



NATIONAL TEXTILE

UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE

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LAB -2

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Lab 2: Linux Basics and Introduction

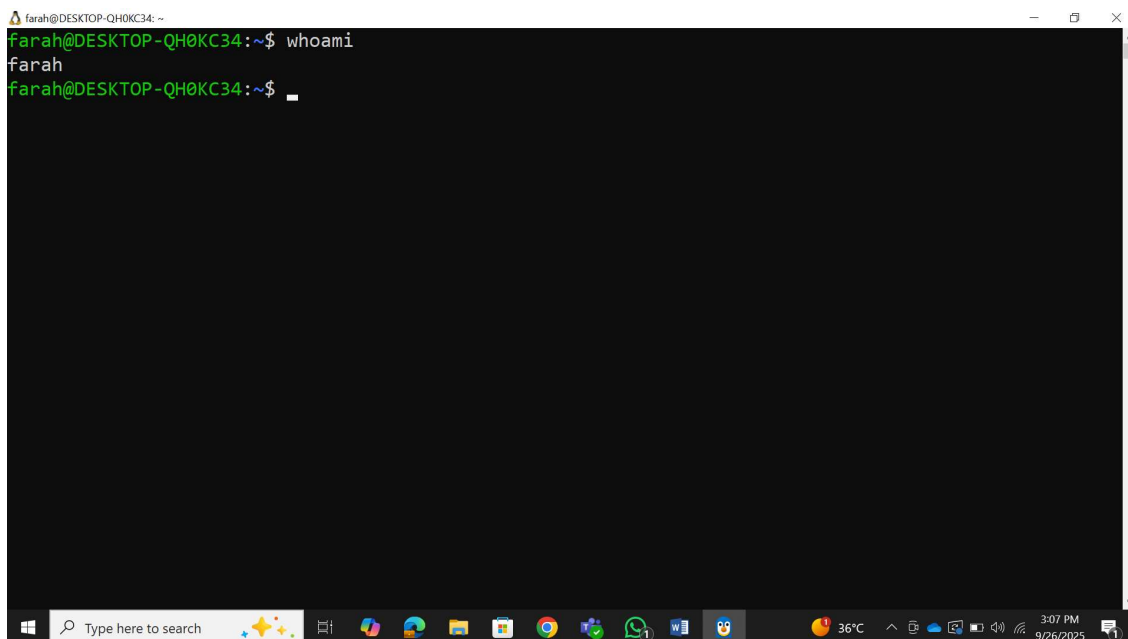
Part 1: Linux Environment Orientation

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:



The screenshot shows a Windows terminal window titled 'farah@DESKTOP-QH0KC34: ~'. The terminal displays the command 'whoami' and its output 'farah'. The Windows taskbar is visible at the bottom, showing the search bar, task view button, and several application icons. The system tray on the right indicates a temperature of 36°C, the time 3:07 PM, and the date 9/26/2025.

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

Pwd:

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

Unamei:

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

1.2 Getting Help in Linux

- **Commands to demonstrate:**

<code>man ls</code>	# Manual pages
<code>ls --help</code>	# Built-in help
<code>which ls</code>	# Location of commands
<code>type ls</code>	# Command type information

Man ls:

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

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
-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
--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
-g                      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
```

Which ls:

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

Type ls:

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

2.2 Basic Navigation Commands (15 minutes)

- Commands to practice:

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

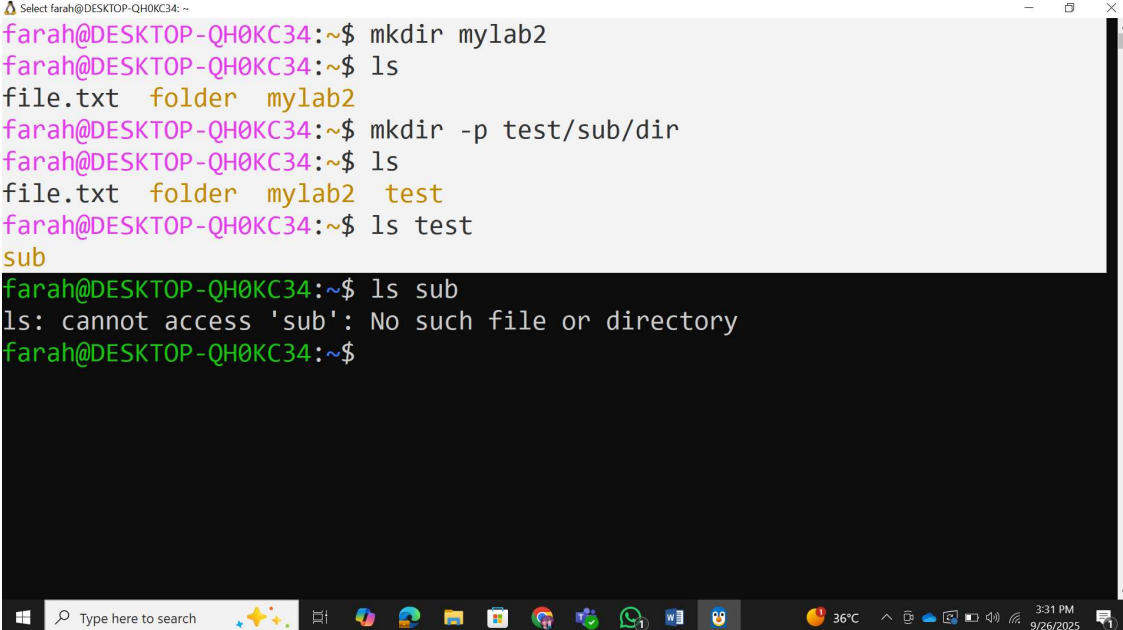
```
mkdir mylab2          # Create directory
mkdir -p test/sub/dir  # Create nested directories
touch file1.txt        # Create empty file
touch file2.txt file3.txt # Multiple files

# 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:

A screenshot of a Linux terminal window titled "Select farah@DESKTOP-QH0KC34: ~". The terminal shows a series of commands and their outputs. The user creates a directory named 'mylab2', lists the contents (showing 'file.txt' and 'folder mylab2'), creates a nested directory 'test/sub/dir', lists the contents again (showing 'file.txt', 'folder mylab2', and 'test'), and lists the contents of the 'test' directory (showing 'sub'). Finally, the user attempts to list the contents of the 'sub' directory, but receives an error: "ls: cannot access 'sub': No such file or directory". The terminal window is overlaid on a Windows desktop background with a taskbar at the bottom showing various application icons and system status information like temperature (36°C) and time (3:31 PM, 9/26/2025).

```
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:~$
```

```
Select 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
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
```

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

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

<code>tail hello.txt</code>	# Last 10 lines
<code>wc hello.txt</code>	# Word count

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

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

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

