



NATIONAL TEXTILE

UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE

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SECTION SE: 5th(A)

LAB -2

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SUBMISSION DATE:

09-26-2025

Operating Systems – COC 3071L

SE 5th A – Fall 2025

Lab 2: Linux Basics and Introduction

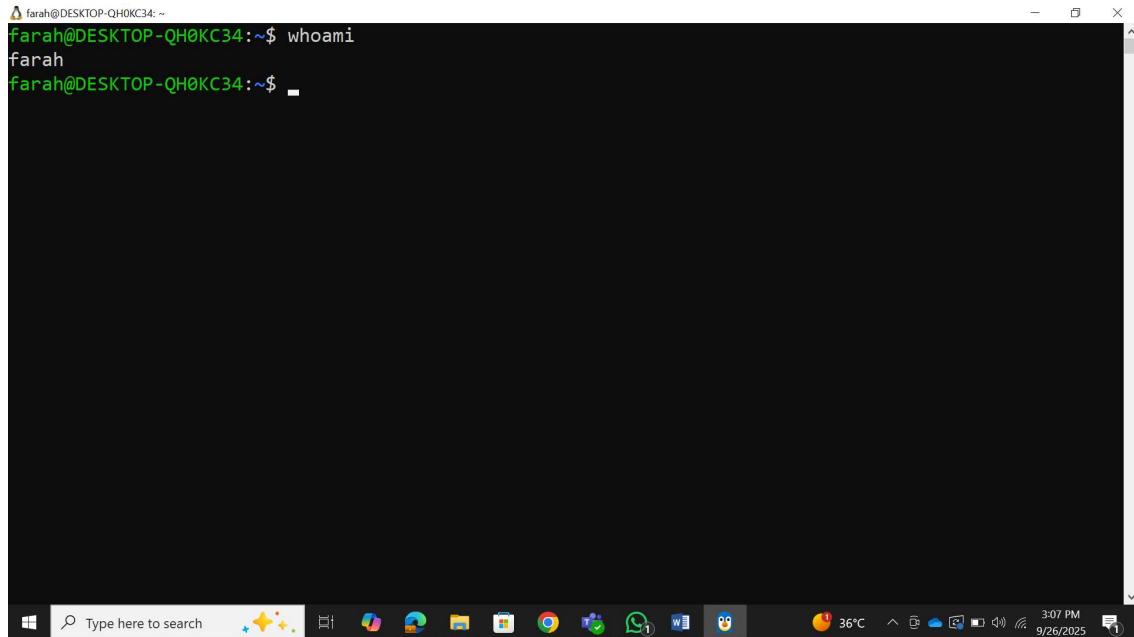
Part 1: Linux Environment Orientation

1.1 Understanding the Linux Environment

- Concepts to Cover:
 - What is Linux? Brief history and distributions
 - Linux vs Windows: Key differences
 - Understanding the shell (bash)
 - WSL2 as a Linux environment
- Hands-on Activity:

