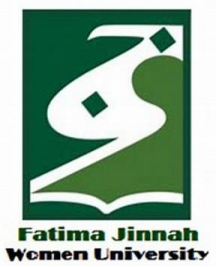
CLOUD COMPUTING

LAB 06



Submitted To:

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Submitted By:

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BSE V-A

2023-BSE-031

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

Steps

1. Set a root password
   sudo passwd root

```
komal_31@ubuntu31:~$ sudo passwd root
[sudo] password for komal_31:
New password:
BAD PASSWORD: The password fails the dictionary check - it is too simplistic/systematic
Retype new password:
passwd: password updated successfully
```

2. Switch to the root user and verify:
   su –
   whoami
   id

```
komal_31@ubuntu31:~$ su -
Password:
root@ubuntu31:~# whoami
root
root@ubuntu31:~# id
uid=0(root) gid=0(root) groups=0(root)
root@ubuntu31:~#
```

3. Switch back to the normal user and verify:
   exit
   whoami

```
root@ubuntu31:~# exit
logout
komal_31@ubuntu31:~$ whoami
komal_31
komal_31@ubuntu31:~$
```

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

Steps

1. Create a new user tom
   sudo adduser tom

```
komal_31@ubuntu31:~$ sudo adduser tom
info: Adding user `tom' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `tom' (1001) ...
info: Adding new user `tom' (1001) with group `tom (1001)' ...
info: Creating home directory `/home/tom' ...
info: Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
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 []: Tom
        Room Number []: 2023-BSE-031
        Work Phone []: 0000-00000000
        Home Phone []: 1111-1111111
        Other []: Software Engineer
Is the information correct? [Y/n] Y
info: Adding new user `tom' to supplemental / extra groups `users' ...
info: Adding user `tom' to group `users' ...
```

2. Verify user tom in the /etc/passwd file:

cat /etc/passwd

```
komal_31@ubuntu31:~$ cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
gdm:x:127:129:Gnome Display Manager:/var/lib/gdm3:/bin/false
tom:x:1001:1001:Tom,2023-BSE-031,0000-00000000,1111-1111111,Software Engineer:/home/tom:/bin/bash
```

3. Verify user tom in the /etc/group file:
   cat /etc/group

```
komal_31@ubuntu31:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,komal_31
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
cdrom:x:24:komal_31
floppy:x:25:
sssd:x:126:
pipewire:x:127:
nm-openvpn:x:128:
gnome-remote-desktop:x:987:
gdm:x:129:
docker:x:986:
tom:x:1001:
```

4. Verify user tom in the /etc/shadow file:
   sudo cat /etc/shadow

```
komal_31@ubuntu31:~$ sudo cat /etc/shadow
root:$y$j9T$XRzhdY5k1j5NiUnAM1jxW.$96irJe7AgBtuz3CIIOGnB10XQmrVNZQO5tkgsZINz2B:20417:0:99999:7:::
daemon:*:20305:0:99999:7:::
bin:*:20305:0:99999:7:::
sys:*:20305:0:99999:7:::
sync:*:20305:0:99999:7:::
games:*:20305:0:99999:7:::
man:*:20305:0:99999:7:::
lp:*:20305:0:99999:7:::
mail:*:20305:0:99999:7:::
news:*:20305:0:99999:7:::
uucp:*:20305:0:99999:7:::
proxy:*:20305:0:99999:7:::
gnome-remote-desktop:!*:20416:::::
gdm:!:20416:::::
tom:$y$j9T$GZ3gWB7oowlDA.64JCBNp/$2X1FwcE52djyqeLVuOhi3XYJKy.88FGX73BUuxnZMR/:20417:0:99999:7:::
```

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

Steps

1. Create the required groups and verify:
   sudo groupadd developer
   sudo groupadd devops
   sudo groupadd designer

```
komal_31@ubuntu31:~$ sudo groupadd developer
komal_31@ubuntu31:~$ sudo groupadd devops
komal_31@ubuntu31:~$ sudo groupadd designer
komal_31@ubuntu31:~$ cat /etc/group
tom:x:1001:
developer:x:1002:
devops:x:1003:
designer:x:1004:
```

2. Change tom's primary group to designer and verify:
   sudo usermod -g designer tom
   id tom

```
komal_31@ubuntu31:~$ sudo usermod -g designer tom
komal_31@ubuntu31:~$ id tom
uid=1001(tom) gid=1004(designer) groups=1004(designer),100(users)
```

3. Add secondary groups developer and devops to tom and verify:
   sudo usermod -aG developer,devops tom
   id tom
   groups tom

```
komal_31@ubuntu31:~$ sudo usermod -aG developer,devops tom
komal_31@ubuntu31:~$ id tom
uid=1001(tom) gid=1004(designer) groups=1004(designer),100(users),1002(developer),1003(devops)
komal_31@ubuntu31:~$ groups tom
tom : designer users developer devops
```

4. Reset secondary groups so only tom (user's own group) remains and verify:
   sudo usermod -G tom tom
   id tom
   groups tom

```
komal_31@ubuntu31:~$ sudo usermod -G tom tom
komal_31@ubuntu31:~$ id tom
uid=1001(tom) gid=1004(designer) groups=1004(designer),1001(tom)
komal_31@ubuntu31:~$ groups tom
tom : designer tom
```

Task 4: Create/Delete Users (Jerry, Scooby) and Groups (jolly, anime)

Steps

1. Create new users Jerry and Scooby:
   sudo adduser Jerry
   sudo useradd Scooby

```
komal_31@ubuntu31:~$ sudo adduser jerry
info: Adding user `jerry' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `jerry' (1005) ...
info: Adding new user `jerry' (1005) with group `jerry (1005)' ...
info: Creating home directory `/home/jerry' ...
info: Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
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 []: Jerry
        Room Number []: 031
        Work Phone []: 1111-1111111
        Home Phone []: 2222
        Other []: Architect
Is the information correct? [Y/n] Y
info: Adding new user `jerry' to supplemental / extra groups `users' ...
info: Adding user `jerry' to group `users' ...
komal_31@ubuntu31:~$ sudo useradd Scooby
```

   - adduser automatically created a home directory and prompted for a password.
   - useradd created a basic user account without a home directory or password.

2. Attempt to log in as Scooby before setting a password (expected failure):
   su – Scooby

```
komal_31@ubuntu31:~$ su - Scooby
Password:
su: Authentication failure
```

3. Set a password for Scooby:
   sudo passwd Scooby

```
komal_31@ubuntu31:~$ sudo passwd Scooby
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
```

4. Log in again as Scooby (observe missing home directory warning):
   su – Scooby

```
komal_31@ubuntu31:~$ su - Scooby
Password:
su: warning: cannot change directory to /home/Scooby: No such file or directory
$
```

5. Verify Scooby's home directory and /etc/passwd entry:
   cat /etc/passwd

```
komal_31@ubuntu31:~$ cat /etc/passwd
jerry:x:1005:1005:Jerry,031,1111-1111111,2222,Architect:/home/jerry:/bin/bash
Scooby:x:1006:1006::/home/Scooby:/bin/sh
komal_31@ubuntu31:~$ ls -ld /home/Scooby
ls: cannot access '/home/Scooby': No such file or directory
```

6. Manually create Scooby's home directory and set ownership/permissions:
   sudo mkdir -p /home/Scooby
   sudo chown Scooby:Scooby /home/Scooby
   sudo chmod 750 /home/Scooby
   ls -ld /home/Scooby

```
komal_31@ubuntu31:~$ sudo mkdir -p /home/Scooby
komal_31@ubuntu31:~$ sudo chown Scooby:Scooby /home/Scooby
komal_31@ubuntu31:~$ sudo chmod 750 /home/Scooby
komal_31@ubuntu31:~$ ls -ld /home/Scooby
drwxr-x--- 2 Scooby Scooby 4096 Nov 25 09:21 /home/Scooby
```

7. Log in as Scooby again to confirm correct home directory access:
   su - Scooby
   pwd
   ls -la

```
komal_31@ubuntu31:~$ su - Scooby
Password:
$ pwd
/home/Scooby
$ ls -la
total 8
drwxr-x--- 2 Scooby Scooby 4096 Nov 25 09:21 .
drwxr-xr-x 6 root   root   4096 Nov 25 09:21 ..
$
```

8. Verify users in /etc/passwd and check Scooby's shell:
   cat /etc/passwd

```
komal_31@ubuntu31:~$ cat /etc/passwd
tom:x:1001:1004:Tom,2023-BSE-031,0000-00000000,1111-1111111,Software Engineer:/home/tom:/bin/bash
jerry:x:1005:1005:Jerry,031,1111-1111111,2222,Architect:/home/jerry:/bin/bash
Scooby:x:1006:1006::/home/Scooby:/bin/sh
```

9. Create groups jolly and anime:
   sudo addgroup jolly
   sudo groupadd anime

```
komal_31@ubuntu31:~$ sudo addgroup jolly
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `jolly' (GID 1007) ...
komal_31@ubuntu31:~$ sudo groupadd anime
komal_31@ubuntu31:~$
```

