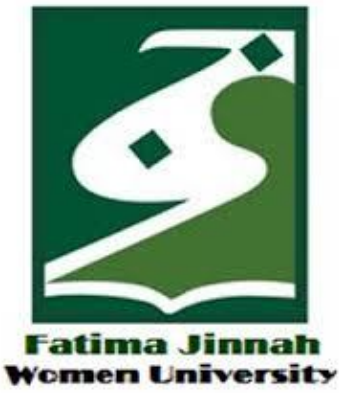


CLOUD COMPUTING

LAB: 06

Submitted By:

Seerat Fatima

Registration.no:

2023-BSE-060

Submitted To:

Engr. Shoaib

Section:

5B

Task 1 – Switch to root with su - and back to a normal user

```
serat060@ubuntu60:~$ sudo passwd root
[sudo] password for serat060:
New password:
Retype new password:
passwd: password updated successfully
```

```
serat060@ubuntu60:~$ su -
Password:
root@ubuntu60:~# whoami
root
root@ubuntu60:~# id
uid=0(root) gid=0(root) groups=0(root)
root@ubuntu60:~# _
```

```
root@ubuntu60:~# exit
logout
serat060@ubuntu60:~$ whoami
serat060
serat060@ubuntu60:~$ _
```

Task 2 – Create user tom and verify in passwd/group/shadow

```
serat060@ubuntu60:~$ sudo adduser tom
info: Adding user `tom' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `tom' (1002) ...
info: Adding new user `tom' (1002) with group `tom (1002)' ...
info: Creating home directory `/home/tom' ...
info: Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for tom
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
info: Adding new user `tom' to supplemental / extra groups `users' ...
info: Adding user `tom' to group `users' ...
```

```
tom:x:1002:1002:,,,:/home/tom:/bin/bash
```

```
tom:x:1002:
```

```
tom:$y$j9T$Y8TPrWuKvB5kgMRqA0Aqo1$EUvJ8uv71L4yYkcippDg1FLVi.ft8V678XLOZGjpYT3:20393:0:99999:7:::
```

Task 3 – Create groups; change tom's primary and secondary groups

```
developer:x:1003:
devops:x:1004:
designer:x:1005:
```

```
serat060@ubuntu60:~$ sudo usermod -g designer tom
serat060@ubuntu60:~$ id tom
uid=1002(tom) gid=1005(designer) groups=1005(designer),100(users)
```

```
serat060@ubuntu60:~$ sudo usermod -aG developer,devops tom
serat060@ubuntu60:~$ id tom
uid=1002(tom) gid=1005(designer) groups=1005(designer),100(users),1003(developer),1004(devops)
serat060@ubuntu60:~$ groups tom
tom : designer users developer devops
```

```
serat060@ubuntu60:~$ sudo usermod -G tom tom
serat060@ubuntu60:~$ id tom
uid=1002(tom) gid=1005(designer) groups=1005(designer),1002(tom)
serat060@ubuntu60:~$ groups tom
tom : designer tom
```

Task 4 – Create/delete users (Jerry, Scooby) and groups (jolly, anime)

```
serat060@ubuntu60:~$ sudo adduser jerry
info: Adding user `jerry' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `jerry' (1007) ...
info: Adding new user `jerry' (1007) with group `jerry (1007)' ...
info: Creating home directory `/home/jerry' ...
info: Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for jerry
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
info: Adding new user `jerry' to supplemental / extra groups `users' ...
info: Adding user `jerry' to group `users' ...
serat060@ubuntu60:~$ sudo useradd scooby
```

```
serat060@ubuntu60:~$ su - scooby
Password:
su: Authentication failure
```

```
serat060@ubuntu60:~$ sudo passwd scooby
New password:
Retype new password:
passwd: password updated successfully
```

```
serat060@ubuntu60:~$ su - scooby
Password:
su: warning: cannot change directory to /home/scooby: No such file or directory
$
```

```
jerry:x:1007:1007:,,,:/home/jerry:/bin/bash
scooby:x:1008:1008::/home/scooby:/bin/sh
serat060@ubuntu60:~$ ls -ld /home/scooby
ls: cannot access '/home/scooby': No such file or directory
```

```
serat060@ubuntu60:~$ sudo mkdir -p /home/scooby
serat060@ubuntu60:~$ sudo chown scooby:scooby /home/scooby
serat060@ubuntu60:~$ sudo chmod 750 /home/scooby
serat060@ubuntu60:~$ ls -ld /home/scooby
drwxr-x--- 2 scooby scooby 4096 Nov  1 12:19 /home/scooby
```

```
serat060@ubuntu60:~$ su - scooby
Password:
$ pwd
/home/scooby
$ ls -la
total 8
drwxr-x--- 2 scooby scooby 4096 Nov  1 12:19 .
drwxr-xr-x 7 root   root   4096 Nov  1 12:19 ..
```

```
jerry:x:1007:1007:,,,:/home/jerry:/bin/bash
scooby:x:1008:1008::/home/scooby:/bin/sh
```

```
serat060@ubuntu60:~$ sudo addgroup jolly
[sudo] password for serat060:
Sorry, try again.
[sudo] password for serat060:
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `jolly' (GID 1009) ...
serat060@ubuntu60:~$ sudo groupadd anime
```

```
jolly:x:1009:
anime:x:1010:
```

```
devops:x:1004:
designer:x:1005:
Scooby:x:1006:
jerry:x:1007:
scooby:x:1008:
serat060@ubuntu60:~$
```

```
xrdp:x:119:124::/run/xrdp:/usr/sbin/nologin
tom:x:1002:1005:,,,:/home/tom:/bin/bash
serat060@ubuntu60:~$
```

Task 5 – Create user Student; create files; set owner/group; identify file types

```
serat060@ubuntu60:~$ sudo adduser --allow-bad-names Student
info: Allowing use of questionable username.
info: Adding user `Student' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `Student' (1006) ...
info: Adding new user `Student' (1006) with group `Student (1006)' ...
info: Creating home directory `/home/Student' ...
info: Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for Student
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
info: Adding new user `Student' to supplemental / extra groups `users' ...
info: Adding user `Student' to group `users' ...
```

```
serat060@ubuntu60:~$ su - Student
Password:
Student@ubuntu60:~$ touch file1
Student@ubuntu60:~$ mkdir -p dir1
Student@ubuntu60:~$ touch dir1/file2
Student@ubuntu60:~$ ls -l
total 4
drwxrwxr-x 2 Student Student 4096 Nov  1 17:42 dir1
-rw-rw-r-- 1 Student Student    0 Nov  1 17:41 file1
```

```
root@ubuntu60:/home/Student# sudo chown tom /home/Student/file1

root@ubuntu60:/home/Student# ls -l file1
-rw-rw-r-- 1 tom Student 0 Nov  1 17:41 file1
```

```
root@ubuntu60:/home/Student# sudo chgrp devops file1
root@ubuntu60:/home/Student# ls -l file1
-rw-rw-r-- 1 tom devops 0 Nov  1 17:41 file1
```

```
serat060@ubuntu60:~$ su - Student
Password:
Student@ubuntu60:~$ ls -l
total 4
drwxrwxr-x 2 Student Student 4096 Nov  1 17:42 dir1
-rw-rw-r-- 1 tom     devops     0 Nov  1 17:41 file1
Student@ubuntu60:~$ ls -l dir1
total 0
-rw-rw-r-- 1 Student Student 0 Nov  1 17:42 file2
Student@ubuntu60:~$ ls -l /dev/null
crw-rw-rw- 1 root root 1, 3 Nov  1 11:50 /dev/null
Student@ubuntu60:~$ file file1 dir1 /dev/null
file1:     empty
dir1:      directory
/dev/null: character special (1/3)
```

```
Student@ubuntu60:~$ exit_
```

