

Cloud Computing Lab

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BSE-V B

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LAB 06

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

- task1_set_root_password.png

```
sudo: 1 incorrect password attempt
safa@safa056:~$ sudo passwd root
[sudo] password for safा:
New password:
Retype new password:
passwd: password updated successfully
safa@safa056:~$ _
```

- task1_su_root.png

```
safa@safa056:~$ su -
Password:
root@safa056:~# whoami
root
root@safa056:~# id
uid=0(root) gid=0(root) groups=0(root)
root@safa056:~# _
```

- task1_exit_to_user.png

```
uid=0(root) gid=0(root) group
root@safa056:~# exit
logout
safa@safa056:~$ whoami
safa
safa@safa056:~$
```

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

- task2_adduser_tom.png

```
safa@safa056:~$ 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:
```

- task2_verify_passwd.png

```
sun@sun056:~$ cat /etc/passwd
cups-pk-helper:x:111:111:user for cups-pk-helper service,,,:/nonexistent
lightdm:x:112:115:Light Display Manager:/var/lib/lightdm:/bin/false
whoopsie:x:113:117::/nonexistent:/bin/false
avahi:x:114:118:Avahi mDNS daemon,,,:/run/avahi-daemon:/usr/sbin/nologin
saned:x:115:120::/var/lib/saned:/usr/sbin/nologin
colord:x:116:121:colord colour management daemon,,,:/var/lib/colord:/usr
pulse:x:117:122:PulseAudio daemon,,,:/run/pulse:/usr/sbin/nologin
cups-browsed:x:118:111::/nonexistent:/usr/sbin/nologin
xrdp:x:119:124::/run/xrdp:/usr/sbin/nologin
tom:x:1001:1001:tom,11,121233,122423,1:/home/tom:/bin/bash
safa@safa056:~$
```

- task2_verify_group.png

```
avahi:x:118:
scanner:x:119:saned
saned:x:120:
colord:x:121:
pulse:x:122:
pulse-access:x:123:
xrdp:x:124:
tom:x:1001:
safa@safa056:~$
```

- task2_verify_shadow.png

```
:coloru:::20384:::::
pulse:!::20384:::::
cups-browsed:!::20384:::::
xrdp:!::20384:::::
tom:$!$j9T$uDbkuT7YE6UzUvYB3bS7f1$.uOTv9RIuGIwzPR05mhekL00UhAa190NBFuQF7wI.t4:20391:0:99999:7:::
safa@safa056:~$
```

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

- task3_groupadd.png

```
tom@tom001:
developer:x:1002:
devops:x:1003:
desigher:x:1004:
safa@safa056:~$
```

- task3_change_primary_group.png

```
root@root001:~# group desigher does not exist
safa@safa056:~$ sudo usermod -g desigher tom
safa@safa056:~$ id tom
uid=1001(tom) gid=1004(desigher) groups=1004(desigher),100(users)
safa@safa056:~$
```

- task3_add_secondary_groups.png

```
safa@safa056:~$ sudo usermod -aG developer,devops tom
safa@safa056:~$ id tom
uid=1001(tom) gid=1004(desigher) groups=1004(desigher),100(users),1002(developer),1003(devops)
safa@safa056:~$ groups tom
tom : desigher users developer devops
safa@safa056:~$
```

- task3_reset_secondary_groups.png

```
tom : desigher users developer devops
safa@safa056:~$ sudo usermod -G tom tom
safa@safa056:~$ id tom
uid=1001(tom) gid=1004(desigher) groups=1004(desigher),1001(tom)
safa@safa056:~$ groups tom
tom : desigher tom
safa@safa056:~$
```

