminal output is as follows:

```
eman@DESKTOP-ITNHL9J:~$ pwd
/home/eman
eman@DESKTOP-ITNHL9J:~$ ls
hello.      hello.c      hello.c.save.1  helloo.c      test
hello..save hello.c.save  hello.out       project-os
```

- ls -l



The screenshot shows a Visual Studio Code window with a terminal pane open. The terminal is running a bash shell in a WSL Ubuntu 24.04 environment. The user 'eman' has executed the 'ls -l' command, which lists the files in the current directory with long format. The output shows the permissions, owner, group, size, and name of each file. The files are: 'hello.', 'hello..save', 'hello.c', 'hello.c.save', 'hello.c.save.1', 'hello.out', 'helloo.c', 'project-os', and 'test'. The file 'hello.out' is listed with green text, and 'project-os' is listed with blue text. The terminal output is as follows:

```
eman@DESKTOP-ITNHL9J:~$ ls -l
total 48
-rw-r--r-- 1 eman eman   89 Sep 25 01:49 hello.
-rw-r--r-- 1 eman eman   91 Sep 25 01:49 hello..save
-rw-r--r-- 1 eman eman   89 Sep 25 01:54 hello.c
-rw----- 1 eman eman  110 Sep 25 01:39 hello.c.save
-rw----- 1 eman eman  113 Sep 25 01:44 hello.c.save.1
-rwxr-xr-x 1 eman eman 15960 Sep 25 01:55 hello.out
-rw-r--r-- 1 eman eman   86 Sep 25 01:51 helloo.c
drwxr-xr-x 3 eman eman  4096 Sep 25 02:16 project-os
drwxr-xr-x 3 eman eman  4096 Sep 19 02:56 test
```

- `ls -la`

```

eman@DESKTOP-ITNHL9J:~$ ls -la
total 104
drwxr-x--- 9 eman eman 4096 Sep 26 02:47 .
drwxr-xr-x 3 root root 4096 Sep 18 09:43 ..
-rw----- 1 eman eman 2269 Sep 25 02:37 .bash_history
-rw-r--r-- 1 eman eman 220 Sep 18 09:43 .bash_logout
-rw-r--r-- 1 eman eman 3771 Sep 18 09:43 .bashrc
drwx----- 3 eman eman 4096 Sep 18 10:59 .cache
drwxr-xr-x 3 eman eman 4096 Sep 18 11:00 .dotnet
-rw-r--r-- 1 eman eman 52 Sep 25 01:16 .gitconfig
-rw----- 1 eman eman 20 Sep 26 02:47 .lessht
drwxr-xr-x 3 eman eman 4096 Sep 25 01:34 .local
-rw-rw-r-- 1 eman eman 0 Sep 26 02:35 .motd_shown
-rw-r--r-- 1 eman eman 807 Sep 18 09:43 .profile
drwx----- 2 eman eman 4096 Sep 19 04:06 .ssh
-rw-r--r-- 1 eman eman 0 Sep 18 09:47 .sudo_as_admin_successful
drwxr-xr-x 5 eman eman 4096 Sep 18 10:59 .vscode-server
-rw-r--r-- 1 eman eman 183 Sep 19 02:49 .wget-hsts
-rw-r--r-- 1 eman eman 89 Sep 25 01:49 hello.
-rw-r--r-- 1 eman eman 91 Sep 25 01:49 hello..save
-rw-r--r-- 1 eman eman 89 Sep 25 01:54 hello.c
-rw----- 1 eman eman 110 Sep 25 01:39 hello.c.save