Task 6 – Change permissions using symbolic mode

```
serat060@ubuntu60:~$ su - Student
Password:
Student@ubuntu60:~$ cd ~
Student@ubuntu60:~$ ls -l file1
-rw-rw-r-- 1 tom devops 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod -rwx file1
Student@ubuntu60:~$
Student@ubuntu60:~$ ls -l file1
---------- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod +r file1
Student@ubuntu60:~$ ls -l file1
-r--r--r-- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod u+x file1
Student@ubuntu60:~$ ls -l file1
-r-xr--r-- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod ug+w file1
Student@ubuntu60:~$ ls -l file1
-rwxrw-r-- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod ugo-rwx file1
Student@ubuntu60:~$ ls -l file1
---------- 1 Student Student 0 Nov  1 17:41 file1
```

Task 7 – Change permissions using “set” symbolic form (u= g= o=)

```
serat060@ubuntu60:~$ su - Student
Password:
Student@ubuntu60:~$ cd ~
Student@ubuntu60:~$ ls -l fle1
ls: cannot access 'fle1': No such file or directory
Student@ubuntu60:~$ ls -l file1
---------- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod u=rwx,g=rwx,o=rwx file1
Student@ubuntu60:~$ ls -l file1
-rwxrwxrwx 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod g=rw,o=rw file1
Student@ubuntu60:~$ ls -l file1
-rwxrw-rw- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod u=,g=,o= file1
Student@ubuntu60:~$ ls -l file1
---------- 1 Student Student 0 Nov  1 17:41 file1
```

Task 8 – Change permissions using numeric (octal) mode

```
serat060@ubuntu60:~$ su - Student
Password:
Student@ubuntu60:~$ cd ~
Student@ubuntu60:~$ ls -l file1
---------- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 777 file1
Student@ubuntu60:~$ ls -l file1
-rwxrwxrwx 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 700 file1
Student@ubuntu60:~$ ls -l file1
-rwx------ 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 744 file1
Student@ubuntu60:~$ ls -l file1
-rwxr--r-- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 640 file1
Student@ubuntu60:~$ ls -l file1
-rw-r----- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 644 file1
Student@ubuntu60:~$ ls -l file1
-rw-r--r-- 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 755 file1
Student@ubuntu60:~$ ls -l file1
-rwxr-xr-x 1 Student Student 0 Nov  1 17:41 file1
```

```
Student@ubuntu60:~$ chmod 750 file1
Student@ubuntu60:~$ ls -l file1
-rwxr-x--- 1 Student Student 0 Nov  1 17:41 file1
```