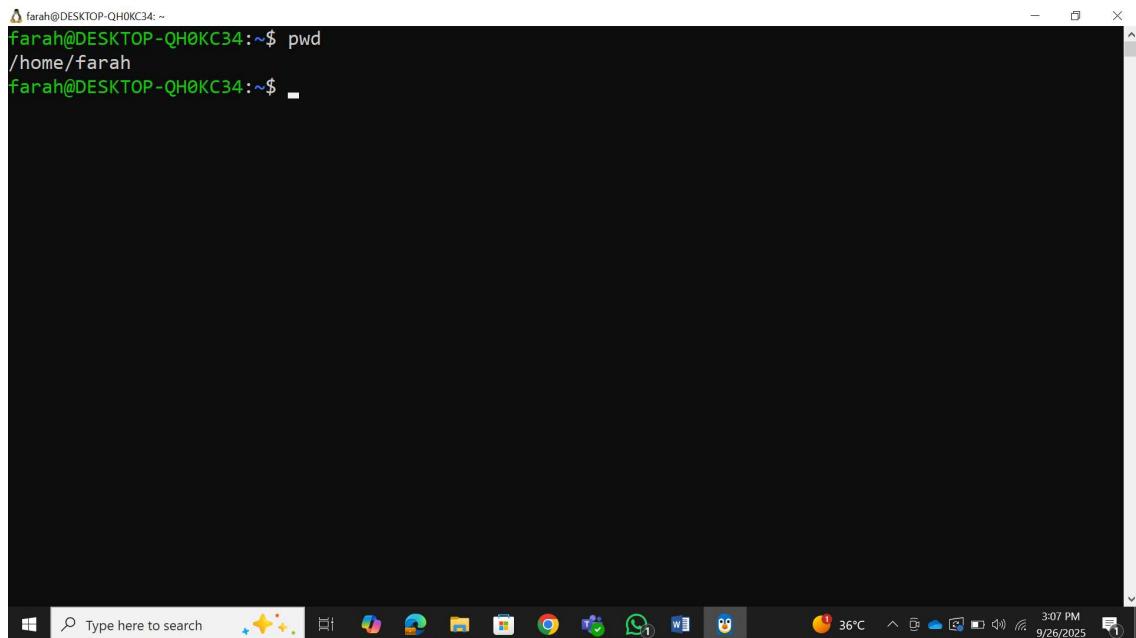
```
# Students open WSL2 terminal and explore
whoami          # Check current user
pwd             # Print working directory
uname -a         # System information
date            # Current date and time
```

Whoami:



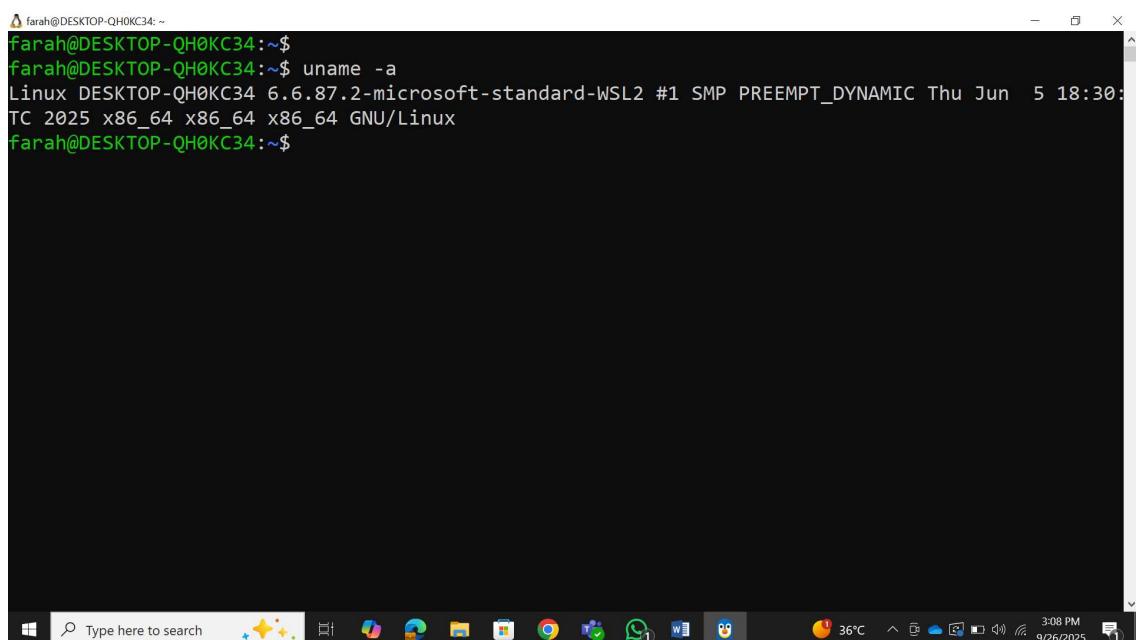
A screenshot of a Windows desktop environment. At the bottom is a taskbar with various icons for applications like File Explorer, Edge, and Mail. In the center is a dark terminal window titled 'Windows Terminal'. The window displays the command 'farah@DESKTOP-QH0KC34:~\$ whoami' followed by the output 'farah'. The desktop background is white.