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

- task4_add_users.png

```
safa@safa056:~$ 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:
retype new password:
asswd: password updated successfully
changing the user information for jerry
Enter the new value, or press ENTER for the default
  Full Name []: jerrykelin
  Room Number []: 6
  Work Phone []: 8798
  Home Phone []: 46587
  Other []: 7
Is the information correct? [Y/n] y
info: Adding new user `jerry' to supplemental / extra groups `users' ...
info: Adding user jerry to group users ...
safa@safa056:~$ sudo useradd scooby
safa@safa056:~$
```

- task4_scooby_su_auth_failure.png

```
safa@safa056:~$ sudo useradd scooby
safa@safa056:~$ su - scooby
Password:
su: Authentication failure
safa@safa056:~$
```

- task4_set_password_scooby.png

```
safa@safa056:~$ 
safa@safa056:~$ sudo passwd scooby
New password:
Retype new password:
passwd: password updated successfully
safa@safa056:~$ su - scooby
```

- task4_scooby_su_no_home.png

```
passwd: password updated successfully
safa@safa056:~$ su - scooby
Password:
su: warning: cannot change directory to /home/scooby: No such file or directory
safa@safa056:~$
```

- task4_scooby_no_home.png

```
com:x:1001:1004:com,ii,ic2100,ic2100,1.:/home/com:/bin/bash
Jerry:x:1005:1005:jerrykelin,6,8798,46587,7:/home/jerry:/bin/
scooby:x:1006:1006::/home/scooby:/bin/sh
safa@safa056:~$ ls -ld /home/scooby
ls: cannot access '/home/scooby': No such file or directory
safa@safa056:~$
```

- task4_scooby_create_home.png

```
safa@safa056:~$ sudo mkdir -p /home/scooby
safa@safa056:~$ sudo chown scooby:scooby /home/scooby
safa@safa056:~$ ls -ld /home/scooby
drwxr-xr-x 2 scooby scooby 4096 Oct 30 11:49 /home/scooby
safa@safa056:~$
```

- task4_scooby_login_success.png

```
* exit
safa@safa056:~$ su - scooby
Password:
$ pwd
/home/scooby
$ ls -la
total 8
drwxr-xr-x 2 scooby scooby 4096 Oct 30 11:49 .
drwxr-xr-x 6 root   root    4096 Oct 30 11:49 ..
$
```

- task4_verify_users.png

```
jerry:x:1005:1005:jerrykelin,6,8798,46587,7:/home/jerry
scooby:x:1006:1006::/home/scooby:/bin/sh
```

- task4_add_groups.png

```
safa@safa056:~$ sudo addgroup jolly
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `jolly' (GID 1007) ...
safa@safa056:~$ sudo groupadd anime
safa@safa056:~$
```

- task4_verify_groups.png

```
jerry:x:1005:
scooby:x:1006:
Jolly:x:1007:
anime:x:1008:
safa@safa056:~$
```

- task4_delete_groups.png

```
safa@safa056:~$ sudo delgroup jolly
info: Removing group `jolly' ...
safa@safa056:~$ sudo groupdel anime
safa@safa056:~$ cat /etc/group_
```

```
designer:x:1004:
jerry:x:1005:
scooby:x:1006:
safa@safa056:~$
```

- task4_delete_users.png

```
sshd:x:109:65534::/run/sshd:/usr/sbin/nologin
rtkit:x:110:110:RealtimeKit,,,:/proc:/usr/sbin/nologin
dnsmasq:x:999:65534:dnsmasq:/var/lib/misc:/usr/sbin/nologin
cups-pk-helper:x:111:111:user for cups-pk-helper service,,,:/nonexistent
lightdm:x:112:115:Light Display Manager:/var/lib/lightdm:/bin/false
whoopsie:x:113:117:/nonexistent:/bin/false
avahi:x:114:118:Avahi mDNS daemon,,,:/run/avahi-daemon:/usr/sbin/nologin
saned:x:115:120:/var/lib/saned:/usr/sbin/nologin
colord:x:116:121:colord colour management daemon,,,:/var/lib/colord:/us
pulse:x:117:122:PulseAudio daemon,,,:/run/pulse:/usr/sbin/nologin
cups-browsed:x:118:111:/nonexistent:/usr/sbin/nologin
xrpd:x:119:124:/run/xrpd:/usr/sbin/nologin
tom:x:1001:1004:tomm,11,121233,122423,1:/home/tom:/bin/bash
safa@safa056:~$
```