Task 9 – Practice pipes, pagers, grep, and redirects with /var/log/syslog

```
2025-11-01T11:52:07.097280+00:00 ubuntu60 systemd[1646]: Listening on gpg-agent-extra.socket - GnuPG cryptographic agent and passphrase cache (
2025-11-01T11:52:07.097349+00:00 ubuntu60 systemd[1646]: Starting gpg-agent-ssh.socket - GnuPG cryptographic agent (ssh-agent emulation)...
2025-11-01T11:52:07.097434+00:00 ubuntu60 systemd[1646]: Listening on gpg-agent.socket - GnuPG cryptographic agent and passphrase cache.
2025-11-01T11:52:07.099791+00:00 ubuntu60 systemd[1646]: Listening on keyboxd.socket - GnuPG public key management service.
2025-11-01T11:52:07.100099+00:00 ubuntu60 systemd[1646]: Listening on pk-debconf-helper.socket - debconf communication socket.
2025-11-01T11:52:07.100298+00:00 ubuntu60 systemd[1646]: Listening on pulseaudio.socket - Sound System.
2025-11-01T11:52:07.100534+00:00 ubuntu60 systemd[1646]: Listening on snapd.session-agent.socket - REST API socket for snapd user session agent
2025-11-01T11:52:07.107510+00:00 ubuntu60 systemd[1646]: Listening on dbus.socket - D-Bus User Message Bus Socket.
2025-11-01T11:52:07.181780+00:00 ubuntu60 systemd[1646]: Listening on gpg-agent-ssh.socket - GnuPG cryptographic agent (ssh-agent emulation).
2025-11-01T11:52:07.182212+00:00 ubuntu60 systemd[1646]: Reached target sockets.target - Sockets.
2025-11-01T11:52:07.182399+00:00 ubuntu60 systemd[1646]: Reached target basic.target - Basic System.
2025-11-01T11:52:07.183620+00:00 ubuntu60 systemd[1]: Started user@1000.service - User Manager for UID 1000.
2025-11-01T11:52:07.192736+00:00 ubuntu60 systemd[1]: Started session-1.scope - Session 1 of User serat060.
2025-11-01T11:52:07.195525+00:00 ubuntu60 systemd[1646]: Starting pulseaudio.service - Sound Service...
2025-11-01T11:52:10.284901+00:00 ubuntu60 dbus-daemon[1148]: [system] Activating via systemd: service name='org.freedesktop.RealtimeKit1' unit=
vice' requested by ':1.24' (uid=1000 pid=1662 comm="/usr/bin/pulseaudio --daemonize=no --log-target=jo" label="unconfined")
serat060@ubuntu60:~$
```

```
2025-11-01T11:52:07.097280+00:00 ubuntu60 systemd[1646]: Listening on gpg-agent-extra.socket - GnuPG cryptographic agent and passphrase cache (
2025-11-01T11:52:07.097349+00:00 ubuntu60 systemd[1646]: Starting gpg-agent-ssh.socket - GnuPG cryptographic agent (ssh-agent emulation)...
2025-11-01T11:52:07.097434+00:00 ubuntu60 systemd[1646]: Listening on gpg-agent.socket - GnuPG cryptographic agent and passphrase cache.
2025-11-01T11:52:07.099791+00:00 ubuntu60 systemd[1646]: Listening on keyboxd.socket - GnuPG public key management service.
2025-11-01T11:52:07.100099+00:00 ubuntu60 systemd[1646]: Listening on pk-debconf-helper.socket - debconf communication socket.
2025-11-01T11:52:07.100298+00:00 ubuntu60 systemd[1646]: Listening on pulseaudio.socket - Sound System.
2025-11-01T11:52:07.100534+00:00 ubuntu60 systemd[1646]: Listening on snapd.session-agent.socket - REST API socket for snapd user session agent
2025-11-01T11:52:07.107510+00:00 ubuntu60 systemd[1646]: Listening on dbus.socket - D-Bus User Message Bus Socket.
2025-11-01T11:52:07.181780+00:00 ubuntu60 systemd[1646]: Listening on gpg-agent-ssh.socket - GnuPG cryptographic agent (ssh-agent emulation).
2025-11-01T11:52:07.182212+00:00 ubuntu60 systemd[1646]: Reached target sockets.target - Sockets.
2025-11-01T11:52:07.182399+00:00 ubuntu60 systemd[1646]: Reached target basic.target - Basic System.
2025-11-01T11:52:07.183620+00:00 ubuntu60 systemd[1]: Started user@1000.service - User Manager for UID 1000.
2025-11-01T11:52:07.192736+00:00 ubuntu60 systemd[1]: Started session-1.scope - Session 1 of User serat060.
2025-11-01T11:52:07.195525+00:00 ubuntu60 systemd[1646]: Starting pulseaudio.service - Sound Service...
2025-11-01T11:52:10.284901+00:00 ubuntu60 dbus-daemon[1148]: [system] Activating via systemd: service name='org.freedesktop.RealtimeKit1' unit=
vice' requested by ':1.24' (uid=1000 pid=1662 comm="/usr/bin/pulseaudio --daemonize=no --log-target=jo" label="unconfined")
--More--
```

```
serat060@ubuntu60:~$ sudo grep -E 'fail|error' /var/log/syslog | head
2025-11-01T11:56:19.023330+00:00 ubuntu60 systemd[1]: Starting update-notifier-download.service - Download data for packages that failed at pa
...
2025-11-01T11:56:19.643361+00:00 ubuntu60 systemd[1]: Finished update-notifier-download.service - Download data for packages that failed at pa
.
2025-11-01T12:17:49.379722+00:00 ubuntu60 apt-helper[1957]: E: Sub-process nm-online returned an error code (1)
2025-11-01T17:26:48.596626+00:00 ubuntu60 fwupd[2837]: 17:26:48.595 FuEngine            failed to add device /sys/devices/pci0000:00/0000:00:
ata4/host3/target3:0:0/3:0:0:0/block/sr0: failed to open /dev/sr0: No medium found
2025-11-01T17:27:14.317904+00:00 ubuntu60 apt-helper[2820]: E: Sub-process nm-online returned an error code (1)
2025-11-01T17:28:01.988490+00:00 ubuntu60 fwupd[3223]: 17:28:01.987 FuEngine            failed to add device /sys/devices/pci0000:00/0000:00:
ata4/host3/target3:0:0/3:0:0:0/block/sr0: failed to open /dev/sr0: No medium found
2025-11-01T17:29:41.710810+00:00 ubuntu60 NetworkManager[1293]: <info>  [1762018181.7090] audit: op="sleep-control" arg="off" pid=3680 uid=0 r
n="Already awake"
2025-11-01T17:30:08.832187+00:00 ubuntu60 fwupd[3897]: 17:30:08.831 FuEngine            failed to add device /sys/devices/pci0000:00/0000:00:
ata4/host3/target3:0:0/3:0:0:0/block/sr0: failed to open /dev/sr0: No medium found
2025-11-01T18:27:06.236696+00:00 ubuntu60 systemd[1]: Stopped update-notifier-download.timer - Download data for packages that failed at packa
2025-11-01T18:27:57.569325+00:00 ubuntu60 multipathd[475]: sda: failed to get udev uid: No data available
```

```
serat060@ubuntu60:~$ sudo grep -i systemd /var/log/syslog > ~/syslog_systemd.txt

serat060@ubuntu60:~$
```

```
2025-11-01T18:28:08.009305+00:00 ubuntu60 NetworkManager[1183]: <info>  [1762021688.0088] manager: startup complete
2025-11-01T18:28:08.013346+00:00 ubuntu60 systemd[1]: Reached target network.target - Network.
2025-11-01T18:28:08.035627+00:00 ubuntu60 systemd[1]: Starting NetworkManager-wait-online.service - Network Manager Wait Online...
2025-11-01T18:28:08.037701+00:00 ubuntu60 NetworkManager[1183]: <info>  [1762021688.0375] modem-manager: ModemManager available
2025-11-01T18:28:08.197154+00:00 ubuntu60 systemd[1]: Finished NetworkManager-wait-online.service - Network Manager Wait Online.
2025-11-01T18:28:08.210815+00:00 ubuntu60 systemd[1]: Reached target network-online.target - Network is Online.
2025-11-01T18:28:12.406033+00:00 ubuntu60 systemd[1]: NetworkManager-dispatcher.service: Deactivated successfully.
2025-11-01T18:28:47.794097+00:00 ubuntu60 systemd[1548]: Listening on dirmngr.socket - GnuPG network certificate management daemon.
2025-11-01T18:29:57.021289+00:00 ubuntu60 systemd-networkd[682]: ens33: Lost carrier
2025-11-01T18:29:57.022464+00:00 ubuntu60 systemd-networkd[682]: ens33: DHCP lease lost
2025-11-01T18:29:57.023021+00:00 ubuntu60 systemd-networkd[682]: ens33: DHCPv6 lease lost
2025-11-01T18:29:57.038600+00:00 ubuntu60 systemd-timesyncd[685]: No network connectivity, watching for changes.
2025-11-01T18:30:03.169650+00:00 ubuntu60 NetworkManager[1183]: <info>  [1762021803.1654] device (ens33): carrier: link connected
2025-11-01T18:30:03.173140+00:00 ubuntu60 systemd-networkd[682]: ens33: Gained carrier
2025-11-01T18:30:03.201224+00:00 ubuntu60 systemd-timesyncd[685]: Network configuration changed, trying to establish connection.
2025-11-01T18:30:03.207150+00:00 ubuntu60 systemd-networkd[682]: ens33: DHCPv4 address 192.168.243.128/24, gateway 192.168.243.2 acquired from
2025-11-01T18:30:03.217767+00:00 ubuntu60 systemd-timesyncd[685]: Network configuration changed, trying to establish connection.
```