```

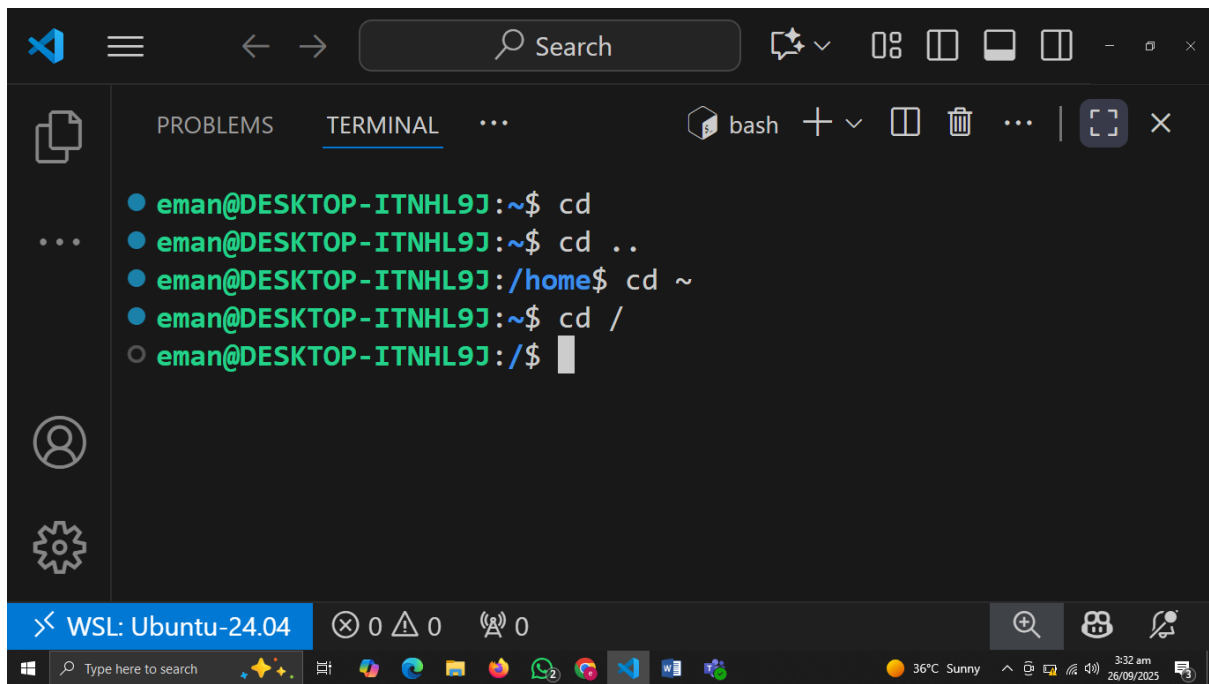
- `ls -lh`

```

eman@DESKTOP-ITNHL9J:~$ ls -lh
total 48K
-rw-r--r-- 1 eman eman 89 Sep 25 01:49 hello.
-rw-r--r-- 1 eman eman 91 Sep 25 01:49 hello..save
-rw-r--r-- 1 eman eman 89 Sep 25 01:54 hello.c
-rw----- 1 eman eman 110 Sep 25 01:39 hello.c.save
-rw----- 1 eman eman 113 Sep 25 01:44 hello.c.save.1
-rwxr-xr-x 1 eman eman 16K Sep 25 01:55 hello.out
-rw-r--r-- 1 eman eman 86 Sep 25 01:51 helloo.c
drwxr-xr-x 3 eman eman 4.0K Sep 25 02:16 project-os
drwxr-xr-x 3 eman eman 4.0K Sep 19 02:56 test