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

- task5_create_student.png

```
safa@safa056:~$ 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:
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 00
    Room Number []: 66
    Work Phone []: 978750
    Home Phone []: 536557978
    Other []: 4
Is the information correct? [Y/n] y
info: Adding new user `student' to supplemental / extra groups `users' ...
info: Adding user `student' to group `users' ...
safa@safa056:~$
```

- task5_create_files.png

```
Password:  
student@safa056:~$ touch file1  
student@safa056:~$ mkdir -p dir1  
student@safa056:~$ touch dir1/file2  
student@safa056:~$ ls -l  
total 4  
drwxrwxr-x 2 student student 4096 Oct 30 12:04 dir1  
-rw-rw-r-- 1 student student 0 Oct 30 12:03 file1  
student@safa056:~$
```

- task5_chown_file1.png

```
-bash: cd: /home/student: Permission denied  
safa@safa056:~$ sudo chown tom /home/student/file1  
safa@safa056:~$ ls -l file1
```

- task5_chgrp_file1.png

```
student@safa056:~$ ls -l file1  
-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1  
student@safa056:~$
```

- task5_file_types.png

```
student@safa056:~$ ls -l  
total 4  
drwxrwxr-x 2 student student 4096 Oct 30 12:04 dir1  
-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1  
student@safa056:~$ ls -l dir1  
total 0  
-rw-rw-r-- 1 student student 0 Oct 30 12:04 file2  
student@safa056:~$ ls -l /dev/null  
crw-rw-rw- 1 root root 1, 3 Oct 30 11:18 /dev/null  
student@safa056:~$ file file1 dir1 /dev/null  
file1: empty  
dir1: directory  
/dev/null: character special (1/3)  
student@safa056:~$ _
```

- task5_exit_student.png

```
safa@safa056:~$
```

Task 6 – Change permissions using symbolic mode

- task6_su_student.png

```
safa@safa056:~$ su - student  
Password:  
student@safa056:~$ cd ~  
student@safa056:~$ ls -l file1  
-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1  
student@safa056:~$ _
```

- task6_chmod_remove_rwx.png

```
@safa056:~$ sudo chmod -rwx /home/student/file1  
d: /home/student/file1: new permissions are ----w----, not -----  
@safa056:~$ ls -l file1
```

- task6_chmod_add_r.png

```
sfuqenf@sfaf056:~$  
-L-LW-L-- T foW qeavos 0 Oct 30 15:03 tTf6T  
sfuqenf@sfaf056:~$ ls -T tTf6T  
sfuqenf.
```

- task6_chmod_u_plus_x.png

```
@safa056:~$ sudo chmod u+x /home/student/file1
@safa056:~$ ls -l file1
```

- task6_chmod_ug_plus_w.png

```
@safa056:~$ sudo chmod ug+w /home/student/file1
@safa056:~$ ls -l file1
ls: cannot access 'file1': No such file or directory
```

- task6_chmod_ugo_minus_rwx.png

```
student@safa056:~$ ls -l file1
----- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

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

- task7_student_context.png

```
safa@safa056:~$ su - student
Password:
student@safa056:~$ cd ~
student@safa056:~$ ls -l file1
----- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task7_chmod_set_all_rwx.png

```
student@safa056:~$ ls -l file1
-rwxrwxrwx 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task7_remove_exec_go.png

```
student@safa056:~$ ls -l file1
-rw-rw-rw- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task7_remove_all_perms.png

```
student@safa056:~$ ls -l file1
----- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

Task 8 – Change permissions using numeric (octal) mode

- task8_student_context.png