Task 10 – Script setup.sh – variables, command substitution, file/dir checks, permissions (use vim)

```
~
~
~
"setup.sh" [New] 0L, 0B written
```

```
serat060@ubuntu60:~$ chmod +x setup.sh
serat060@ubuntu60:~$ ./setup.sh
```

```
 from Lab 6"

 echo "var1: $var1"

~
~
~
```

```
serat060@ubuntu60:~$ ./setup.sh
var1: Hello from lab6
```

```
  2
  3 echo "allFiles (ls -l):"
  4
  5 echo "$allFiles"
~
~
~
```

```
serat060@ubuntu60:~$ ./setup.sh
allFiles (ls -l):
total 200
-rw-rw-r-- 1 serat060 serat060    142 Oct 17 05:12 answers.md
-rw-rw-r-- 1 serat060 serat060    455 Oct 24 04:50 apt_update_vs_upgrade.md
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Desktop
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Documents
drwxr-xr-x 2 serat060 serat060   4096 Oct 25 19:43 Downloads
drwxrwxr-x 3 serat060 serat060   4096 Oct 23 18:01 lab4
drwxrwxr-x 3 serat060 serat060   4096 Oct 17 05:17 Lab4
drwxrwxr-x 2 serat060 serat060   4096 Oct 24 23:45 Lab5
-rw-rw-r-- 1 serat060 serat060     20 Oct 17 05:22 main.py
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Music
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Pictures
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Public
-rw-rw-r-- 1 serat060 serat060    247 Oct 23 18:34 Q2_report.md
-rw-rw-r-- 1 serat060 serat060     12 Oct 17 05:19 README.md
drwxrwxr-x 3 serat060 serat060   4096 Oct 23 18:38 sandbox
drwxrwxr-x 3 serat060 serat060   4096 Oct 23 18:48 sandbox_backup
-rwxrwxr-x 1 serat060 serat060     64 Nov  1 19:07 setup.sh
drwx------ 3 serat060 serat060   4096 Oct 24 05:09 snap
-rw-rw-r-- 1 serat060 serat060 115747 Nov  1 18:37 syslog_systemd.txt
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Templates
drwxrwxr-t 2 serat060 serat060   4096 Oct 24 07:33 thinclient_drives
drwxr-xr-x 2 serat060 serat060   4096 Oct 24 07:33 Videos
```

```
 1
 2 if [ -d "dir1" ]; then
 3
 4           echo "Directory dir1 exists."
 5
 6   else
 7
 8             echo "Directory dir1 does not exist. Creating..."
 9
10               mkdir -p "dir1"
11
12                 echo "Directory dir1 created."
13
14 fi
~
~
```

```
serat060@ubuntu60:~$ ./setup.sh
Directory dir1 does not exist. Creating...
Directory dir1 created.
```

```
 2 if [ -f "dir1/file2" ]; then
 3
 4           echo "file2 already exists."
 5
 6   else
 7
 8             echo "file2 does not exist. Creating..."
 9
10               touch "dir1/file2"
11
12                 chmod a-rwx "dir1/file2"
13
14                   echo "file2 created."
15
16 fi
```

```
serat060@ubuntu60:~$ ./setup.sh
file2 does not exist. Creating...
file2 created.
```

```
 1
 2 f="dir1/file2"
 3
 4 if [ ! -r "$f" ]; then
 5
 6           echo "Read permission missing; granting to user..."
 7
 8             chmod u+r "$f"
 9
10 fi
11
12
13
14 if [ ! -w "$f" ]; then
15
16           echo "Write permission missing; granting to user..."
17
18             chmod u+w "$f"
19
20 fi
21
22
23
24 if [ ! -x "$f" ]; then
25
26           echo "Execute permission missing; granting to user..."
27
28             chmod u+x "$f"
29
30 fi
31
32
33
34 echo "Final permissions for $f:"
35
36 ls -l "$f"_
```

```
serat060@ubuntu60:~$ ./setup.sh
Read permission missing; granting to user...
Write permission missing; granting to user...
Execute permission missing; granting to user...
Final permissions for dir1/file2:
-rwx------ 1 serat060 serat060 0 Nov  1 19:13 dir1/file2
```

Task 11 – Script setup.sh – argument comparisons (eq, ne, gt, lt, ge, le) and string checks

```
num=$1
str=$2
~
```

```
serat060@ubuntu60:~$ chmod +x setup.sh
serat060@ubuntu60:~$ ./setup.sh 10 Student
```

```
 1
 2 num=$1
 3
 4 str=$2
 5
 6
 7
 8 if [ "$num" -eq 10 ]; then
 9
10           echo "$num is equal to 10 (-eq)."
11
12   else
13
14             echo "$num is NOT equal to 10 (-eq)."
15
16 fi
~
```

```
serat060@ubuntu60:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
serat060@ubuntu60:~$ ./setup.sh 7 Student
7 is NOT equal to 10 (-eq).
```

```
 1
 2 num=$1
 3
 4 str=$2
 5
 6
 7
 8 if [ "$num" -eq 10 ]; then
 9
10           echo "$num is equal to 10 (-eq)."
11
12   else
13
14             echo "$num is NOT equal to 10 (-eq)."
15
16 fi
17
18 if [ "$num" -gt 10 ]; then
19
20           echo "$num is greater than 10 (-gt)."
21
22   else
23
24             echo "$num is NOT greater than 10 (-gt)."
25
26 fi
```

```
serat060@ubuntu60:~$ ./setup.sh 12 Student
12 is NOT equal to 10 (-eq).
12 is greater than 10 (-gt).
serat060@ubuntu60:~$ ./setup.sh 9 Student
9 is NOT equal to 10 (-eq).
9 is NOT greater than 10 (-gt).
```

```
 5
 6
 7
 8 if [ "$num" -eq 10 ]; then
 9
10           echo "$num is equal to 10 (-eq)."
11
12   else
13
14             echo "$num is NOT equal to 10 (-eq)."
15
16 fi
17
18 if [ "$num" -gt 10 ]; then
19
20           echo "$num is greater than 10 (-gt)."
21
22   else
23
24             echo "$num is NOT greater than 10 (-gt)."
25
26 fi
27
28 if [ "$num" -lt 10 ]; then
29
30           echo "$num is less than 10 (-lt)."
31
32   else
33
34             echo "$num is NOT less than 10 (-lt)."
35
36 fi
```

```
serat060@ubuntu60:~$ ./setup.sh 5 Student
5 is NOT equal to 10 (-eq).
5 is NOT greater than 10 (-gt).
5 is less than 10 (-lt).
serat060@ubuntu60:~$ ./setup.sh 11 Student
11 is NOT equal to 10 (-eq).
11 is greater than 10 (-gt).
11 is NOT less than 10 (-lt).
```

```
14              echo "$num is NOT equal to 10 (-eq)."
15
16 fi
17
18 if [ "$num" -gt 10 ]; then
19
20           echo "$num is greater than 10 (-gt)."
21
22   else
23
24             echo "$num is NOT greater than 10 (-gt)."
25
26 fi
27
28 if [ "$num" -lt 10 ]; then
29
30           echo "$num is less than 10 (-lt)."
31
32   else
33
34             echo "$num is NOT less than 10 (-lt)."
35
36 fi
37
38 if [ "$num" -ge 10 ]; then
39
40   echo "$num is greater than or equal to 10 (-ge)."
41
42 else
43
44           echo "$num is NOT greater than or equal to 10 (-ge)."
45 _fi
```

```
serat060@ubuntu60:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
serat060@ubuntu60:~$ ./setup.sh 8 Student
8 is NOT equal to 10 (-eq).
8 is NOT greater than 10 (-gt).
8 is less than 10 (-lt).
8 is NOT greater than or equal to 10 (-ge).
```

```
21
22   else
23
24             echo "$num is NOT greater than 10 (-gt)."
25
26 fi
27
28 if [ "$num" -lt 10 ]; then
29
30           echo "$num is less than 10 (-lt)."
31
32   else
33
34             echo "$num is NOT less than 10 (-lt)."
35
36 fi
37
38 if [ "$num" -ge 10 ]; then
39
40   echo "$num is greater than or equal to 10 (-ge)."
41
42 else
43
44           echo "$num is NOT greater than or equal to 10 (-ge)."
45  fi
46
47 if [ "$num" -le 10 ]; then
48
49   echo "$num is less than or equal to 10 (-le)."
50
51 else
52
53           echo "$num is NOT less than or equal to 10 (-le)."
54  fi
55
```

```
serat060@ubuntu60:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
serat060@ubuntu60:~$ ./setup.sh 12 Student
12 is NOT equal to 10 (-eq).
12 is greater than 10 (-gt).
12 is NOT less than 10 (-lt).
12 is greater than or equal to 10 (-ge).
12 is NOT less than or equal to 10 (-le).
```

```
30          echo "$num is less than 10 (-lt)."
31
32   else
33
34             echo "$num is NOT less than 10 (-lt)."
35
36 fi
37
38 if [ "$num" -ge 10 ]; then
39
40   echo "$num is greater than or equal to 10 (-ge)."
41
42 else
43
44          echo "$num is NOT greater than or equal to 10 (-ge)."
45  fi
46
47 if [ "$num" -le 10 ]; then
48
49   echo "$num is less than or equal to 10 (-le)."
50
51 else
52
53          echo "$num is NOT less than or equal to 10 (-le)."
54  fi
55 if [ "$str" = "Student" ]; then
56
57   echo "Second argument equals 'Student' ( = )."
58
59 else
60
61          echo "Second argument does NOT equal 'Student' ( = )."
62  fi
```

```
serat060@ubuntu60:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument equals 'Student' ( = ).
serat060@ubuntu60:~$ ./setup.sh 10 Test
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument does NOT equal 'Student' ( = ).
```

```
 40   echo "$num is greater than or equal to 10 (-ge)."
 41
 42 else
 43
 44           echo "$num is NOT greater than or equal to 10 (-ge)."
 45  fi
 46
 47 if [ "$num" -le 10 ]; then
 48
 49   echo "$num is less than or equal to 10 (-le)."
 50
 51 else
 52
 53           echo "$num is NOT less than or equal to 10 (-le)."
 54  fi
 55 if [ "$str" = "Student" ]; then
 56
 57   echo "Second argument equals 'Student' ( = )."
 58
 59 else
 60
 61           echo "Second argument does NOT equal 'Student' ( = )."
 62  fi
 63 if [ "$str" != "Student" ]; then
 64
 65   echo "Second argument is not equal to 'Student' ( != )."
 66
 67 else
 68
 69           echo "Second argument equals 'Student' ( != false)."
 70  fi
```

```
serat060@ubuntu60:~$ ./setup.sh 10 Test
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument does NOT equal 'Student' ( = ).
Second argument is not equal to 'Student' ( != ).
serat060@ubuntu60:~$ ./setup.sh 12 Student
12 is NOT equal to 10 (-eq).
12 is greater than 10 (-gt).
12 is NOT less than 10 (-lt).
12 is greater than or equal to 10 (-ge).
12 is NOT less than or equal to 10 (-le).
Second argument equals 'Student' ( = ).
Second argument equals 'Student' ( != false).
```

```
55 if [ "$str" = "Student" ]; then
56
57   echo "Second argument equals 'Student' ( = )."
58
59 else
60
61           echo "Second argument does NOT equal 'Student' ( = )."
62  fi
63 if [ "$str" != "Student" ]; then
64
65   echo "Second argument is not equal to 'Student' ( != )."
66
67 else
68
69           echo "Second argument equals 'Student' ( != false)."
70  fi
71 if [ -z "$str" ]; then
72
73   echo "Second argument is empty (zero-length)."
74
75 else
76
77           echo "Second argument is not empty."
78  fi
```

```
serat060@ubuntu60:~$ ./setup.sh 10
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument does NOT equal 'Student' ( = ).
Second argument is not equal to 'Student' ( != ).
Second argument is empty (zero-length).
serat060@ubuntu60:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument equals 'Student' ( = ).
Second argument equals 'Student' ( != false).
Second argument is not empty.
```