10. Verify groups in /etc/group:

cat /etc/group

```
komal_31@ubuntu31:~$ cat /etc/group
jerry:x:1005:
Scooby:x:1006:
jolly:x:1007:
anime:x:1008:
```

11. Delete the groups and users:

sudo delgroup jolly
sudo groupdel anime
cat /etc/group

```
komal_31@ubuntu31:~$ sudo deluser --remove-home jerry
info: Looking for files to backup/remove ...
info: Removing files ...
info: Removing crontab ...
info: Removing user `jerry' ...
komal_31@ubuntu31:~$ sudo userdel -r Scooby
userdel: Scooby mail spool (/var/mail/Scooby) not found
komal_31@ubuntu31:~$ cat /etc/passwd
gdm:x:127:129:Gnome Display Manager:/var/lib/gdm3:/bin/false
tom:x:1001:1004:Tom,2023-BSE-031,0000-00000000,1111-1111111,Software Engineer:/home/tom:/bin/bash
komal_31@ubuntu31:~$
```

sudo deluser --remove-home Jerry
sudo userdel -r Scooby
cat /etc/passwd


```
komal_31@ubuntu31:~$ sudo deluser --remove-home jerry
info: Looking for files to backup/remove ...
info: Removing files ...
info: Removing crontab ...
info: Removing user `jerry' ...
komal_31@ubuntu31:~$ sudo userdel -r Scooby
userdel: Scooby mail spool (/var/mail/Scooby) not found
komal_31@ubuntu31:~$ cat /etc/passwd
gdm:x:127:129:Gnome Display Manager:/var/lib/gdm3:/bin/false
tom:x:1001:1004:Tom,2023-BSE-031,0000-00000000,1111-1111111,Software Engineer:/home/tom:/bin/bash
komal_31@ubuntu31:~$
```

Task 5: Create User "Student"; Create Files; Set Owner/Group; Identify File Types

Steps

1. Create a new user Student:
   sudo adduser Student

```
komal_31@ubuntu31:~$ sudo adduser student
info: Adding user `student' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `student' (1005) ...
info: Adding new user `student' (1005) with group `student (1005)' ...
info: Creating home directory `/home/student' ...
info: Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
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 []: Student 31
        Room Number []: 031
        Work Phone []: 1111-1111111
        Home Phone []: 2222-2222222
        Other []: Student
Is the information correct? [Y/n] Y
info: Adding new user `student' to supplemental / extra groups `users' ...
info: Adding user `student' to group `users' ...
```

2. Switch to Student and create files and directories:
   su - Student
   touch file1
   mkdir -p dir1
   touch dir1/file2
   ls -l

```
komal_31@ubuntu31:~$ su - student
Password:
student@ubuntu31:~$ touch file1
student@ubuntu31:~$ mkdir -p dir1
student@ubuntu31:~$ touch dir1/file2
student@ubuntu31:~$ ls -l
total 4
drwxrwxr-x 2 student student 4096 Nov 25 10:00 dir1
-rw-rw-r-- 1 student student    0 Nov 25 10:00 file1
```

3. Change the owner of file1 to tom and verify:
   sudo chown tom file1
   ls -l file1

```
student@ubuntu31:~$ sudo chown tom file1
[sudo] password for student:
student@ubuntu31:~$ ls -l file1
-rw-rw-r-- 1 tom student 0 Nov 25 10:00 file1
```

   Change the group of file1 to devops and verify:
   sudo chgrp devops file1
   ls -l file1

```
student@ubuntu31:~$ sudo chgrp devops file1
student@ubuntu31:~$ ls -l file1
-rw-rw-r-- 1 tom devops 0 Nov 25 10:00 file1
```

4. Identify files, directories, and special files:
    ls -l
    ls -l dir1
    ls -l /dev/null
    file file1 dir1 /dev/null

```
student@ubuntu31:~$ ls -l
total 4
drwxrwxr-x 2 student student 4096 Nov 25 10:00 dir1
-rw-rw-r-- 1 tom     devops     0 Nov 25 10:00 file1
student@ubuntu31:~$ ls -l dir1
total 0
-rw-rw-r-- 1 student student 0 Nov 25 10:00 file2
student@ubuntu31:~$ ls -l /dev/null
crw-rw-rw- 1 root root 1, 3 Nov 25 07:25 /dev/null
student@ubuntu31:~$ file file1 dir1 /dev/null
file1:     empty
dir1:      directory
/dev/null: character special (1/3)
```

5. Exit from Student account:

```
student@ubuntu31:~$ exit
logout
komal_31@ubuntu31:~$
```

Task 6: Change Permissions Using Symbolic Mode

Steps:

1. Ensure the Student user and target file exist:
    su - Student
    cd ~
    ls -l file1

```
komal_31@ubuntu31:~$ su - student
Password:
student@ubuntu31:~$ cd ~
student@ubuntu31:~$ ls -l file1
-rw-rw-r-- 1 tom devops 0 Nov 25 10:00 file1
```

2. Remove all permissions from file1:
    chmod -rwx file1
    ls -l file1

```
student@ubuntu31:~$ sudo chmod 000 file1
student@ubuntu31:~$ sudo chown student file1
student@ubuntu31:~$ chmod -rwx file1
student@ubuntu31:~$ ls -l file1
---------- 1 student devops 0 Nov 25 10:00 file1
```

3. Add read permission to all users:
    chmod +r file1
    ls -l file1

```
student@ubuntu31:~$ chmod +r file1
student@ubuntu31:~$ ls -l file1
-r--r--r-- 1 student devops 0 Nov 25 10:00 file1
```

4. Add execute permission to the user (owner):
   chmod u+x file1
   ls -l file1

```
student@ubuntu31:~$ chmod u+x file1
student@ubuntu31:~$ ls -l file1
-r-xr--r-- 1 student devops 0 Nov 25 10:00 file1
```

5. Add write permission to both user and group:
   chmod ug+w file1
   ls -l file1

```
student@ubuntu31:~$ chmod ug+w file1
student@ubuntu31:~$ ls -l file1
-rwxrw-r-- 1 student devops 0 Nov 25 10:00 file1
```

6. Remove all permissions explicitly from user, group, and others:
   chmod ugo-rwx file1
   ls -l file1

```
student@ubuntu31:~$ chmod ugo-rwx file1
student@ubuntu31:~$ ls -l file1
---------- 1 student devops 0 Nov 25 10:00 file1
```

Task 7: Change Permissions Using "Set" Symbolic Form (u= g= o=)

Steps

1. Ensure you are logged in as Student and confirm the file exists:
   su - Student
   cd ~
   ls -l file1

```
komal_31@ubuntu31:~$ su - student
Password:
student@ubuntu31:~$ cd ~
student@ubuntu31:~$ ls -l file1
---------- 1 student devops 0 Nov 25 10:00 file1
```

2. Set all permissions (read, write, execute) for user, group, and others:
   chmod u=rwx,g=rwx,o=rwx file1
   ls -l file1

```
student@ubuntu31:~$ chmod u=rwx,g=rwx,o=rwx file1
student@ubuntu31:~$ ls -l file1
-rwxrwxrwx 1 student devops 0 Nov 25 10:00 file1
```

3. Remove execute permission from group and others:
   chmod g=rw,o=rw file1
   ls -l file1

```
student@ubuntu31:~$ chmod g=rw,o=rw file1
student@ubuntu31:~$ ls -l file1
-rwxrw-rw- 1 student devops 0 Nov 25 10:00 file1
```

4. Remove all permissions from user, group, and others:
   chmod u=,g=,o= file1
   ls -l file1

```
student@ubuntu31:~$ chmod u=,g=,o= file1
student@ubuntu31:~$ ls -l file1
---------- 1 student devops 0 Nov 25 10:00 file1
```

Task 8: Change Permissions Using Numeric (Octal) Mode

Steps

1. Ensure you are logged in as Student and the file exists:
   su - Student
   cd ~
   ls -l file1

```
komal_31@ubuntu31:~$ su - student
Password:
student@ubuntu31:~$ cd ~
student@ubuntu31:~$ ls -l file1
---------- 1 student devops 0 Nov 25 10:00 file1
```

2. Set permissions to 777 (rwx for user, group, and others):
   chmod 777 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 777 file1
student@ubuntu31:~$ ls -l file1
-rwxrwxrwx 1 student devops 0 Nov 25 10:00 file1
```

3. Set permissions to 700 (rwx for user only):
   chmod 700 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 700 file1
student@ubuntu31:~$ ls -l file1
-rwx------ 1 student devops 0 Nov 25 10:00 file1
```

4. Set permissions to 744 (rwx for user, read for group and others):
   chmod 744 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 744 file1
student@ubuntu31:~$ ls -l file1
-rwxr--r-- 1 student devops 0 Nov 25 10:00 file1
```

5. Set permissions to 640 (rw for user, r for group, none for others):
   chmod 640 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 640 file1
student@ubuntu31:~$ ls -l file1
-rw-r----- 1 student devops 0 Nov 25 10:00 file1
student@ubuntu31:~$ chmod 644 file1
```