Pwd:



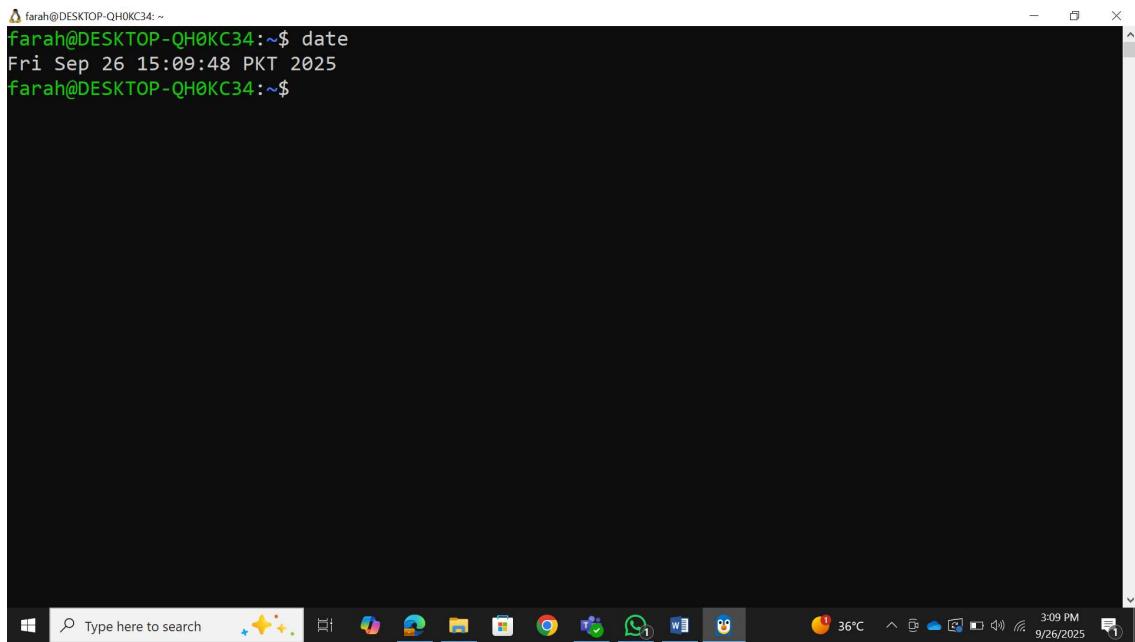
```
farah@DESKTOP-QH0KC34:~$ pwd
/home/farah
farah@DESKTOP-QH0KC34:~$
```

Unamei:



```
farah@DESKTOP-QH0KC34:~$ uname -a
Linux DESKTOP-QH0KC34 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Thu Jun  5 18:30:10 UTC 2025 x86_64 x86_64 x86_64 GNU/Linux
farah@DESKTOP-QH0KC34:~$
```

Date:



```
farah@DESKTOP-QH0KC34:~$ date
Fri Sep 26 15:09:48 PKT 2025
farah@DESKTOP-QH0KC34:~$
```