Task 12 – Script setup.sh – print all arguments with a for loop

```
  1
  2 #!/bin/bash
  3 # Script to demonstrate printing all user-entered arguments using $*
  4
~
~
```

```
serat060@ubuntu60:~$ ./setup.sh
serat060@ubuntu60:~$ _
```

```
  1
  2 #!/bin/bash
  3 # Script to demonstrate printing all user-entered arguments using $*
  4 "Printing all arguments using \$*:"
  5 for arg in $*; do
  6           echo "Argument: $arg"
  7   done
~
```

```
serat060@ubuntu60:~$ ./setup.sh one "two words" three
./setup.sh: line 4: Printing all arguments using $*:: command not found
Argument: one
Argument: two
Argument: words
Argument: three
```

Task 13 – Script setup.sh – while loop summation and functions

```
~
~
"setup.sh" 2L, 13B written
```

```
serat060@ubuntu60:~$ chmod +x setup.sh
serat060@ubuntu60:~$ ./setup.sh
```

```
#!/bin/bash
# While-loop summation (interactive)
 sum=0
 while true; do
   read -p "Enter a number (or 'q' to quit): " input
     if [ "$input" = "q" ]; then

        break
      fi
    sum=$((sum + input))
    echo "Total Score: $sum"
 done
 echo "Final total: $sum"
~
```

```
serat060@ubuntu60:~$ ./setup.sh
Enter a number (or 'q' to quit): 5
Total Score: 5
Enter a number (or 'q' to quit): 7
Total Score: 12
Enter a number (or 'q' to quit): q
Final total: 12
```