```
safa@safa056:~$ su - student
Password:
student@safa056:~$ cd ~
student@safa056:~$ ls -l file1
----- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_777.png

```
student@safa056:~$ ls -l file1
-rwxrwxrwx 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_700.png

```
student@safa056:~$ ls -l file1
-rwx----- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_744.png

```
student@safa056:~$ ls -l file1
-rwxr--r-- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_640.png

```
student@safa056:~$ ls -l file1
-rw-r----- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_664.png

```
student@safa056:~$ ls -l file1
-rw-r--r-- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_775.png

```
student@safa056:~$ ls -l file1
-rwxr-xr-x 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

- task8_chmod_750.png

```
student@safa056:~$ ls -l file1
-rwxr-x--- 1 tom devops 0 Oct 30 12:03 file1
student@safa056:~$
```

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

- task9_grep_less.png

```
2025-10-30T11:17:32.666357+00:00 safa056 kernel: workqueue: blk_mq_run_work_fn hogged CPU for >10000us 8 times, con
switching to WQ_UNBOUND
2025-10-30T11:17:32.802616+00:00 safa056 systemd-timesyncd[15461]: Contacted time server 185.125.190.56:123 (ntp.ub
.com).
2025-10-30T11:17:33.748516+00:00 safa056 kernel: workqueue: e1000_watchdog [e1000] hogged CPU for >10000us 4 times,
ider switching to WQ_UNBOUND
2025-10-30T11:17:56.735779+00:00 safa056 systemd[1]: unattended-upgrades.service: Deactivated successfully.
2025-10-30T11:17:56.847500+00:00 safa056 systemd[1]: Stopping session-1.scope - Session 1 of User saf...
2025-10-30T11:17:56.850318+00:00 safa056 systemd[1]: Stopping session-10.scope - Session 10 of User saf...
2025-10-30T11:17:56.900539+00:00 safa056 systemd[1]: Stopping session-c1.scope - Session c1 of User saf...
2025-10-30T11:17:56.928871+00:00 safa056 systemd[1]: Removed slice system-modprobe.slice - Slice /system/modprobe.
2025-10-30T11:17:56.942188+00:00 safa056 systemd[1]: Stopped target multi-user.target - Multi-User System.
2025-10-30T11:17:56.951998+00:00 safa056 systemd[1]: Stopped target getty.target - Login Prompts.
2025-10-30T11:17:56.975862+00:00 safa056 systemd[1]: Stopped target nss-lookup.target - Host and Network Name Looku...
2025-10-30T11:17:56.979103+00:00 safa056 systemd[1]: Stopped target sound.target - Sound Card.
2025-10-30T11:17:56.979372+00:00 safa056 systemd[1]: Stopped target timers.target - Timer Units.
2025-10-30T11:17:56.979608+00:00 safa056 systemd[1]: dpkg-db-backup.timer: Deactivated successfully.
2025-10-30T11:17:56.979826+00:00 safa056 systemd[1]: Stopped dpkg-db-backup.timer - Daily dpkg database backup time...
2025-10-30T11:17:56.980076+00:00 safa056 systemd[1]: e2scrub_all.timer: Deactivated successfully.
2025-10-30T11:17:56.980319+00:00 safa056 systemd[1]: Stopped e2scrub_all.timer - Periodic ext4 Online Metadata Che...
All Filesystems.
2025-10-30T11:17:56.980558+00:00 safa056 systemd[1]: fstrim.timer: Deactivated successfully.
2025-10-30T11:17:56.980726+00:00 safa056 systemd[1]: Stopped fstrim.timer - Discard unused filesystem blocks once a...
.
2025-10-30T11:17:56.981113+00:00 safa056 systemd[1]: fwupd-refresh.timer: Deactivated successfully.
2025-10-30T11:17:56.989652+00:00 safa056 systemd[1]: Stopped fwupd-refresh.timer - Refresh fwupd metadata regularly...
2025-10-30T11:17:56.989945+00:00 safa056 systemd[1]: logrotate.timer: Deactivated successfully.
2025-10-30T11:17:56.990104+00:00 safa056 systemd[1]: Stopped logrotate.timer - Daily rotation of log files.
```