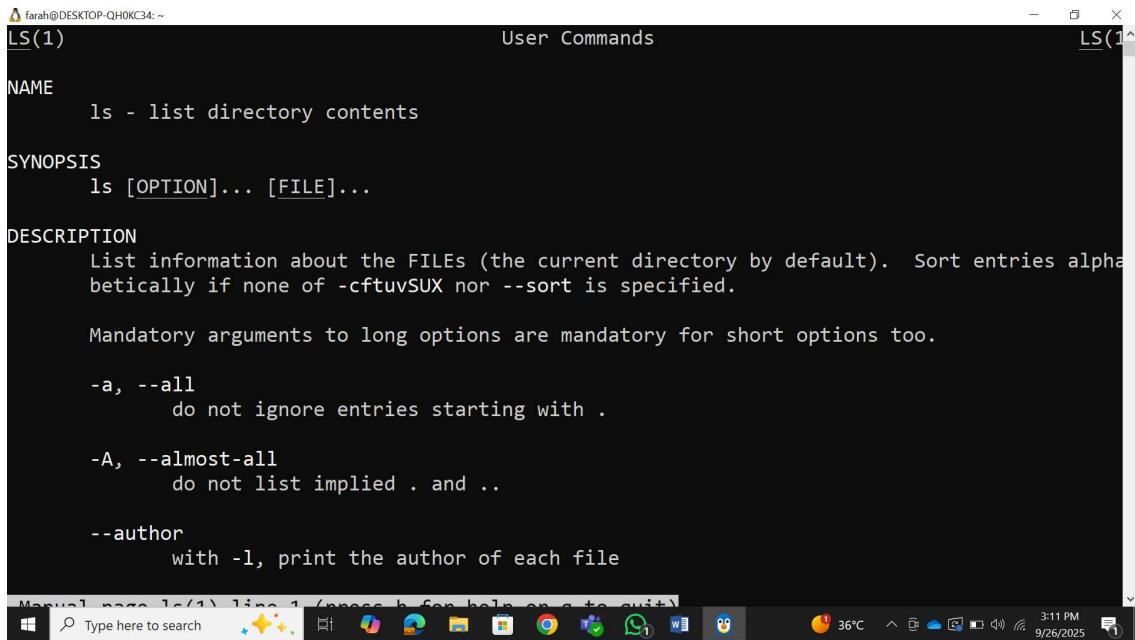
The image shows a Windows desktop environment. A black terminal window is open in the center, displaying the command 'date' and its output. The desktop taskbar at the bottom shows various pinned icons and the system tray with the date and time.

1.2 Getting Help in Linux

- Commands to demonstrate:

```
man ls          # Manual pages
ls --help       # Built-in help
which ls        # Location of commands
type ls         # Command type information
```

Man ls:



```
farah@DESKTOP-QH0KC34:~$ man ls
ls(1)                               User Commands
...
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
...
Manual page ls(1) 1 line 1 (press h for help or q to quit)
```

The image shows a Windows desktop environment. A terminal window is open, displaying the 'man ls' command and its manual page content. The desktop taskbar at the bottom shows various pinned icons and the system tray with the date and time.

Ls –help:

```
farah@DESKTOP-QH0KC34:~
```

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
- 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
- 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
- file-type likewise, except do not append '*'
- format=WORD across -x, commas -m, horizontal -x, long -l, single-column -1, verbose -l, vertical -C
- full-time like -l --time-style=full-iso
- group-directories-first like -l, but do not list owner
- group-directories-first group directories before files; can be augmented with a --sort option, but any use of --sort=none (-U) disables grouping
- G, --no-group in a long listing, don't print group names
- h, --human-readable with -l and -s, print sizes like 1K 234M 2G etc.
- si likewise, but use powers of 1000 not 1024



36°C 3:12 PM 9/26/2025

Which ls:

```
farah@DESKTOP-QH0KC34:~$ which ls
/usr/bin/ls
farah@DESKTOP-QH0KC34:~$
```



36°C 3:13 PM 9/26/2025

Type ls:

A screenshot of a Windows desktop environment. At the top, there's a taskbar with various icons for apps like File Explorer, Edge, and File History. The system tray shows the date (9/26/2025), time (3:14 PM), battery level (36°C), and signal strength. Below the taskbar is a large black terminal window titled 'Select farah@DESKTOP-QH0KC34: ~'. The terminal displays the command 'type ls' followed by its alias 'ls is aliased to `ls --color=auto'.

```
Select farah@DESKTOP-QH0KC34: ~
farah@DESKTOP-QH0KC34:~$ type ls
ls is aliased to `ls --color=auto'
farah@DESKTOP-QH0KC34:~$
```