```

- `cd`
- `cd ..`
- `cd ~`
- `cd /`

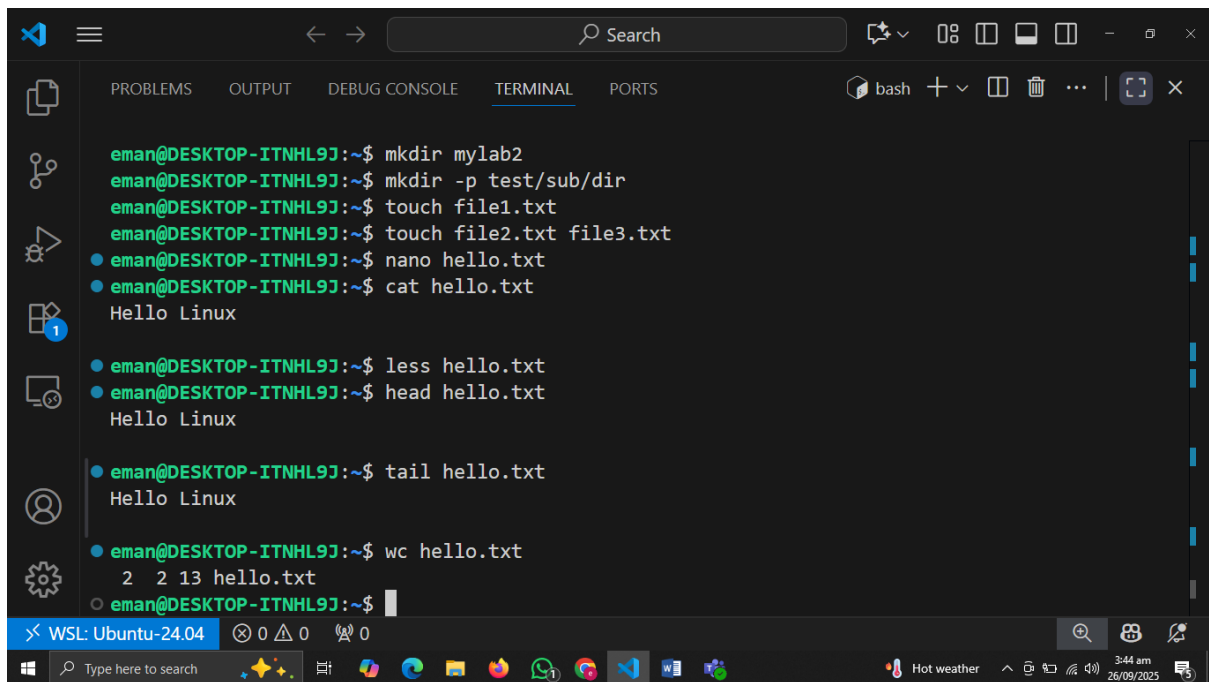


```
eman@DESKTOP-ITNHL9J:~$ cd
eman@DESKTOP-ITNHL9J:~$ cd ..
eman@DESKTOP-ITNHL9J:/home$ cd ~
eman@DESKTOP-ITNHL9J:~$ cd /
eman@DESKTOP-ITNHL9J:/$
```