6. Set permissions to 664 (rw for user and group, read for others):
   chmod 664 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 644 file1
student@ubuntu31:~$ ls -l file1
-rw-r--r-- 1 student devops 0 Nov 25 10:00 file1
```

7. Set permissions to 775 (rwx for user and group, read/execute for others):
   chmod 775 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 775 file1
student@ubuntu31:~$ ls -l file1
-rwxrwxr-x 1 student devops 0 Nov 25 10:00 file1
```

8. Set permissions to 750 (rwx for user, read/execute for group, none for others):
   chmod 750 file1
   ls -l file1

```
student@ubuntu31:~$ chmod 750 file1
student@ubuntu31:~$ ls -l file1
-rwxr-x--- 1 student devops 0 Nov 25 10:00 file1
```

Task 9: Practice Pipes, Pagers, Grep, and Redirects with

Steps

1. View /var/log/syslog using less (with pipe):
   sudo cat /var/log/syslog | less

```
gnu-gcc-13 (Ubuntu 13.3.0-6ubuntu2~24.04) 13.3.0, GNU ld (GNU Binutils for Ubuntu) 2.42) #71-Ubuntu SMP PREEMPT_DYNAMIC
Tue Jul 22 16:52:38 UTC 2025 (Ubuntu 6.8.0-71.71-generic 6.8.12)
2025-11-15T10:30:24.952934+00:00 ubuntu31 kernel: Command line: BOOT_IMAGE=/vmlinuz-6.8.0-71-generic root=/dev/mapper/ub
untu--vg-ubuntu--lv ro
2025-11-15T10:30:24.952937+00:00 ubuntu31 kernel: KERNEL supported cpus:
2025-11-15T10:30:24.952938+00:00 ubuntu31 kernel:   Intel GenuineIntel
2025-11-15T10:30:24.952939+00:00 ubuntu31 kernel:   AMD AuthenticAMD
2025-11-15T10:30:24.952941+00:00 ubuntu31 kernel:   Hygon HygonGenuine
2025-11-15T10:30:24.952942+00:00 ubuntu31 kernel:   Centaur CentaurHauls
2025-11-15T10:30:24.952948+00:00 ubuntu31 kernel:   zhaoxin   Shanghai
2025-11-15T10:30:24.952949+00:00 ubuntu31 kernel: Disabled fast string operations
2025-11-15T10:30:24.952950+00:00 ubuntu31 kernel: BIOS-provided physical RAM map:
2025-11-15T10:30:24.952950+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000009e7ff] usable
2025-11-15T10:30:24.952951+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x000000000009e800-0x000000000009ffff] reserved
2025-11-15T10:30:24.952952+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000000dc000-0x00000000000fffff] reserved
2025-11-15T10:30:24.952956+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x0000000000100000-0x00000000bfecffff] usable
2025-11-15T10:30:24.952957+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000bfed0000-0x00000000bfefefff] ACPI data
2025-11-15T10:30:24.952957+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000bfeff000-0x00000000bfffffff] ACPI NVS
2025-11-15T10:30:24.952958+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000bff00000-0x00000000bfffffff] usable
2025-11-15T10:30:24.952959+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000f0000000-0x00000000f7ffffff] reserved
2025-11-15T10:30:24.952959+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000fec00000-0x00000000fec0ffff] reserved
2025-11-15T10:30:24.952960+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000fee00000-0x00000000fee00fff] reserved
2025-11-15T10:30:24.952964+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000fffe0000-0x00000000ffffffff] reserved
2025-11-15T10:30:24.952965+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x0000000100000000-0x000000013fffffff] usable
2025-11-15T10:30:24.952965+00:00 ubuntu31 kernel: NX (Execute Disable) protection: active
2025-11-15T10:30:24.952966+00:00 ubuntu31 kernel: APIC: Static calls initialized
2025-11-15T10:30:24.952966+00:00 ubuntu31 kernel: SMBIOS 2.7 present.
2025-11-15T10:30:24.952967+00:00 ubuntu31 kernel: DMI: VMware, Inc. VMware Virtual Platform/440BX Desktop Reference Plat
form, BIOS 6.00 11/12/2020
```

2. View /var/log/syslog using more (with pipe):
   sudo cat /var/log/syslog | more

```
gnu-gcc-13 (Ubuntu 13.3.0-6ubuntu2~24.04) 13.3.0, GNU ld (GNU Binutils for Ubuntu) 2.42) #71-Ubuntu SMP PREEMPT_DYNAMIC
Tue Jul 22 16:52:38 UTC 2025 (Ubuntu 6.8.0-71.71-generic 6.8.12)
2025-11-15T10:30:24.952934+00:00 ubuntu31 kernel: Command line: BOOT_IMAGE=/vmlinuz-6.8.0-71-generic root=/dev/mapper/ub
untu--vg-ubuntu--lv ro
2025-11-15T10:30:24.952937+00:00 ubuntu31 kernel: KERNEL supported cpus:
2025-11-15T10:30:24.952938+00:00 ubuntu31 kernel:   Intel GenuineIntel
2025-11-15T10:30:24.952939+00:00 ubuntu31 kernel:   AMD AuthenticAMD
2025-11-15T10:30:24.952941+00:00 ubuntu31 kernel:   Hygon HygonGenuine
2025-11-15T10:30:24.952942+00:00 ubuntu31 kernel:   Centaur CentaurHauls
2025-11-15T10:30:24.952948+00:00 ubuntu31 kernel:   zhaoxin   Shanghai
2025-11-15T10:30:24.952949+00:00 ubuntu31 kernel: Disabled fast string operations
2025-11-15T10:30:24.952950+00:00 ubuntu31 kernel: BIOS-provided physical RAM map:
2025-11-15T10:30:24.952950+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000009e7ff] usable
2025-11-15T10:30:24.952951+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x000000000009e800-0x000000000009ffff] reserved
2025-11-15T10:30:24.952952+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000000dc000-0x00000000000fffff] reserved
2025-11-15T10:30:24.952956+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x0000000000100000-0x00000000bfecffff] usable
2025-11-15T10:30:24.952957+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000bfed0000-0x00000000bfefefff] ACPI data
2025-11-15T10:30:24.952957+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000bfeff000-0x00000000bfefffff] ACPI NVS
2025-11-15T10:30:24.952958+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000bff00000-0x00000000bfffffff] usable
2025-11-15T10:30:24.952959+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000f0000000-0x00000000f7ffffff] reserved
2025-11-15T10:30:24.952959+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000fec00000-0x00000000fec0ffff] reserved
2025-11-15T10:30:24.952960+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000fee00000-0x00000000fee00fff] reserved
2025-11-15T10:30:24.952964+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x00000000fffe0000-0x00000000ffffffff] reserved
2025-11-15T10:30:24.952965+00:00 ubuntu31 kernel: BIOS-e820: [mem 0x0000000100000000-0x000000013fffffff] usable
2025-11-15T10:30:24.952965+00:00 ubuntu31 kernel: NX (Execute Disable) protection: active
2025-11-15T10:30:24.952966+00:00 ubuntu31 kernel: APIC: Static calls initialized
2025-11-15T10:30:24.952966+00:00 ubuntu31 kernel: SMBIOS 2.7 present.
2025-11-15T10:30:24.952967+00:00 ubuntu31 kernel: DMI: VMware, Inc. VMware Virtual Platform/440BX Desktop Reference Plat
form, BIOS 6.00 11/12/2020
--More--
```

3. Search for log entries containing “fail” or “error”:
   sudo grep -E 'fail|error' /var/log/syslog | head

```
komal_31@ubuntu31:~$ sudo grep -E 'fail|error' /var/log/syslog | head
2025-11-15T10:30:24.961683+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.961815+00:00 ubuntu31 multipath: sda: failed to get sysfs uid: No such file or directory
2025-11-15T10:30:24.961821+00:00 ubuntu31 multipath: sda: failed to get sgio uid: No such file or directory
2025-11-15T10:30:24.961829+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.961835+00:00 ubuntu31 multipathd[487]: sda: failed to get path uid
2025-11-15T10:30:24.961840+00:00 ubuntu31 multipathd[487]: uevent trigger error
2025-11-15T10:30:24.967631+00:00 ubuntu31 multipath: sda: failed to get sysfs uid: No such file or directory
2025-11-15T10:30:24.967638+00:00 ubuntu31 multipath: sda: failed to get sgio uid: No such file or directory
2025-11-15T10:30:24.967647+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.967653+00:00 ubuntu31 multipathd[487]: sda: failed to get path uid
```

4. Redirect search results to a new file (overwrite mode):
   sudo grep -i systemd /var/log/syslog > ~/syslog_systemd.txt

```
komal_31@ubuntu31:~$ sudo grep -i systemd /var/log/syslog > ~/syslog_systemd.txt
```