Part 2: File System Navigation

2.1 Understanding Linux Directory Structure

- **Concepts to Cover:**
 - Root directory (/)
 - Important directories: /home, /usr, /etc, /var, /tmp
 - Absolute vs relative paths
 - Hidden files and directories
- **Demonstration:**

```
ls /          # Root directory contents
ls -la        # Long listing with hidden files
cd ~home     # Change directory
cd ~         # Home directory shortcut
cd -         # Previous directory
```

```
farah@DESKTOP-QH0KC34:~$ 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  
farah@DESKTOP-QH0KC34:~$ ls -la  
total 64  
drwxr-x--- 9 farah farah 4096 Sep 26 15:11 .  
drwxr-xr-x  3 root  root  4096 Sep 18 21:50 ..  
-rw-r--r--  1 farah farah 2463 Sep 26 15:15 .bash_history  
-rw-r--r--  1 farah farah 220 Sep 18 21:50 .bash_logout  
-rw-r--r--  1 farah farah 3771 Sep 18 21:50 .bashrc  
drwx----- 3 farah farah 4096 Sep 18 23:56 .cache  
drwxr-xr-x  8 farah farah 4096 Sep 19 00:35 .git  
-rw-r--r--  1 farah farah 53 Sep 19 21:38 .gitconfig  
drwxr-xr-x  2 farah farah 4096 Sep 18 21:51 .landscape  
-rw-r--r--  1 farah farah 20 Sep 26 15:11 .lessht  
drwxr-xr-x  3 farah farah 4096 Sep 23 15:41 .local  
-rw-rw-r--  1 farah farah 0 Sep 26 14:28 .motd_shown  
-rw-r--r--  1 farah farah 807 Sep 18 21:50 .profile  
drwx----- 3 farah farah 4096 Sep 19 21:57 .ssh  
-rw-r--r--  1 farah farah 0 Sep 18 21:56 .sudo_as_admin_successful  
drwxr-xr-x  5 farah farah 4096 Sep 18 23:56 .vscode-server  
-rw-r--r--  1 farah farah 183 Sep 18 23:56 wget-hsts  
-rw-r--r--  1 farah farah 0 Sep 26 14:30 file.txt  
drwxr-xr-x  4 farah farah 4096 Sep 26 14:34 folder  
farah@DESKTOP-QH0KC34:~$
```



```
farah@DESKTOP-QH0KC34:/home$ cd /home  
farah@DESKTOP-QH0KC34:/home$ cd ~  
farah@DESKTOP-QH0KC34:~/  
farah@DESKTOP-QH0KC34:~/
```

2.2 Basic Navigation Commands (15 minutes)

- Commands to practice:

```
pwd          # Present working directory  
ls           # List directory contents  
ls -l        # Long format  
ls -la       # Include hidden files  
ls -lh       # Human readable sizes  
cd           # Change directory  
cd ..        # Parent directory  
cd ~         # Home directory  
cd /         # Root directory
```

```
farah@DESKTOP-QH0KC34:/home$ pwd
/home
farah@DESKTOP-QH0KC34:/home$ ls
farah
farah@DESKTOP-QH0KC34:/home$ ls -l
total 4
drwxr-x--- 9 farah farah 4096 Sep 26 15:11 farah
farah@DESKTOP-QH0KC34:/home$ ls -la
total 12
drwxr-xr-x  3 root  root  4096 Sep 18 21:50 .
drwxr-xr-x 22 root  root  4096 Sep 26 14:28 ..
drwxr-x---  9 farah farah 4096 Sep 26 15:11 farah
farah@DESKTOP-QH0KC34:/home$ ls -lh
total 4.0K
drwxr-x--- 9 farah farah 4.0K Sep 26 15:11 farah
farah@DESKTOP-QH0KC34:/home$
```

```
farah@DESKTOP-QH0KC34:/$ cd /mnt/c/Users/Dell
farah@DESKTOP-QH0KC34:/mnt/c/Users/Dell$ cd Desktop
farah@DESKTOP-QH0KC34:/mnt/c/Users/Dell/Desktop$ cd --
farah@DESKTOP-QH0KC34:~/cd /mnt/c/Users/Dell/Downloads
farah@DESKTOP-QH0KC34:/mnt/c/Users/Dell/Downloads$ cd ~
farah@DESKTOP-QH0KC34:~/cd /
farah@DESKTOP-QH0KC34:/$ ls
bin          home          lost+found  root          srv
bin usr-is-merged init          media        run          sys
boot         lib           mnt         sbin        tmp
dev          lib usr-is-merged opt          sbin usr-is-merged usr
etc          lib64         proc        snap        var
farah@DESKTOP-QH0KC34:/$
```