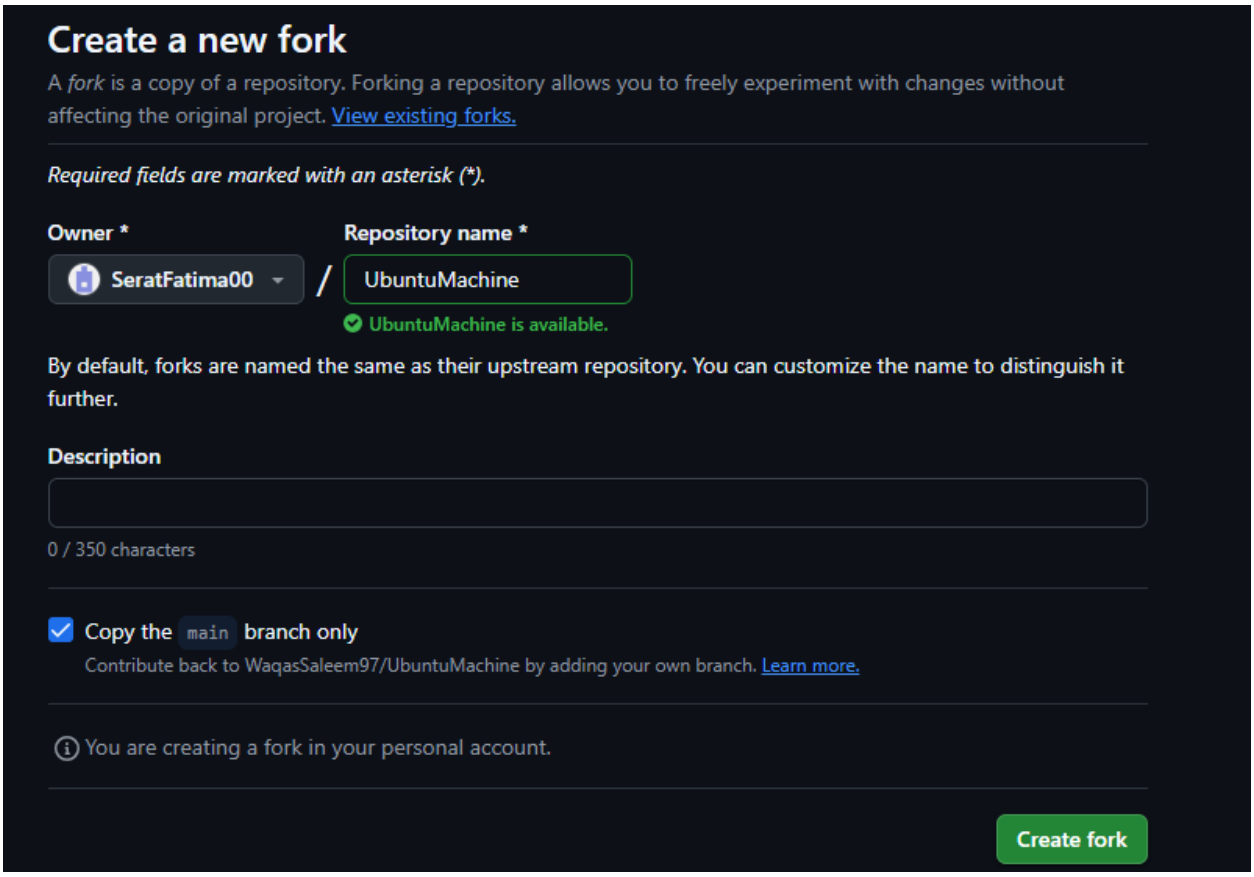
```
15  # Function to accumulate scores interactively
16  sum_two() {
17   sum=0
18   while true; do
19           read -p "Enter a number (or 'q' to quit): " input
20           if [ "$input" = "q" ]; then
21           break
22           fi
23           sum=$((sum + input))
24           echo "Total Score: $sum"
25  done
26  echo "Function final total: $sum"
27 }
28 # Demonstrate the function
29  echo "Now calling sum_two function:"
30  sum_two
```

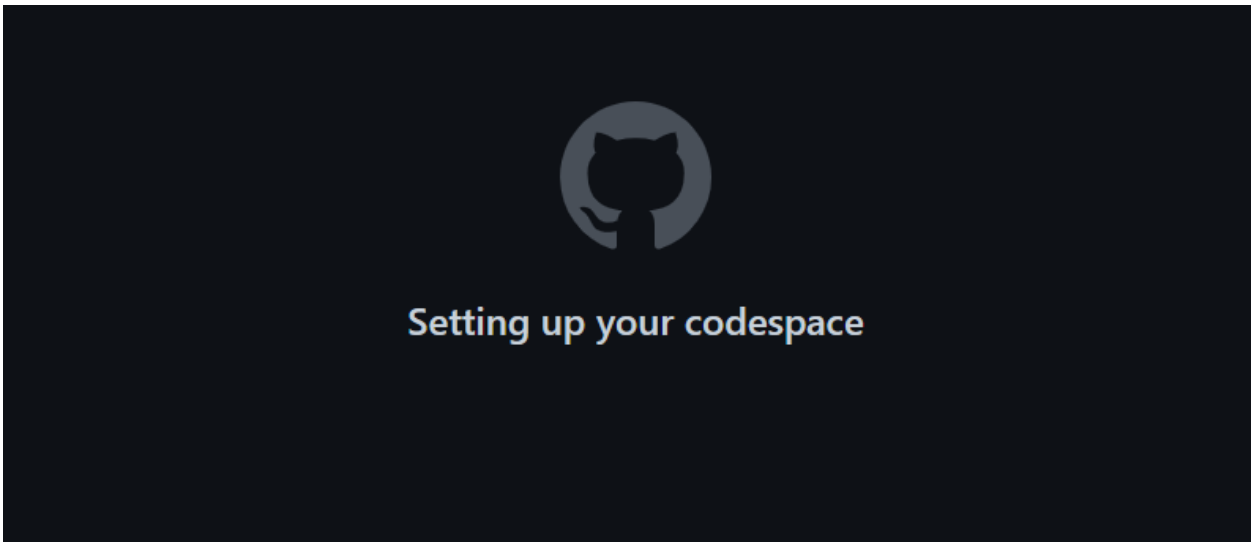
```
Now calling sum_two function:
Enter a number (or 'q' to quit): 3
Total Score: 3
Enter a number (or 'q' to quit): 4
Total Score: 7
Enter a number (or 'q' to quit): q
Function final total: 7
```

```
19 # Function that sums two arguments and returns the result
20 sum_args() {
21           a=$1
22             b=$2
23               return $((a + b))
24   }
25   # Demonstrate sum_args function
26  echo "Now demonstrating sum_args function:"
27 _sum_args 3 4
28  result=$?
29  echo "sum_args(3,4) returned: $result"
~
```

```
serat060@ubuntu60:~$ chmod +x setup.sh
serat060@ubuntu60:~$ ./setup.sh
Now calling sum_two function:
Enter a number (or 'q' to quit): q
Function final total: 0
Now demonstrating sum_args function:
sum_args(3,4) returned: 7
```

Task 14 – Codespaces GUI — fork repo, run start-desktop.sh, open VNC, stop GUI





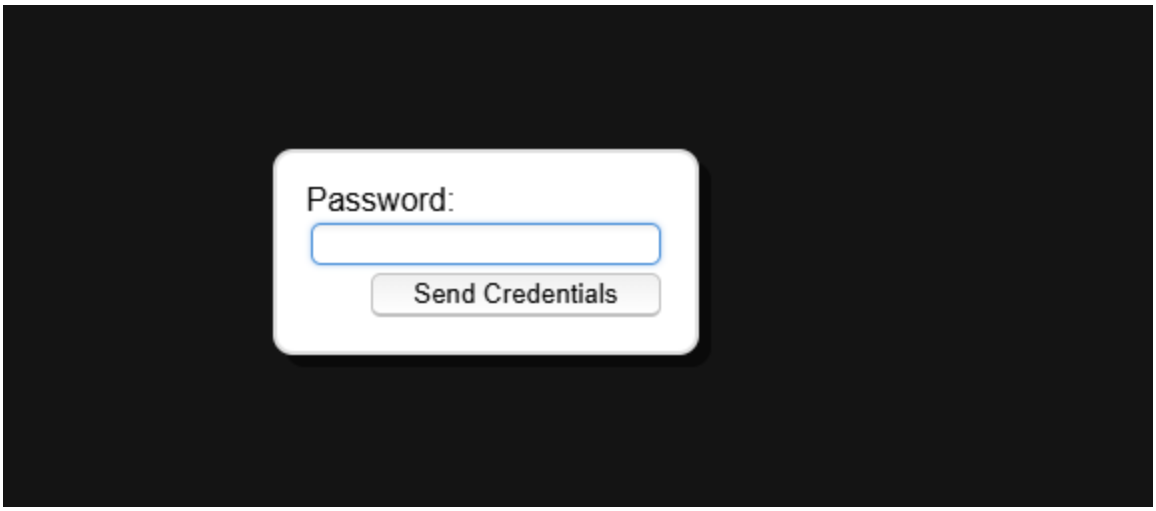
```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l start-desktop.sh stop-desktop.sh
-rwxrwxrwx 1 codespace root 1333 Nov  2 09:34 start-desktop.sh
-rwxrwxrwx 1 codespace root  428 Nov  2 09:34 stop-desktop.sh
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ chmod +x start-desktop.sh stop-desktop.sh
```