- task9_grep_more.png

```
2025-10-30T11:17:56.84790+00:00 safaf056 systemd[1]: Stopping session 1.scope - Session 1 of User safaf...
2025-10-30T11:17:56.850318+00:00 safaf056 systemd[1]: Stopping session-10.scope - Session 10 of User safaf...
2025-10-30T11:17:56.900539+00:00 safaf056 systemd[1]: Stopping session-c1.scope - Session c1 of User safaf...
2025-10-30T11:17:56.928871+00:00 safaf056 systemd[1]: Removed slice system-modprobe.slice - Slice /system/modprobe.
2025-10-30T11:17:56.942188+00:00 safaf056 systemd[1]: Stopped target multi-user.target - Multi-User System.
2025-10-30T11:17:56.951998+00:00 safaf056 systemd[1]: Stopped target getty.target - Login Prompts.
2025-10-30T11:17:56.975862+00:00 safaf056 systemd[1]: Stopped target nss-lookup.target - Host and Network Name Lookups.
2025-10-30T11:17:56.979103+00:00 safaf056 systemd[1]: Stopped target sound.target - Sound Card.
2025-10-30T11:17:56.979372+00:00 safaf056 systemd[1]: Stopped target timers.target - Timer Units.
2025-10-30T11:17:56.979608+00:00 safaf056 systemd[1]: dpkg-db-backup.timer: Deactivated successfully.
2025-10-30T11:17:56.979826+00:00 safaf056 systemd[1]: Stopped dpkg-db-backup.timer - Daily dpkg database backup timer.
2025-10-30T11:17:56.980076+00:00 safaf056 systemd[1]: e2scrub_all.timer: Deactivated successfully.
2025-10-30T11:17:56.980319+00:00 safaf056 systemd[1]: Stopped e2scrub_all.timer - Periodic ext4 Online Metadata Check fo
All Filesystems.
--More--
```

- task9_grep_head.png

```
safa@safa056:~$ sudo grep -E 'fail|error' /var/log/syslog | head
2025-10-30T11:17:56.007961+00:00 safaf056 systemd[1]: Stopped update-notifier-download.timer - Download data for packages that failed at
package install time.
2025-10-30T11:18:45.415336+00:00 safaf056 multipathd[481]: sda: failed to get udev uid: No data available
2025-10-30T11:18:45.415834+00:00 safaf056 multipathd: sda: failed to get sysfs uid: No such file or directory
2025-10-30T11:18:45.415846+00:00 safaf056 multipath: sda: failed to get sgio uid: No such file or directory
2025-10-30T11:18:45.416106+00:00 safaf056 multipathd[481]: sda: failed to get udev uid: No data available
2025-10-30T11:18:45.416122+00:00 safaf056 multipathd[481]: sda: failed to get path uid
2025-10-30T11:18:45.416133+00:00 safaf056 multipathd[481]: uevent trigger error
2025-10-30T11:18:45.574689+00:00 safaf056 systemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
(File watch) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
2025-10-30T11:18:45.574737+00:00 safaf056 systemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enable
d (timer based) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
2025-10-30T11:18:45.585222+00:00 safaf056 kernel: ACPI: _OSC evaluation for CPUs failed, trying _PDC
```

- task9_redirect_overwrite.png

```
safa@safa056:~$ sudo grep -i systemd /var/log/syslog > ~/syslog_systemd.txt
```