## Part 3: File and Directory Operations

### 3.1 Creating and Managing Files/Directories

- mkdir
- touch
- nano
- echo
- cat
- less
- head
- tail
- wc



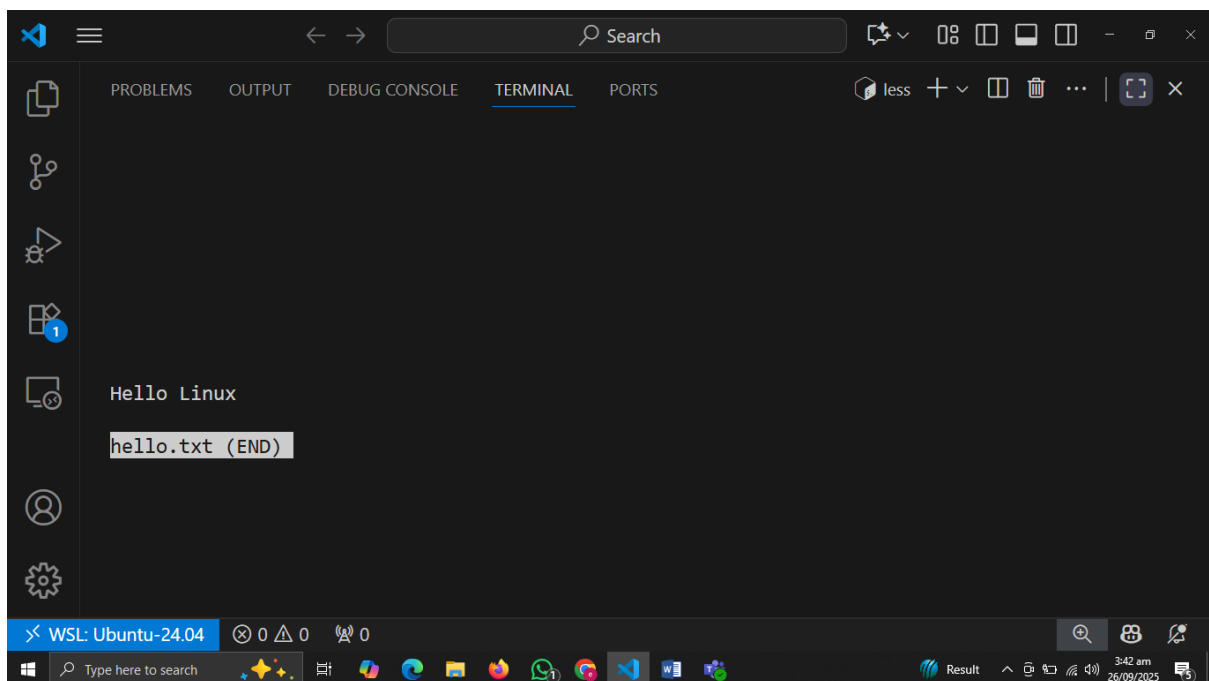
```
eman@DESKTOP-ITNHL9J:~$ mkdir mylab2
eman@DESKTOP-ITNHL9J:~$ mkdir -p test/sub/dir
eman@DESKTOP-ITNHL9J:~$ touch file1.txt
eman@DESKTOP-ITNHL9J:~$ touch file2.txt file3.txt
eman@DESKTOP-ITNHL9J:~$ nano hello.txt
eman@DESKTOP-ITNHL9J:~$ cat hello.txt
Hello Linux

eman@DESKTOP-ITNHL9J:~$ less hello.txt
eman@DESKTOP-ITNHL9J:~$ head hello.txt
Hello Linux

eman@DESKTOP-ITNHL9J:~$ tail hello.txt
Hello Linux

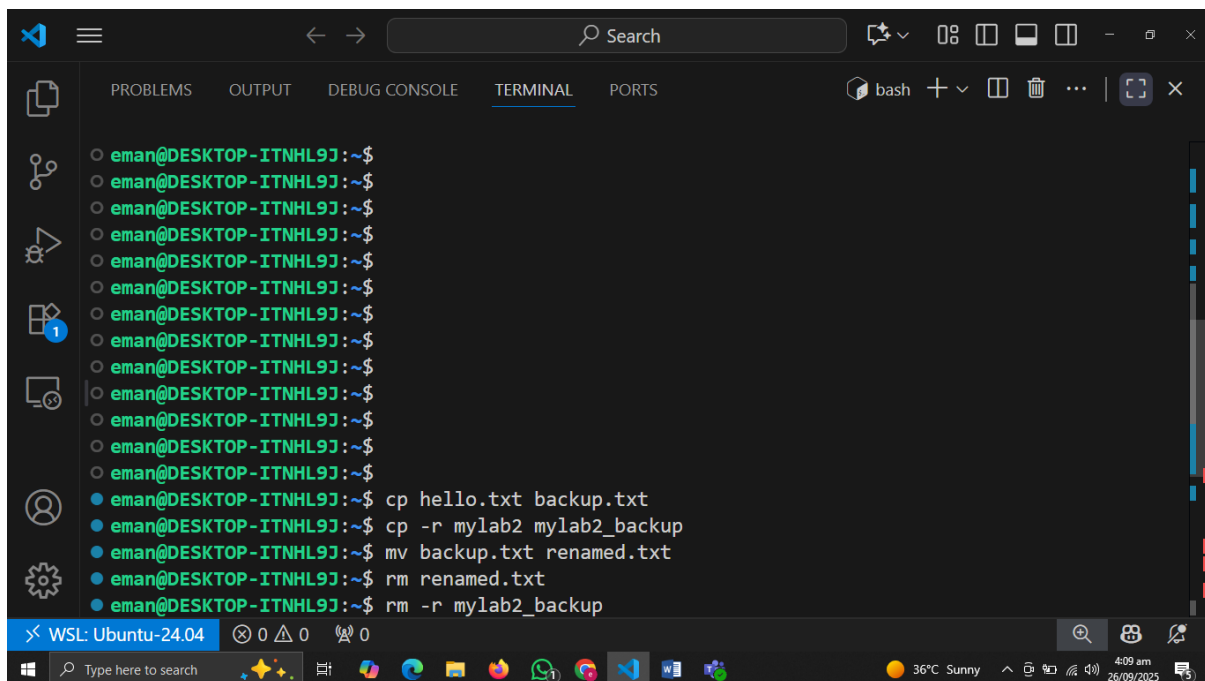
eman@DESKTOP-ITNHL9J:~$ wc hello.txt
  2  2 13 hello.txt
eman@DESKTOP-ITNHL9J:~$
```