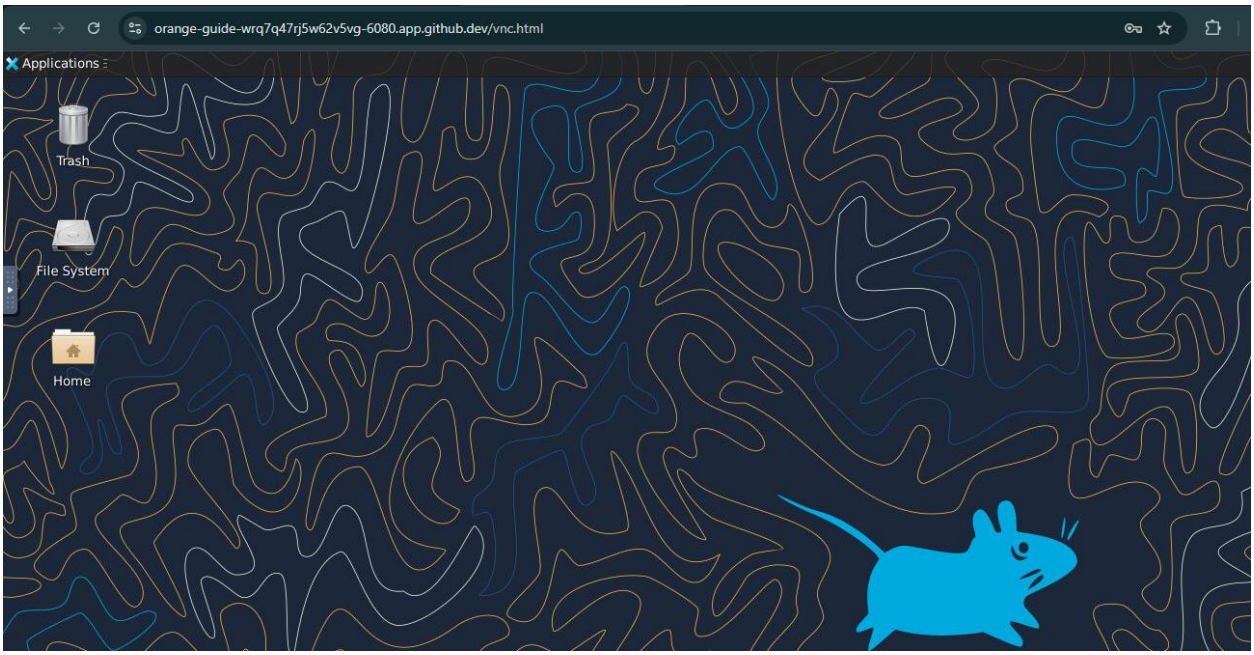
```
    http://codespaces-63a18b:6080/vnc.html?host=codespaces-63a18b&port=6080

Press Ctrl-C to exit


[✓] XFCE desktop environment is running!
 Access it via the Codespaces HTTPS port (6080)
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ WebSocket server settings:
  - Listen on :6080
  - Web server. Web root: /usr/share/novnc
  - No SSL/TLS support (no cert file)
  - proxying from :6080 to localhost:5901

(xfdesktop:20192): GVFS-RemoteVolumeMonitor-WARNING **: 09:51:05.483: remote volume monitor with dbus name org.gtk.vfs.UDisks2VolumeMonitor
is not supported

** (xfdesktop:20192): WARNING **: 09:51:05.584: Failed to get system bus: Could not connect: No such file or directory
```

PROBLEMS OUTPUT TERMINAL PORTS 1

Port	Forwarded Address	Running Process	Visibility	Origin
6080	https://ora...		Public	User Forwarded

Add Port






```
● @SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ./stop-desktop.sh
  [*] Stopping noVNC server...

  Terminating WebSockets proxy (13101)
  [*] Stopping x11vnc server...
  In exit
  Terminating child 14804
  Process Process-4:
  caught signal: 15
  [*] Stopping XFCE desktop session...
  02/11/2025 10:40:07 deleted 60 tile_row polling images.
  02/11/2025 10:40:07 Restored X server key autorepeat to: 1
  [*] Stopping virtual X server (Xvfb)...
  [✓] All services stopped.
```

Exam Evaluation Questions

1. Group Management and Membership

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo groupadd g1
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo groupadd g2
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo groupadd g3
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ getent group g1 g2 g3
g1:x:1002:
g2:x:1003:
g3:x:1004:
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo useradd -m examuser
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo usermod -g g3 examuser
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo usermod -a -G g1,g2 examuser
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ id examuser
uid=1001(examuser) gid=1004(g3) groups=1004(g3),1002(g1),1003(g2)
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ grep '^g[123]:' /etc/group
g1:x:1002:examuser
g2:x:1003:examuser
g3:x:1004:
```

2. Ownership and Permission Tasks

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ mkdir -p ~/workspace
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ echo "top secret" > ~/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l ~/workspace/secret.txt
-rw-r--r-- 1 codespace codespace 11 Nov  2 12:40 /home/codespace/workspace/secret.txt
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo chown examuser:g1 ~/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l ~/workspace/secret.txt
-rw-r--r-- 1 examuser g1 11 Nov  2 12:40 /home/codespace/workspace/secret.txt
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo chmod go= ~/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l ~/workspace/secret.txt
-rw------- 1 examuser g1 11 Nov  2 12:40 /home/codespace/workspace/secret.txt
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo chmod 0644 ~/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l ~/workspace/secret.txt
-rw-r--r-- 1 examuser g1 11 Nov  2 12:40 /home/codespace/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo chmod 0600 ~/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l ~/workspace/secret.txt
-rw------- 1 examuser g1 11 Nov  2 12:40 /home/codespace/workspace/secret.txt
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l ~/workspace/secret.txt
-rw------- 1 examuser g1 11 Nov  2 12:40 /home/codespace/workspace/secret.txt
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ stat -c "%U %G %A %a %n" ~/workspace/secret.txt
examuser g1 -rw------- 600 /home/codespace/workspace/secret.txt
```