- task9_redirect_append.png

```
safa@safa056:~$ cat ~/syslog_systemd.txt
2025-10-30T11:17:32.562777+00:00 safaf056 systemd[1]: rsyslog.service: Sent signal SIGHUP to main process 14849 (rsyslogd) on client request.
2025-10-30T11:17:32.577700+00:00 safaf056 systemd[1]: logrotate.service: Deactivated successfully.
2025-10-30T11:17:32.579234+00:00 safaf056 systemd[1]: Finished logrotate.service - Rotate log files.
2025-10-30T11:17:32.802616+00:00 safaf056 systemd-timesyncd[15461]: Contacted time server 185.125.190.56:123 (ntp.ubuntu.com).
2025-10-30T11:17:56.735779+00:00 safaf056 systemd[1]: unattended-upgrades.service: Deactivated successfully.
2025-10-30T11:17:56.847500+00:00 safaf056 systemd[1]: Stopping session-1.scope - Session 1 of User safaf...
2025-10-30T11:17:56.850318+00:00 safaf056 systemd[1]: Stopping session-10.scope - Session 10 of User safaf...
2025-10-30T11:17:56.900539+00:00 safaf056 systemd[1]: Stopping session-c1.scope - Session c1 of User safaf...
2025-10-30T11:17:56.928871+00:00 safaf056 systemd[1]: Removed slice system-modprobe.slice - Slice /system/modprobe.
2025-10-30T11:17:56.942188+00:00 safaf056 systemd[1]: Stopped target multi-user.target - Multi-User System.
2025-10-30T11:17:56.951998+00:00 safaf056 systemd[1]: Stopped target getty.target - Login Prompts.
2025-10-30T11:17:56.975862+00:00 safaf056 systemd[1]: Stopped target nss-lookup.target - Host and Network Name Lookups.
2025-10-30T11:17:56.979103+00:00 safaf056 systemd[1]: Stopped target sound.target - Sound Card.
2025-10-30T11:17:56.979372+00:00 safaf056 systemd[1]: Stopped target timers.target - Timer Units.
2025-10-30T11:17:56.979608+00:00 safaf056 systemd[1]: dpkg-db-backup.timer: Deactivated successfully.
2025-10-30T11:17:56.979826+00:00 safaf056 systemd[1]: Stopped dpkg-db-backup.timer - Daily dpkg database backup timer.
2025-10-30T11:17:56.980076+00:00 safaf056 systemd[1]: e2scrub_all.timer: Deactivated successfully.
2025-10-30T11:17:56.980558+00:00 safaf056 systemd[1]: fstrim.timer: Deactivated successfully.
2025-10-30T11:17:56.980726+00:00 safaf056 systemd[1]: Stopped fstrim.timer - Discard unused filesystem blocks once a week.
2025-10-30T11:17:56.981113+00:00 safaf056 systemd[1]: fwupd-refresh.timer: Deactivated successfully.
2025-10-30T11:17:56.988652+00:00 safaf056 systemd[1]: Stopped fwupd-refresh.timer - Refresh fwupd metadata regularly.
2025-10-30T11:17:56.989945+00:00 safaf056 systemd[1]: logrotate.timer: Deactivated successfully.
2025-10-30T11:17:56.990104+00:00 safaf056 systemd[1]: Stopped logrotate.timer - Daily rotation of log files.
2025-10-30T11:17:56.990227+00:00 safaf056 systemd[1]: man-db.timer: Deactivated successfully.
2025-10-30T11:17:56.992195+00:00 safaf056 systemd[1]: Stopped man-db.timer - Daily man-db regeneration.
```

- task9_journalctl_alternative.png

```
2025-10-31T05:04:04.391816+00:00 safaf056 systemd-networkd[648]: ens33: DHCPv4 address 192.
2025-10-31T05:04:04.394605+00:00 safaf056 systemd-timesyncd[673]: Network configuration cha
safa@safa056:~$ sudo journalctl | less
safa@safa056:~$ sudo journalctl -u systemd | grep -i error > ~/journal_errors.txt
safa@safa056:~$ sudo journalctl -u systemd | grep -i error > ~/journal_errors.txt
```