- after entering less hello.txt command



```
Hello Linux
hello.txt (END)
```

## 3.2 Copying, Moving, and Deleting



A screenshot of a terminal window within a VS Code editor. The terminal shows a series of commands and their outputs. The prompt is `eman@DESKTOP-ITNHL9J:~$`. The commands executed are:

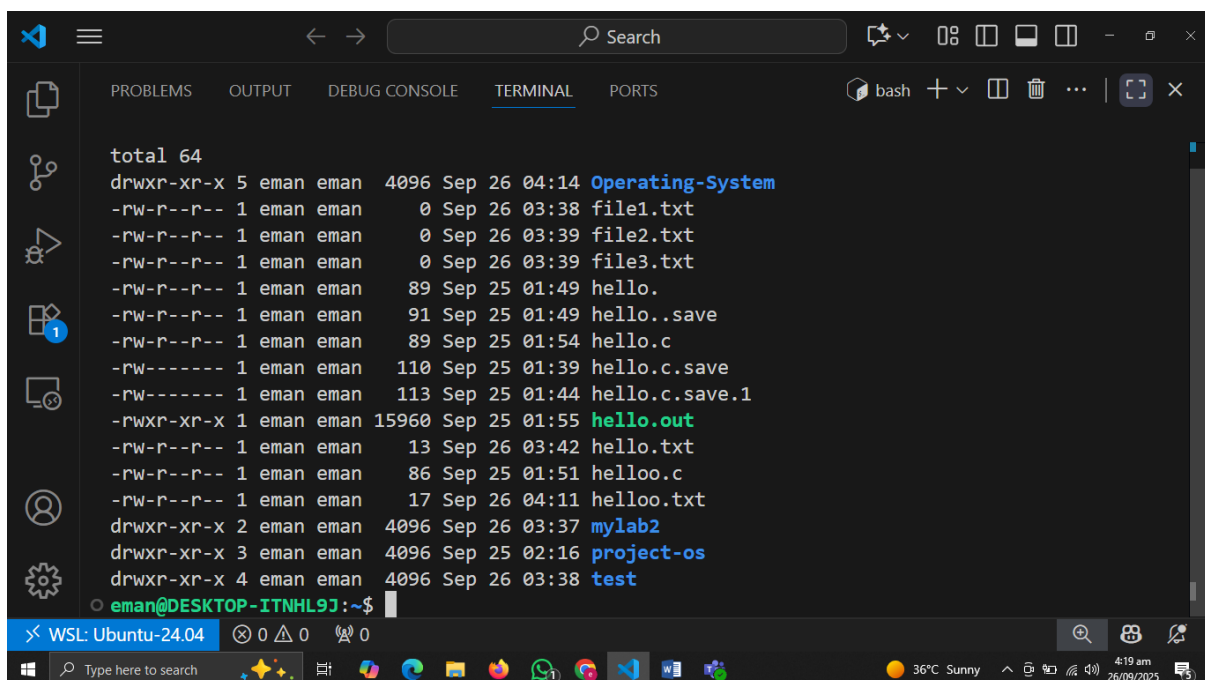
- `cp hello.txt backup.txt`
- `cp -r mylab2 mylab2_backup`
- `mv backup.txt renamed.txt`
- `rm renamed.txt`
- `rm -r mylab2_backup`

The terminal output shows the successful execution of these commands. The status bar at the bottom indicates the terminal is running on WSL: Ubuntu-24.04.