Part 3: File and Directory Operations

****3.1 Creating and Managing Files/Directories**

- **Commands to demonstrate:**

```
mkdir mylab2          # Create directory
mkdir -p test/sub/dir # Create nested directories
touch file1.txt        # Create empty file
touch file2.txt file3.txt # Multiple files

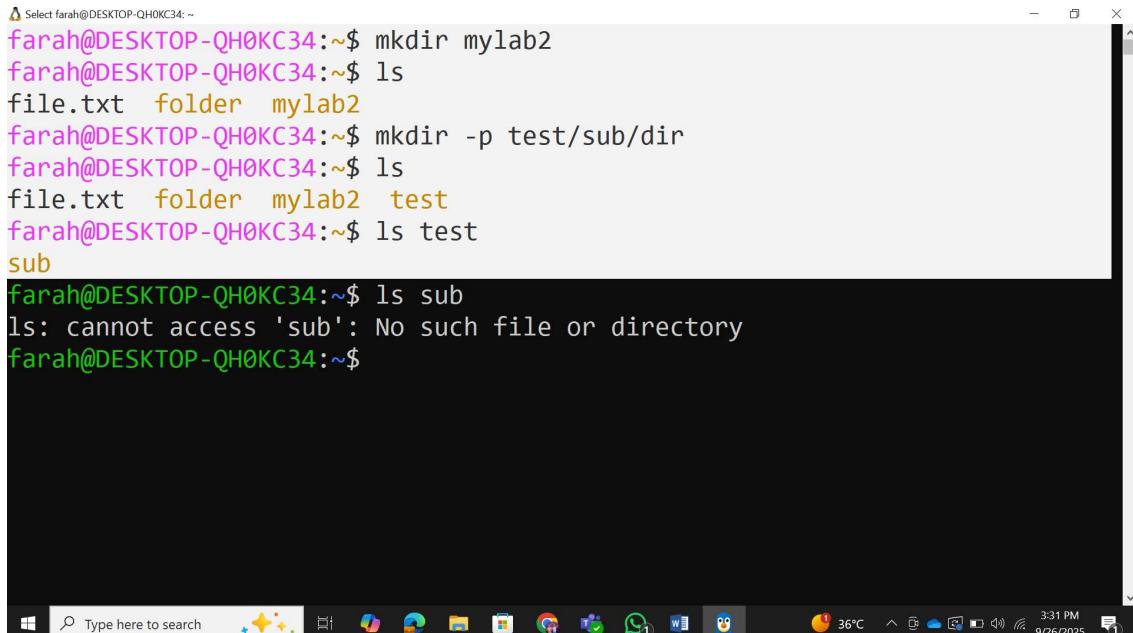
# Text editors introduction
nano hello.txt        # Simple text editor
# OR
echo "Hello Linux!" > hello.txt # Redirect output to file
```

- **File viewing commands:**

```
cat hello.txt          # Display file contents  
less hello.txt        # Page through file  
head hello.txt        # First 10 lines
```

Commands to demonstrate:

```
⚠ Select farah@DESKTOP-QH0KC34: ~
farah@DESKTOP-QH0KC34:~$ mkdir mylab2
farah@DESKTOP-QH0KC34:~$ ls
file.txt folder mylab2
farah@DESKTOP-QH0KC34:~$ mkdir -p test/sub/dir
farah@DESKTOP-QH0KC34:~$ ls
file.txt folder mylab2 test
farah@DESKTOP-QH0KC34:~$ ls test
sub
farah@DESKTOP-QH0KC34:~$ ls sub
ls: cannot access 'sub': No such file or directory
farah@DESKTOP-QH0KC34:~$
```



```
farah@DESKTOP-QH0KC34:~$ touch file1.txt
farah@DESKTOP-QH0KC34:~$ ls
file.txt file1.txt folder mylab2 test
farah@DESKTOP-QH0KC34:~$ touch file2.txt file3.txt
farah@DESKTOP-QH0KC34:~$ ls
file.txt file1.txt file2.txt file3.txt folder mylab2 test
farah@DESKTOP-QH0KC34:~$
```