5. Append additional search results to the same file:
   sudo grep -i network /var/log/syslog >> ~/syslog_systemd.txt
   cat ~/syslog_systemd.txt

```
2025-11-25T10:40:32.096349+00:00 ubuntu31 systemd[1]: sysstat-collect.service: Deactivated successfully.
2025-11-25T10:40:32.096642+00:00 ubuntu31 systemd[1]: Finished sysstat-collect.service - system activity accounting tool
.
2025-11-25T10:40:39.733745+00:00 ubuntu31 dbus-daemon[875]: [system] Activating via systemd: service name='org.freedeskt
op.nm_dispatcher' unit='dbus-org.freedesktop.nm-dispatcher.service' requested by ':1.9' (uid=0 pid=920 comm="/usr/sbin/N
etworkManager --no-daemon" label="unconfined")
2025-11-25T10:40:39.753624+00:00 ubuntu31 systemd[1]: Starting NetworkManager-dispatcher.service - Network Manager Scrip
t Dispatcher Service...
2025-11-25T10:40:39.790873+00:00 ubuntu31 systemd[1]: Started NetworkManager-dispatcher.service - Network Manager Script
 Dispatcher Service.
2025-11-25T10:40:49.807195+00:00 ubuntu31 systemd[1]: NetworkManager-dispatcher.service: Deactivated successfully.
2025-11-25T10:50:08.609440+00:00 ubuntu31 systemd[1]: Starting sysstat-collect.service - system activity accounting tool
...
2025-11-25T10:50:08.728445+00:00 ubuntu31 systemd[1]: sysstat-collect.service: Deactivated successfully.
2025-11-25T10:50:08.731477+00:00 ubuntu31 systemd[1]: Finished sysstat-collect.service - system activity accounting tool
.
2025-11-25T10:55:39.777539+00:00 ubuntu31 dbus-daemon[875]: [system] Activating via systemd: service name='org.freedeskt
op.nm_dispatcher' unit='dbus-org.freedesktop.nm-dispatcher.service' requested by ':1.9' (uid=0 pid=920 comm="/usr/sbin/N
etworkManager --no-daemon" label="unconfined")
2025-11-25T10:55:39.809584+00:00 ubuntu31 systemd[1]: Starting NetworkManager-dispatcher.service - Network Manager Scrip
t Dispatcher Service...
2025-11-25T10:55:39.864695+00:00 ubuntu31 systemd[1]: Started NetworkManager-dispatcher.service - Network Manager Script
 Dispatcher Service.
2025-11-25T10:55:49.877832+00:00 ubuntu31 systemd[1]: NetworkManager-dispatcher.service: Deactivated successfully.
komal_31@ubuntu31:~$
```

6. (Alternative) Use journalctl to explore logs:
   sudo journalctl | less
   sudo journalctl -u systemd | grep -i error > ~/journal_errors.txt

```
komal_31@ubuntu31:~$ sudo journalctl | less
Nov 25 09:47:26 ubuntu31 sudo[5847]: komal_31 : TTY=pts/0 ; PWD=/home/komal_31 ; USER=root ; COMMAND=/usr/sbin/adduser
tudent
Nov 25 09:47:26 ubuntu31 sudo[5847]: pam_unix(sudo:session): session opened for user root(uid=0) by komal_31(uid=1000)
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: file '/var/log/auth.log'[9] write error - see https://www.rsyslog.com/solving-
yslog-write-errors/ for help OS error: No space left on device [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: action 'action-2-builtin:omfile' (module 'builtin:omfile') message lost, could
ot be processed. Check for additional error messages before this one. [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: file '/var/log/syslog'[7] write error - see https://www.rsyslog.com/solving-rs
log-write-errors/ for help OS error: No space left on device [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: action 'action-3-builtin:omfile' (module 'builtin:omfile') message lost, could
ot be processed. Check for additional error messages before this one. [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: file '/var/log/syslog'[7] write error - see https://www.rsyslog.com/solving-rs
log-write-errors/ for help OS error: No space left on device [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: action 'action-3-builtin:omfile' (module 'builtin:omfile') message lost, could
ot be processed. Check for additional error messages before this one. [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: file '/var/log/syslog'[7] write error - see https://www.rsyslog.com/solving-rs
log-write-errors/ for help OS error: No space left on device [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: action 'action-3-builtin:omfile' (module 'builtin:omfile') message lost, could
ot be processed. Check for additional error messages before this one. [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: file '/var/log/syslog'[7] write error - see https://www.rsyslog.com/solving-rs
log-write-errors/ for help OS error: No space left on device [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: action 'action-3-builtin:omfile' (module 'builtin:omfile') message lost, could
ot be processed. Check for additional error messages before this one. [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: file '/var/log/syslog'[7] write error - see https://www.rsyslog.com/solving-rs
log-write-errors/ for help OS error: No space left on device [v8.2312.0 try https://www.rsyslog.com/e/2027 ]
Nov 25 09:47:26 ubuntu31 rsyslogd[998]: action 'action-3-builtin:omfile' (module 'builtin:omfile') message lost, could
:
```

```
komal_31@ubuntu31:~$ sudo journalctl -u systemd | grep -i error > ~/journal_errors.txt
```

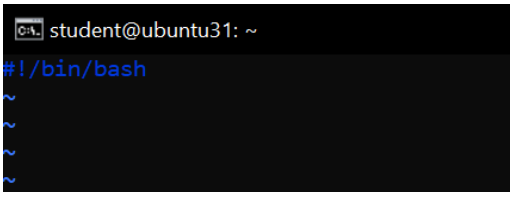
Task 10: Bash Script: setup.sh (Variables, Command Substitution, File/Dir Checks, Permissions)

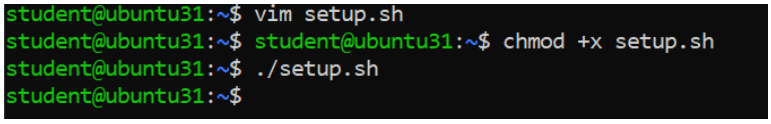
1. Add Bash Shebang

Code added:

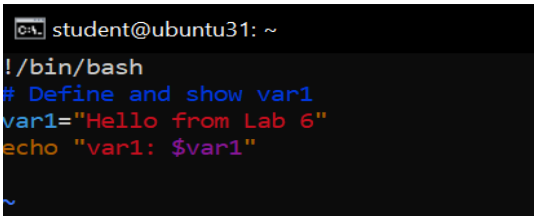
#!/bin/bash

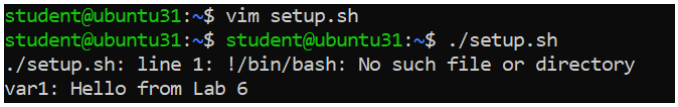
- Opened vim: vim setup.sh
- Inserted the shebang line, saved and quit (:wq).
- Made the script executable and ran it:
  chmod +x setup.sh
  ./setup.sh



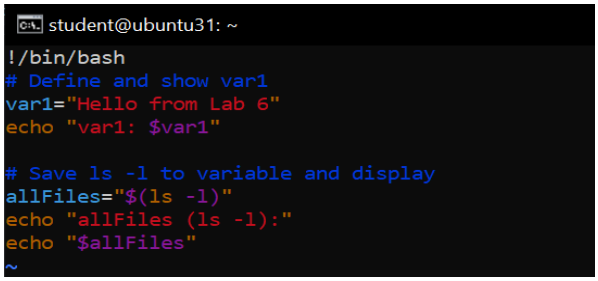


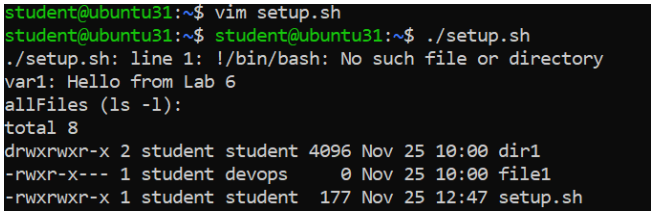
2. Define and Display a Variable





3. Command Substitution: Save and Display ls -l





4. Directory Check and Creation

```
# Directory check
 if [ -d "dir1" ]; then
   echo "Directory dir1 exists."
 else
   echo "Directory dir1 does not exist. Creating..."
   mkdir -p "dir1"
   echo "Directory dir1 created."
 fi
```

```
student@ubuntu31:~$ student@ubuntu31:~$ ./setup.sh
./setup.sh: line 1: !/bin/bash: No such file or directory
var1: Hello from Lab 6
allFiles (ls -l):
total 8
drwxrwxr-x 2 student student 4096 Nov 25 10:00 dir1
-rwxr-x--- 1 student devops     0 Nov 25 10:00 file1
-rwxrwxr-x 1 student student  371 Nov 25 12:50 setup.sh
Directory dir1 exists.
```