3. Pipes, Grep, and Redirection Practice

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo journalctl -n 200 2>/dev/null | grep -i -E 'error|fail' | head -n 20
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo grep -i -E 'error|fail' /var/log/syslog 2>/dev/null | head -n 20
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ mkdir -p "$HOME/logs"
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo journalctl -n 1000 2>/dev/null | grep -i -E 'error|fail' | head -n 100 > "$HOME/log
s/errors.txt" 2>/dev/null
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ sudo journalctl -n 100 2>/dev/null | grep -i -E 'error|fail' | tail -n 10 >> "$HOME/logs
/errors.txt" 2>/dev/null
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ ls -l $HOME/logs/errors.txt
-rw-r--r-- 1 codespace codespace 0 Nov  2 13:24 /home/codespace/logs/errors.txt
```

4. Script: Variables, Command Substitution, File & Dir Checks

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat > "$HOME/workspace/setup.sh" <<'BASH'
#!/bin/bash
var1="Hello from Lab 6"
echo "var1: $var1"
BASH
chmod +x "$HOME/workspace/setup.sh"
# show in editor or with head
sed -n '1,20p' "$HOME/workspace/setup.sh"
#!/bin/bash
var1="Hello from Lab 6"
echo "var1: $var1"
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat >> "$HOME/workspace/setup.sh" <<'BASH'

# command substitution: store ls -l of current dir
allfiles="$(ls -l)"
echo "All files in CWD:"
echo "$allfiles"
BASH
# show file
sed -n '1,60p' "$HOME/workspace/setup.sh"
#!/bin/bash
var1="Hello from Lab 6"
echo "var1: $var1"

# command substitution: store ls -l of current dir
allfiles="$(ls -l)"
echo "All files in CWD:"
echo "$allfiles"
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat >> "$HOME/workspace/setup.sh" <<'BASH'

# directory and file checks
dir1="$HOME/workspace/dir1"
file2="$dir1/file2" …
#!/bin/bash
var1="Hello from Lab 6"
echo "var1: $var1"

# command substitution: store ls -l of current dir
allfiles="$(ls -l)"
echo "All files in CWD:"
echo "$allfiles"

# directory and file checks
dir1="$HOME/workspace/dir1"
file2="$dir1/file2"
if [ ! -d "$dir1" ]; then
  mkdir -p "$dir1"
  echo "Created $dir1"
fi
if [ ! -f "$file2" ]; then
  echo "sample content" > "$file2"
  echo "Created $file2"
fi
ls -ld "$dir1"
ls -l "$file2"
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ chmod +x "$HOME/workspace/setup.sh"
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh"
var1: Hello from Lab 6
All files in CWD:
total 12
-rw-rw-rw- 1 codespace root   31 Nov  2 09:34 README.md
-rwxrwxrwx 1 codespace root 1333 Nov  2 09:34 start-desktop.sh
-rwxrwxrwx 1 codespace root  428 Nov  2 09:34 stop-desktop.sh
Created /home/codespace/workspace/dir1
Created /home/codespace/workspace/dir1/file2
drwxr-sr-x 2 codespace codespace 4096 Nov  2 13:36 /home/codespace/workspace/dir1
-rw-r--r-- 1 codespace codespace 15 Nov  2 13:36 /home/codespace/workspace/dir1/file2
```

5. Script: Comparisons and String Tests

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat > "$HOME/workspace/setup.sh" <<'BASH'
#!/bin/bash
num=$1
str=$2

if [ "$num" -eq 10 ]; then
  echo "$num is equal to 10 (-eq)."
else
  echo "$num is NOT equal to 10 (-eq)."
fi
BASH
chmod +x "$HOME/workspace/setup.sh"
# Run both true/false examples:
"$HOME/workspace/setup.sh" 10 Student
"$HOME/workspace/setup.sh" 7 Student
10 is equal to 10 (-eq).
7 is NOT equal to 10 (-eq).
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" 12 Student
12 is NOT equal to 10 (-eq).
12 is not equal to 10 (-ne).
12 is greater than 10 (-gt).
12 is NOT less than 10 (-lt).
12 is greater than or equal to 10 (-ge).
12 is NOT less than or equal to 10 (-le).
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" 9 Student
9 is NOT equal to 10 (-eq).
9 is not equal to 10 (-ne).
9 is NOT greater than 10 (-gt).
9 is less than 10 (-lt).
9 is NOT greater than or equal to 10 (-ge).
9 is less than or equal to 10 (-le).
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" 10 Student
10 is equal to 10 (-eq).
10 is equal to 10 (-ne false).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" 10 Student
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument equals 'Student' ( = ).
Second argument equals 'Student' ( != false).
Second argument is not empty.
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" 10 Test
10 is equal to 10 (-eq).
10 is equal to 10 (-ne false).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument does NOT equal 'Student' ( = ).
Second argument is not equal to 'Student' ( != ).
Second argument is not empty.
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" 10
10 is equal to 10 (-eq).
10 is equal to 10 (-ne false).
10 is NOT greater than 10 (-gt).
10 is NOT less than 10 (-lt).
10 is greater than or equal to 10 (-ge).
10 is less than or equal to 10 (-le).
Second argument does NOT equal 'Student' ( = ).
Second argument is not equal to 'Student' ( != ).
Second argument is empty (zero-length).
```

6. Script: For Loop and Argument Handling

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat > "$HOME/workspace/setup.sh" <<'BASH'
#!/bin/bash
echo "Printing all arguments using \"\$@\":"
for arg in "$@"; do
  echo "Argument: $arg"
done
BASH
chmod +x "$HOME/workspace/setup.sh"
# show file content
sed -n '1,200p' "$HOME/workspace/setup.sh"
#!/bin/bash
echo "Printing all arguments using \"\$@\":"
for arg in "$@"; do
  echo "Argument: $arg"
done
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh" one "two words" three "four five six"
Printing all arguments using "$@":
Argument: one
Argument: two words
Argument: three
Argument: four five six
```

7. Script: While Loop Summation and Functions

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat > "$HOME/workspace/setup.sh" <<'BASH'
#!/bin/bash

# interactive while-loop summation
sum=0
while true; do
  read -p "Enter a number (or 'q' to quit): " input
  if [ "$input" = "q" ]; then
    break
  fi
  sum=$((sum + input))
  echo "Total Score: $sum"
done
echo "Final total: $sum"
BASH
chmod +x "$HOME/workspace/setup.sh"
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh"
Enter a number (or 'q' to quit): 4
Total Score: 4
Enter a number (or 'q' to quit): 5
Total Score: 9
Enter a number (or 'q' to quit): q
Final total: 9
```

```
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ cat >> "$HOME/workspace/setup.sh" <<'BASH'

# function that sums two args and echoes the result
sum_args_echo() {
  a=$1
  b=$2
  echo $((a + b))
}

# demo capturing result
result=$(sum_args_echo 3 4)
echo "sum_args_echo(3,4) returned: $result"
BASH
@SeratFatima00 ➜/workspaces/UbuntuMachine (main) $ "$HOME/workspace/setup.sh"
Enter a number (or 'q' to quit): 2
Total Score: 2
Enter a number (or 'q' to quit): 3
Total Score: 5
Enter a number (or 'q' to quit): q
Final total: 5
sum_args_echo(3,4) returned: 7
```