Text editor introduction:

```
farah@DESKTOP-QH0KC34:~$ gnu nano 7.2          hello.txt
GNU nano 7.2          hello.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINUX COMMANDS

[ Read 2 lines ]
^G Help      ^O Write Out    ^W Where Is     ^K Cut        ^T Execute
^X Exit      ^R Read File     ^\ Replace      ^U Paste      ^J Justify
[ 3:35 PM 9/26/2025 ]
```



The image shows a Windows desktop environment with three separate terminal windows, each displaying a Linux command-line session. The desktop taskbar at the bottom is visible, showing various pinned icons and the system tray.

Terminal 1 (Top):

```
farah@DESKTOP-QH0KC34:~$ cat hello.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINUX COMMANDS
```

Terminal 2 (Middle):

```
farah@DESKTOP-QH0KC34:~$ less hello.txt
farah@DESKTOP-QH0KC34:~$
```

Terminal 3 (Bottom):

```
farah@DESKTOP-QH0KC34:~$ cat hello.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINUX COMMANDS

farah@DESKTOP-QH0KC34:~$ head hello.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINUX COMMANDS

farah@DESKTOP-QH0KC34:~$
```

```
tail hello.txt      # Last 10 lines
wc hello.txt       # Word count
```

A screenshot of a Windows desktop environment. At the top, there's a taskbar with various icons for apps like File Explorer, Edge, and messaging. The system tray shows the date (9/26/2025), time (3:39 PM), and battery level (36°C). Below the taskbar is a black terminal window titled 'Terminal'. The terminal shows the following command history:

```
farah@DESKTOP-QH0KC34:~$ tail hello.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINIX COMMANDS

farah@DESKTOP-QH0KC34:~$ wc hello.txt
 2 11 58 hello.txt
farah@DESKTOP-QH0KC34:~$
```

3.2 Copying, Moving, and Deleting

- Commands to practice:

```
cp hello.txt backup.txt      # Copy file
cp -r mylab2 mylab2_backup  # Copy directory recursively
mv backup.txt renamed.txt   # Move/rename file
rm renamed.txt               # Remove file
rm -r mylab2_backup         # Remove directory
rmdir empty_directory        # Remove empty directory
```

Hands-on Exercise: Students create a directory structure, add files, and practice file operations.

```
farah@DESKTOP-QH0KC34:~$ ls
backup.txt file1.txt file3.txt hello.txt mylab2_backup
file.txt file2.txt folder mylab2 test
farah@DESKTOP-QH0KC34:~$ cat backup.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINIX COMMANDS
farah@DESKTOP-QH0KC34:~$
```

```
farah@DESKTOP-QH0KC34:~$ cp -r mylab2 mylab2_backup
farah@DESKTOP-QH0KC34:~$ ls
backup.txt file1.txt file3.txt hello.txt mylab2_backup
file.txt file2.txt folder mylab2 test
farah@DESKTOP-QH0KC34:~$ ls mylab2_backup/
ques1.txt ques2.txt
farah@DESKTOP-QH0KC34:~$
```

```
farah@DESKTOP-QH0KC34:~$ ls
backup.txt file1.txt file3.txt hello.txt mylab2_backup
file.txt file2.txt folder mylab2 test
farah@DESKTOP-QH0KC34:~$ mv backup.txt renamed.txt
farah@DESKTOP-QH0KC34:~$ ls
file.txt file2.txt folder mylab2 renamed.txt
file1.txt file3.txt hello.txt mylab2_backup test
farah@DESKTOP-QH0KC34:~$ cat renamed.txt
HELLO I AM FARAH AND HERE I AM PRACTICING LINIX COMMANDS

farah@DESKTOP-QH0KC34:~$
```

```
farah@DESKTOP-QH0KC34:~$ rm -r mylab2_backup
farah@DESKTOP-QH0KC34:~$ ls
file.txt file2.txt folder mylab2 test
file1.txt file3.txt hello.txt renamed.txt
farah@DESKTOP-QH0KC34:~$ ls folder
folder1 inside
farah@DESKTOP-QH0KC34:~$ rm -r folder
farah@DESKTOP-QH0KC34:~$ ls
file.txt file1.txt file2.txt file3.txt hello.txt mylab2 renamed.txt test
farah@DESKTOP-QH0KC34:~$
```