5. File Check and Creation

```
# File check
 if [ -f "dir1/file2" ]; then
    echo "file2 already exists."
 else
    echo "file2 does not exist. Creating..."
    touch "dir1/file2"
    chmod a-rwx "dir1/file2"
    echo "file2 created."
 fi
```

```
student@ubuntu31:~$ student@ubuntu31:~$ ./setup.sh
./setup.sh: line 1: !/bin/bash: No such file or directory
var1: Hello from Lab 6
allFiles (ls -l):
total 8
drwxrwxr-x 2 student student 4096 Nov 25 10:00 dir1
-rwxr-x--- 1 student devops     0 Nov 25 10:00 file1
-rwxrwxr-x 1 student student  580 Nov 25 12:54 setup.sh
Directory dir1 exists.
file2 already exists.
```

6. Permission Check and Adjustment

```
# Permission checks for dir1/file2 (user permissions)
f="dir1/file2"
if [ ! -r "$f" ]; then
   echo "Read permission missing; granting to user..."
   chmod u+r "$f"
fi

if [ ! -w "$f" ]; then
   echo "Write permission missing; granting to user..."
   chmod u+w "$f"
fi

if [ ! -x "$f" ]; then
   echo "Execute permission missing; granting to user..."
   chmod u+x "$f"
fi

echo "Final permissions for $f:"
ls -l "$f"
```

```
student@ubuntu31:~$ student@ubuntu31:~$ ./setup.sh
./setup.sh: line 1: !/bin/bash: No such file or directory
var1: Hello from Lab 6
allFiles (ls -l):
total 8
drwxrwxr-x 2 student student 4096 Nov 25 10:00 dir1
-rwxr-x--- 1 student devops     0 Nov 25 10:00 file1
-rwxrwxr-x 1 student student 1017 Nov 25 12:57 setup.sh
Directory dir1 exists.
file2 already exists.
Execute permission missing; granting to user...
Final permissions for dir1/file2:
-rwxrw-r-- 1 student student 0 Nov 25 10:00 dir1/file2
```

Task 11: Script setup.sh – Argument Comparisons and String Checks

1. Shebang, Variable Setup

```
#!/bin/bash
num=$1
str=$2
```

```
student@ubuntu31:~$ chmod +x setup.sh
student@ubuntu31:~$ ./setup.sh 10 Student
```

2. Numeric Equal (-eq)

```
if [ "$num" -eq 10 ]; then
  echo "$num is equal to 10 (-eq)."
else
  echo "$num is NOT equal to 10 (-eq)."
fi
```

```
student@ubuntu31:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
student@ubuntu31:~$ ./setup.sh 7 Student
7 is NOT equal to 10 (-eq).
```

3. Numeric Not Equal (-ne)

```
if [ "$num" -ne 10 ]; then
   echo "$num is not equal to 10 (-ne)."
else
   echo "$num is equal to 10 (-ne false)."
fi
```

```
student@ubuntu31:~$ ./setup.sh 7 Student
7 is NOT equal to 10 (-eq).
7 is not equal to 10 (-ne).
student@ubuntu31:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
10 is equal to 10 (-ne false).
```

4. Greater Than (-gt)

```
if [ "$num" -gt 10 ]; then
   echo "$num is greater than 10 (-gt)."
else
   echo "$num is NOT greater than 10 (-gt)."
fi
```

```
student@ubuntu31:~$ ./setup.sh 12 Student
12 is NOT equal to 10 (-eq).
12 is not equal to 10 (-ne).
12 is greater than 10 (-gt).
student@ubuntu31:~$ ./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).
```

5. Less Than (-lt)

```
if [ "$num" -lt 10 ]; then
   echo "$num is less than 10 (-lt)."
else
   echo "$num is NOT less than 10 (-lt)."
fi
```

```
student@ubuntu31:~$ ./setup.sh 5 Student
5 is NOT equal to 10 (-eq).
5 is not equal to 10 (-ne).
5 is NOT greater than 10 (-gt).
5 is less than 10 (-lt).
student@ubuntu31:~$ ./setup.sh 11 Student
11 is NOT equal to 10 (-eq).
11 is not equal to 10 (-ne).
11 is greater than 10 (-gt).
11 is NOT less than 10 (-lt).
```

6. Greater Than or Equal (-ge)

```
if [ "$num" -ge 10 ]; then
   echo "$num is greater than or equal to 10 (-ge)."
else
   echo "$num is NOT greater than or equal to 10 (-ge)."
fi
```

```
student@ubuntu31:~$ ./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).
student@ubuntu31:~$ ./setup.sh 8 Student
8 is NOT equal to 10 (-eq).
8 is not equal to 10 (-ne).
8 is NOT greater than 10 (-gt).
8 is less than 10 (-lt).
8 is NOT greater than or equal to 10 (-ge).
```

7. Less Than or Equal (-le)

```
if [ "$num" -le 10 ]; then
   echo "$num is less than or equal to 10 (-le)."
else
   echo "$num is NOT less than or equal to 10 (-le)."
fi
```

```
student@ubuntu31:~$ ./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).
student@ubuntu31:~$ ./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).
```

8. String Equality (=)

```
if [ "$str" = "Student" ]; then
   echo "Second argument equals 'Student' ( = )."
else
   echo "Second argument does NOT equal 'Student' ( = )."
fi
```

```
student@ubuntu31:~$ ./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).
Second argument equals 'Student' ( = ).
student@ubuntu31:~$ ./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' ( = ).
```

9. String Inequality (!=)

```
if [ "$str" != "Student" ]; then
   echo "Second argument is not equal to 'Student' ( != )."
else
   echo "Second argument equals 'Student' ( != false)."
fi
```

```
student@ubuntu31:~$ ./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' ( != ).
student@ubuntu31:~$ ./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).
Second argument equals 'Student' ( = ).
Second argument equals 'Student' ( != false).
```

10. String Zero-Length (-z)

```
if [ -z "$str" ]; then
   echo "Second argument is empty (zero-length)."
else
   echo "Second argument is not empty."
fi
```

```
student@ubuntu31:~$ ./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).
student@ubuntu31:~$ ./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).
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. Shebang and Comment

```
#!/bin/bash
# Script to demonstrate printing all user-entered arguments using $*
```

```
student@ubuntu31:~$ ./setup.sh
student@ubuntu31:~$
```

2. Append the For Loop Using $*

```
# Print all arguments using $*
echo "Printing all arguments using \$*:"
 for arg in $*; do
    echo "Argument: $arg"
 done
~
```

```
student@ubuntu31:~$ chmod +x setup.sh
student@ubuntu31:~$ ./setup.sh one "two words" three
Printing all arguments using $*:
Argument: one
Argument: two
Argument: words
Argument: three
```

Task 13: Script setup.sh – While Loop Summation and Functions

1. Shebang Line

```
#!/bin/bash
~
~
```

```
student@ubuntu31:~$ chmod +x setup.sh
student@ubuntu31:~$ ./setup.sh
```

2. Interactive While Loop Summation

```
# 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"
```

```
student@ubuntu31:~$ ./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
```

3. Function sum_two() (Interactive Loop Inside a Function)

```
# Function to accumulate scores interactively
 sum_two() {
   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 "Function final total: $sum"
  }

# Demonstrate the function
  echo "Now calling sum_two function:"
  sum_two
```

```
student@ubuntu31:~$ ./setup.sh
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): 7
Total Score: 14
Enter a number (or 'q' to quit): q
Function final total: 14
```

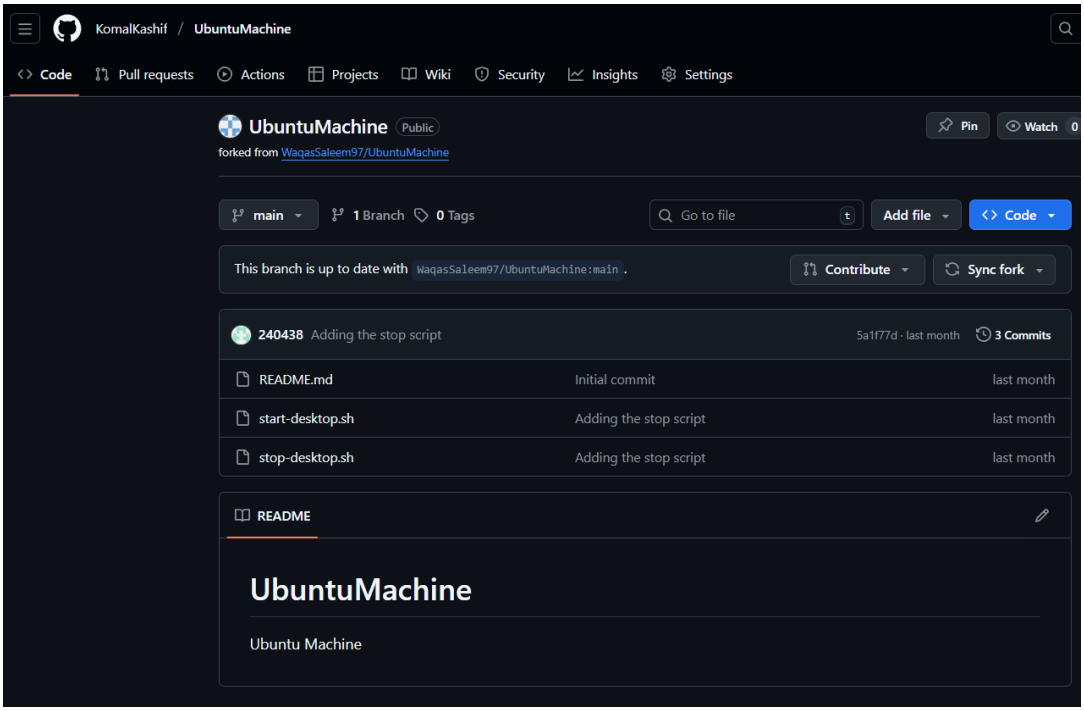
4. Function sum_args() (Two Arguments Summation)