## Part 4: File Permissions and Ownership

### 4.1 Understanding File Permissions

- `ls -l`

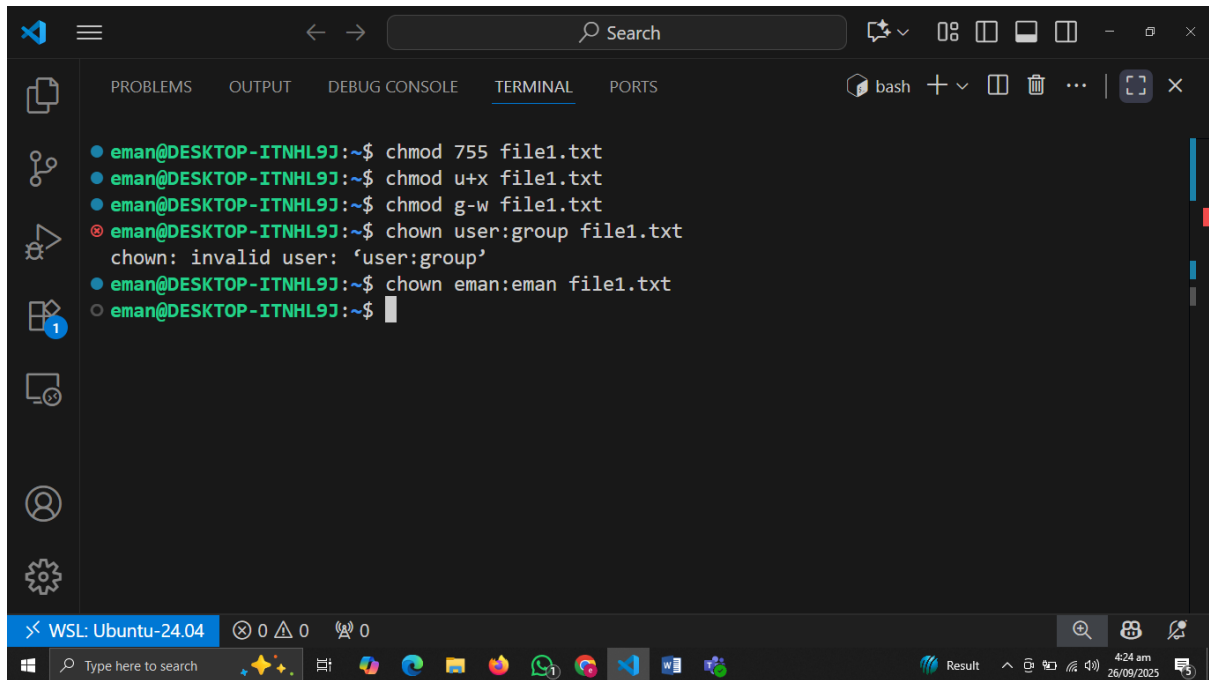


A screenshot of a terminal window within a VS Code editor showing the output of the `ls -l` command. The output lists files and directories with their permissions, ownership, size, and modification date. The files listed are:

- `Operating-System` (directory, permissions `drwxr-xr-x`, owned by `eman`)
- `file1.txt` (file, permissions `-rw-r--r--`, owned by `eman`)
- `file2.txt` (file, permissions `-rw-r--r--`, owned by `eman`)
- `file3.txt` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello.` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello..save` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello.c` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello.c.save` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello.c.save.1` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello.out` (file, permissions `-rw-r--r--`, owned by `eman`)
- `hello.txt` (file, permissions `-rw-r--r--`, owned by `eman`)
- `helloo.c` (file, permissions `-rw-r--r--`, owned by `eman`)
- `helloo.txt` (file, permissions `-rw-r--r--`, owned by `eman`)
- `mylab2` (directory, permissions `drwxr-xr-x`, owned by `eman`)
- `project-os` (directory, permissions `drwxr-xr-x`, owned by `eman`)
- `test` (directory, permissions `drwxr-xr-x`, owned by `eman`)

The terminal prompt is `eman@DESKTOP-ITNHL9J:~$`. The status bar at the bottom indicates the terminal is running on WSL: Ubuntu-24.04.

- `chmod 755 file.txt`
- `chmod u+x file.txt`
- `chmod g-w file.txt`
- `group chown user:group file.txt`



The screenshot shows a Windows terminal window with a dark theme. The terminal is running a bash shell. The commands and their outputs are as follows:

```
eman@DESKTOP-ITNHL9J:~$ chmod 755 file1.txt
eman@DESKTOP-ITNHL9J:~$ chmod u+x file1.txt
eman@DESKTOP-ITNHL9J:~$ chmod g-w file1.txt
eman@DESKTOP-ITNHL9J:~$ chown user:group file1.txt
chown: invalid user: 'user:group'
eman@DESKTOP-ITNHL9J:~$ chown eman:eman file1.txt
eman@DESKTOP-ITNHL9J:~$
```

The terminal window has a title bar that says "WSL: Ubuntu-24.04". The Windows taskbar is visible at the bottom, showing various application icons and the system clock indicating 4:24 am on 26/09/2025.