Part 4: File Permissions and Ownership

4.1 Understanding File Permissions

- Concepts to Cover:

- Permission types: read (r), write (w), execute (x)
- Permission groups: user (u), group (g), others (o)
- Numeric notation: 755, 644, etc.

- Commands to demonstrate:

```
ls -l           # View permissions  
chmod 755 file.txt      # Change permissions (numeric)  
chmod u+x file.txt      # Add execute permission for user  
chmod g-w file.txt      # Remove write permission for group  
chown user:group file.txt # Change ownership (if applicable)
```

A screenshot of a Windows desktop environment. At the top, there's a taskbar with various icons including File Explorer, Microsoft Edge, and messaging apps. The system tray shows the date (9/26/2025), time (4:02 PM), battery level (36°C), and signal strength. Below the taskbar is a terminal window titled 'Select farah@DESKTOP-QH0KC34: ~'. The terminal shows the following command sequence:

```
farah@DESKTOP-QH0KC34:~$ ls -l  
total 16  
-rw-r--r-- 1 farah farah 0 Sep 26 14:30 file.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file1.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file2.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file3.txt  
-rw-r--r-- 1 farah farah 58 Sep 26 15:34 hello.txt  
drwxr-xr-x 2 farah farah 4096 Sep 26 15:46 mylab2  
-rw-r--r-- 1 farah farah 58 Sep 26 15:41 renamed.txt  
drwxr-xr-x 3 farah farah 4096 Sep 26 15:30 test  
farah@DESKTOP-QH0KC34:~$ sudo chmod 755 file.txt  
[sudo] password for farah:  
farah@DESKTOP-QH0KC34:~$ ls -l  
total 16  
-rwxr-xr-x 1 farah farah 0 Sep 26 14:30 file.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file1.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file2.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file3.txt  
-rw-r--r-- 1 farah farah 58 Sep 26 15:34 hello.txt  
drwxr-xr-x 2 farah farah 4096 Sep 26 15:46 mylab2  
-rw-r--r-- 1 farah farah 58 Sep 26 15:41 renamed.txt  
drwxr-xr-x 3 farah farah 4096 Sep 26 15:30 test
```

A second screenshot of a Windows desktop environment, similar to the first one. It shows a terminal window titled 'Select farah@DESKTOP-QH0KC34: ~'. The terminal shows the following command sequence:

```
farah@DESKTOP-QH0KC34:~$ ls -l  
total 16  
-rwxr-xr-x 1 farah farah 0 Sep 26 14:30 file.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file1.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file2.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file3.txt  
-rw-r--r-- 1 farah farah 58 Sep 26 15:34 hello.txt  
drwxr-xr-x 2 farah farah 4096 Sep 26 15:46 mylab2  
-rw-r--r-- 1 farah farah 58 Sep 26 15:41 renamed.txt  
drwxr-xr-x 3 farah farah 4096 Sep 26 15:30 test  
farah@DESKTOP-QH0KC34:~$ sudo chmod g-x file.txt  
farah@DESKTOP-QH0KC34:~$ ls -l  
total 16  
-rwxr--r-x 1 farah farah 0 Sep 26 14:30 file.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file1.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file2.txt  
-rw-r--r-- 1 farah farah 0 Sep 26 15:32 file3.txt  
-rw-r--r-- 1 farah farah 58 Sep 26 15:34 hello.txt  
drwxr-xr-x 2 farah farah 4096 Sep 26 15:46 mylab2  
-rw-r--r-- 1 farah farah 58 Sep 26 15:41 renamed.txt  
drwxr-xr-x 3 farah farah 4096 Sep 26 15:30 test  
farah@DESKTOP-QH0KC34:~$
```