```
# Function that sums two arguments and returns the result
  sum_args() {
    a=$1
    b=$2
    return $((a + b))
   }

# Demonstrate sum_args function
  echo "Now demonstrating sum_args function:"
  sum_args 3 4
  result=$?
  echo "sum_args(3,4) returned: $result"
```

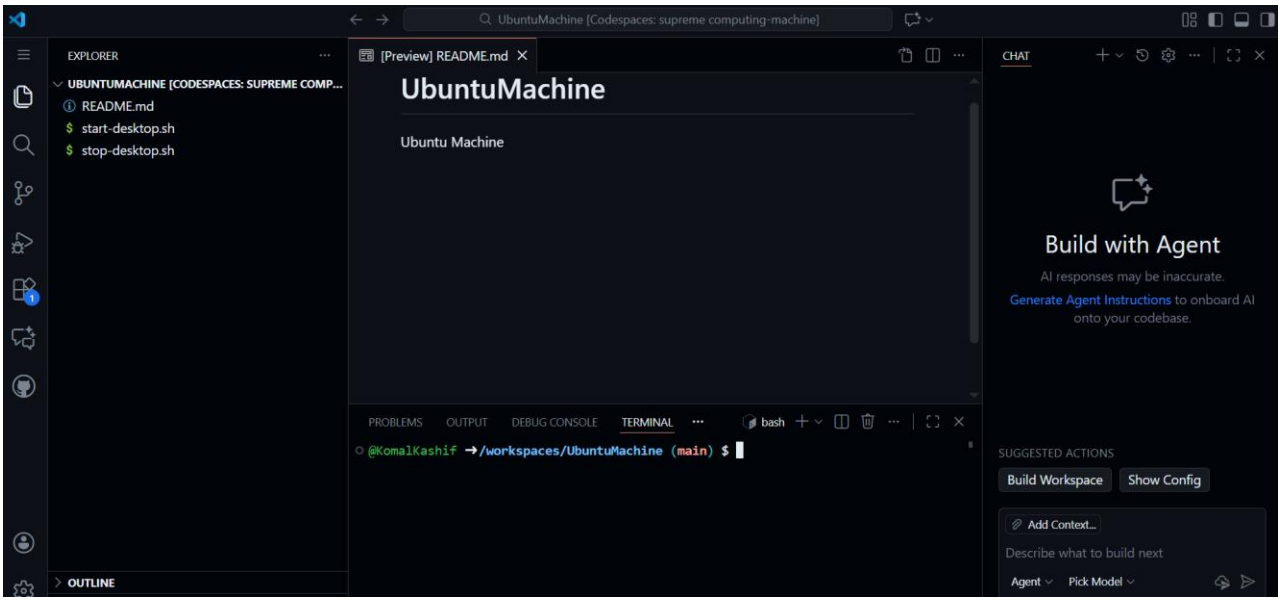
```
student@ubuntu31:~$ chmod +x setup.sh
student@ubuntu31:~$ ./setup.sh
Now demonstrating sum_args function:
sum_args(3,4) returned: 7
```

Task 14: Codespaces GUI: Fork Repo, Start GUI, Connect via VNC, Stop GUI

1. Fork the repository to your GitHub account
   - Open the repo URL in your browser.
     https://github.com/WaqasSaleem97/UbuntuMachine
   - Click **Fork** (top-right) and fork to your account.



2. Open a Codespace on your fork



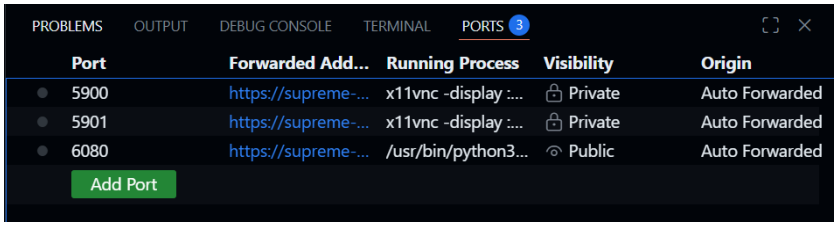
3. Verify start/stop scripts exist and are executable
   ls -l start-desktop.sh stop-desktop.sh

```
@KomalKashif ➜/workspaces/UbuntuMachine (main) $ ls -l start-desktop.sh stop-des
ktop.sh
-rwxrwxrwx 1 codespace root 1333 Nov 25 14:53 start-desktop.sh
-rwxrwxrwx 1 codespace root  428 Nov 25 14:53 stop-desktop.sh
@KomalKashif ➜/workspaces/UbuntuMachine (main) $
```

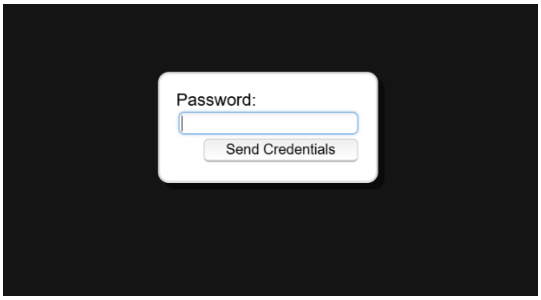
4. Run the start script to launch the GUI
   ./start-desktop.sh

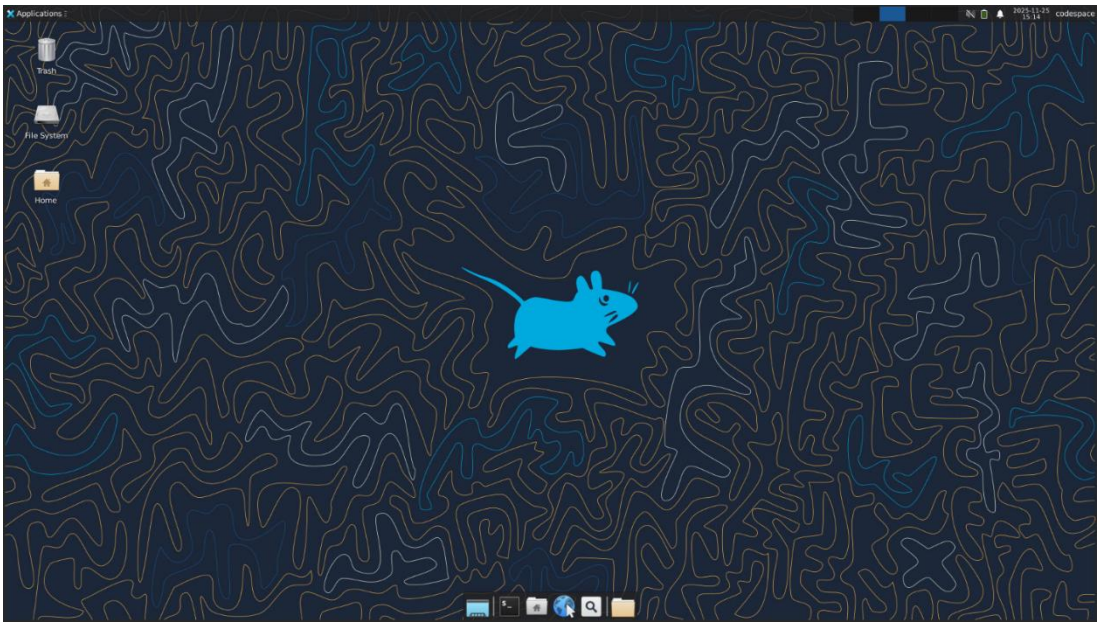
```
Navigate to this URL:

    http://codespaces-1de4e7:6080/vnc.html?host=codespaces-1de4e7&port=6080

Press Ctrl-C to exit


[✓] XFCE desktop environment is running!
 🌐 Access it via the Codespaces HTTPS port (6080)
@KomalKashif ➜/workspaces/UbuntuMachine (main) $
(xfdesktop:23027): GVFS-RemoteVolumeMonitor-WARNING **: 15:04:21.459: remote volu
me monitor with dbus name org.gtk.vfs.UDisks2VolumeMonitor is not supported
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
```

5. Verify forwarded ports in Codespaces (Ports view)
   - Open **Ports panel** and confirm port **6080** is forwarded.



6. Connect to the VNC HTML page





7. **Stop the GUI**

./stop-desktop.sh

```
@KomalKashif ➜/workspaces/UbuntuMachine (main) $ ./stop-desktop.sh
(xfce4-panel:23009): libxfce4ui-WARNING **: 15:16:52.669: ICE I/O Error

(xfce4-panel:23009): libxfce4ui-WARNING **: 15:16:52.674: Disconnected from sessi
on manager.

** (xfce4-power-manager:23053): WARNING **: 15:16:52.690: Error: The connection i
s closed


** (xfce4-power-manager:23053): WARNING **: 15:16:52.690: Error: The connection i
s closed


(Thunar:23017): thunar-WARNING **: 15:16:52.691: Name 'org.xfce.FileManager' lost
 on the message dbus.

(Thunar:23017): thunar-WARNING **: 15:16:52.691: Name 'org.freedesktop.FileManage
r1' lost on the message dbus.
xfsettingsd: Another instance took over. Leaving...
[✓] All services stopped.
```

Exam Evaluation Questions

1. Group Management and Membership

Scenario: Create groups and manage a user's primary and supplementary group memberships.

1. Create groups g1, g2, and g3

```
komal_31@ubuntu31:~$ sudo groupadd g1
[sudo] password for komal_31:
komal_31@ubuntu31:~$ sudo groupadd g2
komal_31@ubuntu31:~$ sudo groupadd g3
komal_31@ubuntu31:~$ cat /etc/group
g1:x:1006:
g2:x:1007:
g3:x:1008:
```

2. Change examuser's primary group and add supplementary groups
   - Primary: g3
   - Supplementary: g1, g2

```
komal_31@ubuntu31:~$ sudo useradd -m examuser
komal_31@ubuntu31:~$ sudo passwd examuser
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
komal_31@ubuntu31:~$ id examuser
uid=1006(examuser) gid=1009(examuser) groups=1009(examuser)
komal_31@ubuntu31:~$ sudo usermod -g g3 examuser
komal_31@ubuntu31:~$ sudo usermod -aG g1,g2 examuser
```

3. Verify group changes
    - Show id examuser and relevant /etc/group lines

```
komal_31@ubuntu31:~$ id examuser
uid=1006(examuser) gid=1008(g3) groups=1008(g3),1006(g1),1007(g2)
komal_31@ubuntu31:~$ grep 'g1\|g2\|g3' /etc/group
g1:x:1006:examuser
g2:x:1007:examuser
g3:x:1008:
```

2. Ownership and Permission Tasks

Scenario: Demonstrate ownership changes and apply symbolic and numeric permission changes.

1. Create file and change ownership

```
komal_31@ubuntu31:~$ mkdir -p workspace
komal_31@ubuntu31:~$ touch workspace/secret.txt
komal_31@ubuntu31:~$ sudo chown examuser workspace/secret.txt
komal_31@ubuntu31:~$ sudo chgrp g1 workspace/secret.txt
komal_31@ubuntu31:~$ ls -l workspace/secret.txt
-rw-rw-r-- 1 examuser g1 0 Nov 25 15:41 workspace/secret.txt
```

2. Remove group/other permissions
    - Symbolic: chmod go-rwx workspace/secret.txt
    - Numeric: chmod 700 workspace/secret.txt

```
komal_31@ubuntu31:~$ sudo chmod go-rwx workspace/secret.txt
komal_31@ubuntu31:~$ sudo chmod 600 workspace/secret.txt
```

3. Show final permissions
   ls -l workspace/secret.txt

```
komal_31@ubuntu31:~$ ls -l workspace/secret.txt
-rw------- 1 examuser g1 0 Nov 25 15:41 workspace/secret.txt
```

3. Pipes, Grep, and Redirection Practice

Scenario: Filter system logs and save results using redirection and piping.

1. **Grep for "error" or "fail" and show first 20 lines**
   grep -E 'error|fail' /var/log/syslog | head -n 20

```
komal_31@ubuntu31:~$ grep -i -E "error|fail" /var/log/syslog | head -n 20
2025-11-15T10:30:24.961683+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.961815+00:00 ubuntu31 multipath: sda: failed to get sysfs uid: No such file or directory
2025-11-15T10:30:24.961821+00:00 ubuntu31 multipath: sda: failed to get sgio uid: No such file or directory
2025-11-15T10:30:24.961829+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.961835+00:00 ubuntu31 multipathd[487]: sda: failed to get path uid
2025-11-15T10:30:24.961840+00:00 ubuntu31 multipathd[487]: uevent trigger error
2025-11-15T10:30:24.967631+00:00 ubuntu31 multipath: sda: failed to get sysfs uid: No such file or directory
2025-11-15T10:30:24.967638+00:00 ubuntu31 multipath: sda: failed to get sgio uid: No such file or directory
2025-11-15T10:30:24.967647+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.967653+00:00 ubuntu31 multipathd[487]: sda: failed to get path uid
2025-11-15T10:30:24.967659+00:00 ubuntu31 multipathd[487]: uevent trigger error
2025-11-15T10:30:24.972828+00:00 ubuntu31 kernel: ACPI: _OSC evaluation for CPUs failed, trying _PDC
2025-11-15T10:30:24.984747+00:00 ubuntu31 kernel: pci 0000:00:15.3: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984756+00:00 ubuntu31 kernel: pci 0000:00:15.4: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984757+00:00 ubuntu31 kernel: pci 0000:00:15.5: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984758+00:00 ubuntu31 kernel: pci 0000:00:15.6: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984759+00:00 ubuntu31 kernel: pci 0000:00:15.7: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984760+00:00 ubuntu31 kernel: pci 0000:00:16.3: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984761+00:00 ubuntu31 kernel: pci 0000:00:16.4: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984761+00:00 ubuntu31 kernel: pci 0000:00:16.5: bridge window [io  size 0x1000]: failed to assign
```

2. Save filtered results to a file
   grep -E 'error|fail' /var/log/syslog > ~/logs/errors.txt
   grep -E 'warning|fail' /var/log/syslog >> ~/logs/errors.txt

```
komal_31@ubuntu31:~$ mkdir -p ~/logs
komal_31@ubuntu31:~$ grep -i -E "error|fail" /var/log/syslog > ~/logs/errors.txt
komal_31@ubuntu31:~$ grep -i -E "warning|fail" /var/log/syslog > ~/logs/errors.txt
```

3. View the saved file using a pager
   less ~/logs/errors.txt

```
2025-11-15T10:30:24.961815+00:00 ubuntu31 multipath: sda: failed to get sysfs uid: No such file or directory
2025-11-15T10:30:24.961821+00:00 ubuntu31 multipath: sda: failed to get sgio uid: No such file or directory
2025-11-15T10:30:24.961829+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.961835+00:00 ubuntu31 multipathd[487]: sda: failed to get path uid
2025-11-15T10:30:24.967631+00:00 ubuntu31 multipath: sda: failed to get sysfs uid: No such file or directory
2025-11-15T10:30:24.967638+00:00 ubuntu31 multipath: sda: failed to get sgio uid: No such file or directory
2025-11-15T10:30:24.967647+00:00 ubuntu31 multipathd[487]: sda: failed to get udev uid: No data available
2025-11-15T10:30:24.967653+00:00 ubuntu31 multipathd[487]: sda: failed to get path uid
2025-11-15T10:30:24.972828+00:00 ubuntu31 kernel: ACPI: _OSC evaluation for CPUs failed, trying _PDC
2025-11-15T10:30:24.984747+00:00 ubuntu31 kernel: pci 0000:00:15.3: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984756+00:00 ubuntu31 kernel: pci 0000:00:15.4: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984757+00:00 ubuntu31 kernel: pci 0000:00:15.5: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984758+00:00 ubuntu31 kernel: pci 0000:00:15.6: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984759+00:00 ubuntu31 kernel: pci 0000:00:15.7: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984760+00:00 ubuntu31 kernel: pci 0000:00:16.3: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984761+00:00 ubuntu31 kernel: pci 0000:00:16.4: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984761+00:00 ubuntu31 kernel: pci 0000:00:16.5: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984762+00:00 ubuntu31 kernel: pci 0000:00:16.6: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984763+00:00 ubuntu31 kernel: pci 0000:00:16.7: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984764+00:00 ubuntu31 kernel: pci 0000:00:17.3: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984764+00:00 ubuntu31 kernel: pci 0000:00:17.4: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984765+00:00 ubuntu31 kernel: pci 0000:00:17.5: bridge window [io  size 0x1000]: failed to assign
2025-11-15T10:30:24.984766+00:00 ubuntu31 kernel: pci 0000:00:17.6: bridge window [io  size 0x1000]: failed to assign
/home/komal_31/logs/errors.txt
```

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

Scenario: Build and run a script incrementally demonstrating variables, command substitution, and filesystem checks.

1. Create setup.sh with shebang and variable var1

```
#!/bin/bash


var1="Hello from var1"
echo "Value of var1: $var1"
```

```
komal_31@ubuntu31:~$ chmod +x setup.sh
komal_31@ubuntu31:~$ ./setup.sh
Value of var1: Hello from var1
```

2. Append command substitution storing ls -l output

```
komal_31@ubuntu31:~$ ./setup.sh
Value of var1: Hello from var1
Listing all files:
total 420288
-rw-rw-r-- 1 komal_31 komal_31       408 Nov 15 11:33 apt_update_vs_upgrade.md
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Desktop
-rw-rw-r-- 1 komal_31 komal_31 429404404 Nov 24 11:26 docker-desktop-amd64.deb
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Documents
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Downloads
-rw-rw-r-- 1 komal_31 komal_31         0 Nov 25 11:03 journal_errors.txt
drwxrwxr-x 2 komal_31 komal_31      4096 Nov 24 21:49 Lab5
drwxrwxr-x 2 komal_31 komal_31      4096 Nov 25 15:59 logs
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Music
-rw-rw-r-- 1 komal_31 komal_31       640 Nov 24 13:11 packages.microsoft.gpg
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Pictures
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Public
-rwxrwxr-x 1 komal_31 komal_31       128 Nov 25 16:07 setup.sh
drwx------ 3 komal_31 komal_31      4096 Nov 24 19:47 snap
-rw-rw-r-- 1 komal_31 komal_31    897156 Nov 25 10:59 syslog_systemd.txt
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Templates
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Videos
drwxrwxr-x 2 komal_31 komal_31      4096 Nov 25 15:41 workspace
```

3. Append directory/file checks for dir1 and dir1/file2

```
komal_31@ubuntu31:~$ ./setup.sh
Value of var1: Hello from var1
Listing all files:
total 420288
-rw-rw-r-- 1 komal_31 komal_31       408 Nov 15 11:33 apt_update_vs_upgrade.md
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Desktop
-rw-rw-r-- 1 komal_31 komal_31 429404404 Nov 24 11:26 docker-desktop-amd64.deb
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Documents
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Downloads
-rw-rw-r-- 1 komal_31 komal_31         0 Nov 25 11:03 journal_errors.txt
drwxrwxr-x 2 komal_31 komal_31      4096 Nov 24 21:49 Lab5
drwxrwxr-x 2 komal_31 komal_31      4096 Nov 25 15:59 logs
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Music
-rw-rw-r-- 1 komal_31 komal_31       640 Nov 24 13:11 packages.microsoft.gpg
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Pictures
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Public
-rwxrwxr-x 1 komal_31 komal_31       535 Nov 25 16:09 setup.sh
drwx------ 3 komal_31 komal_31      4096 Nov 24 19:47 snap
-rw-rw-r-- 1 komal_31 komal_31    897156 Nov 25 10:59 syslog_systemd.txt
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Templates
drwxr-xr-x 2 komal_31 komal_31      4096 Nov 24 12:45 Videos
drwxrwxr-x 2 komal_31 komal_31      4096 Nov 25 15:41 workspace
dir1 does not exist — creating it.
file2 does not exist — creating it.
Final permissions:
drwxrwxr-x 2 komal_31 komal_31 4096 Nov 25 16:09 dir1
-rw-rw-r-- 1 komal_31 komal_31 0 Nov 25 16:09 dir1/file2
```

5. Script: Comparisons and String Tests

Scenario: Incrementally add numeric and string comparison tests and show both true/false cases.

1. **Overwrite setup.sh to set num=$1 and str=$2; add -eq test**

```
num=$1
str=$2

echo "Number: $num"
echo "String: $str"

echo "--- EQ Test ---"
if [ "$num" -eq 5 ]; then
    echo "num == 5 (TRUE)"
else
    echo "num != 5 (FALSE)"
 fi
```

```
komal_31@ubuntu31:~$ ./setup.sh 5 hello
Number: 5
String: hello
--- EQ Test ---
num == 5 (TRUE)
komal_31@ubuntu31:~$ ./setup.sh 3 hello
Number: 3
String: hello
--- EQ Test ---
num != 5 (FALSE)
```

2. Append numeric tests: -ne, -gt, -lt, -ge, -l

```
# -ne
   if [ "$num" -ne 10 ]; then
      echo "num != 10 (TRUE)"
   else
      echo "num == 10 (FALSE)"
   fi

# -gt
   if [ "$num" -gt 5 ]; then
      echo "num > 5 (TRUE)"
   else
      echo "num > 5 (FALSE)"
   fi

# -lt
   if [ "$num" -lt 5 ]; then
      echo "num < 5 (TRUE)"
   else
      echo "num < 5 (FALSE)"
   fi

# -ge
   if [ "$num" -ge 5 ]; then
      echo "num >= 5 (TRUE)"
   else
      echo "num >= 5 (FALSE)"
   fi

# -le
   if [ "$num" -le 5 ]; then
      echo "num <= 5 (TRUE)"
   else
      echo "num > 5 (FALSE)"
   fi
```

```
komal_31@ubuntu31:~$ ./setup.sh 10 abc
Number: 10
String: abc
--- EQ Test ---
num != 5 (FALSE)
--- Other Numeric Tests ---
num == 10 (FALSE)
num > 5 (TRUE)
num < 5 (FALSE)
num >= 5 (TRUE)
num > 5 (FALSE)
```

3. Append string tests: equality (=), inequality (!=), zero-length (-z)

```
# equality test
if [ "$str" = "hello" ]; then
        echo "str == hello (TRUE)"
    else
        echo "str != hello (FALSE)"
fi

# inequality test
if [ "$str" != "bye" ]; then
        echo "str != bye (TRUE)"
    else
        echo "str == bye (FALSE)"
fi

# zero-length test
if [ -z "$str" ]; then
        echo "str is EMPTY (TRUE)"
    else
        echo "str is NOT empty (FALSE)"
fi
```

```
komal_31@ubuntu31:~$ ./setup.sh 5 bye
Number: 5
String: bye
--- EQ Test ---
num == 5 (TRUE)
--- Other Numeric Tests ---
num != 10 (TRUE)
num > 5 (FALSE)
num < 5 (FALSE)
num >= 5 (TRUE)
num <= 5 (TRUE)
--- STRING TESTS ---
str != hello (FALSE)
str == bye (FALSE)
str is NOT empty (FALSE)
```

```
komal_31@ubuntu31:~$ ./setup.sh 5 hello
Number: 5
String: hello
--- EQ Test ---
num == 5 (TRUE)
--- Other Numeric Tests ---
num != 10 (TRUE)
num > 5 (FALSE)
num < 5 (FALSE)
num >= 5 (TRUE)
num <= 5 (TRUE)
--- STRING TESTS ---
str == hello (TRUE)
str != bye (TRUE)
str is NOT empty (FALSE)
```

```
komal_31@ubuntu31:~$ ./setup.sh 5 ""
Number: 5
String:
--- EQ Test ---
num == 5 (TRUE)
--- Other Numeric Tests ---
num != 10 (TRUE)
num > 5 (FALSE)
num < 5 (FALSE)
num >= 5 (TRUE)
num <= 5 (TRUE)
--- STRING TESTS ---
str != hello (FALSE)
str != bye (TRUE)
str is EMPTY (TRUE)
```

6. Script: For Loop and Argument Handling

Scenario: Print all provided arguments and demonstrate correct handling of quoted multi-word arguments.

1. Create/overwrite setup.sh and print each argument using a for loop

```
#!/bin/bash

#Script to print all provided arguments

echo "Printing all arguments:"
for arg in "$@"; do
    echo "$arg"
done
```

2.Run script with single and quoted multi-word arguments

./setup.sh one "two words" three

```
komal_31@ubuntu31:~$ ./setup.sh apple "banana split" 'cherry tart' grape
Printing all arguments:
apple
banana split
cherry tart
grape
```

7. Script: While Loop Summation and Functions

Scenario: Implement an interactive summation function and a function returning a numeric result.

1. Interactive while-loop that accumulates numbers until q

```
# Interactive summation
  total=0
  while read -p "Enter number (q to quit): " n; do
      [[ "$n" == "q" ]] && break
      total=$((total + n))
      echo "Total: $total"
  done
```

```
komal_31@ubuntu31:~$ ./setup.sh
Enter number (q to quit): 5
Total: 5
Enter number (q to quit): 7
Total: 12
Enter number (q to quit): q
Sum of 5 and 7 is: 12
```

2. Function that sums two numeric arguments and demonstrates capturing the result

```
#!/bin/bash

#Function to sum two numbers
sum() {
            echo $(( $1 + $2 ))
    }

# Demonstrate capturing the result in a variable
num1=5
num2=7
result=$(sum "$num1" "$num2")
echo "Sum of $num1 and $num2 is: $result"
```

```
komal_31@ubuntu31:~$ ./setup.sh
Sum of 5 and 7 is: 12
```