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

- task10_b1_vim.png

```
safa@safa056: ~
```

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

- task10_b1_run.png

```
safa@safa056:~$ safa@safa056:~$ ./setup.sh
safa@safa056:~$
```

- task10_b2_vim.png

```
safa@safa056: ~
```

```
# Define and show var1
var1="Hello from Lab 6"
echo "var1: $var1"
~
```

- task10_b2_run.png

```
safa@safa056:~$ safa@safa056:~$ ./setup.sh
var1: Hello from Lab 6
~
```

- task10_b3_vim.png

```
safa@safa056: ~
```

```
# Save ls -l to variable and display
allFiles="$(ls -l)"
echo "allFiles (ls -l):"
echo "$allFiles"
~
```

- task10_b3_run.png

```
safa@safa056:~$ safa@safa056:~$ ./setup.sh
allFiles (ls -l):
total 244
-rw-rw-r-- 1 safa safa    371 Oct 16 17:17 answers.md
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Desktop
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Documents
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Downloads
-rw-rw-r-- 1 safa safa      0 Oct 31 05:15 journal_errors.txt
drwxrwxr-x 3 safa safa   4096 Oct 17 05:53 lab4
drwxrwxr-x 2 safa safa   4096 Oct 24 11:47 Lab5
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Music
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Pictures
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Public
-rwxrwxr-x 1 safa safa    102 Oct 31 11:51 setup.sh
drwx----- 3 safa safa   4096 Oct 23 15:17 snap
-rw-rw-r-- 1 safa safa 189436 Oct 31 05:13 syslog_systemd.txt
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Templates
drwxrwxr-x 2 safa safa   4096 Oct 23 16:15 thinclient_drives
drwxr-xr-x 2 safa safa   4096 Oct 24 04:35 Videos
~
```

- task10_b4_vim.png

```
# 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
```

- task10_b4_run.png

```
safa@safa056:~$ ./setup.sh
Directory dir1 does not exist. Creating...
Directory dir1 created.
```

- task10_b5_vim.png

```
# 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
~
```

- task10_b5_run.png

```
safa@safa056:~$ ./setup.sh
file2 does not exist. Creating...
file2 created.
```

- task10_b6_vim.png

```
# 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"
~
```

- task10_b6_run.png

```
safa@safa056:~$ ./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 safafafa 0 Oct 31 11:55 dir1/file2
safa@safa056:~$
```

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

- task11_b0_vim.png

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

- task11_b0_run.png

```
safa@safa056:~$ chmod +x setup.sh
safa@safa056:~$ ./setup.sh 10 Student
safa@safa056:~$ .
```

- task11_b1_vim.png

```
#!/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
~
```

- task11_b1_run.png

```
safa@safa056:~$ ./setup.sh 10 Student
10 is equal to 10 (-eq).
safa@safa056:~$ ./setup.sh 7 Student
7 is NOT equal to 10 (-eq).
```

- task11_b2_vim.png

```
#!/bin/bash
num=$1
str=$2
if [ "$num" -ne 10 ]; then
    echo "$num is not equal to 10 (-ne)."
else
    echo "$num is equal to 10 (-ne false)."
fi
~
```

- task11_b2_run.png

```
safa@safa056:~$ ./setup.sh 7 Student
7 is not equal to 10 (-ne).
safa@safa056:~$ ./setup.sh 10 Student
10 is equal to 10 (-ne false).
```

- task11_b3_vim.png

```
#!/bin/bash
num=$1
str=$2
if [ "$num" -gt 10 ]; then
    echo "$num is greater than 10 (-gt)."
else
    echo "$num is NOT greater than 10 (-gt)."
fi
~
```

- task11_b3_run.png

```
safa@safa056:~$ ./setup.sh 12 Student
12 is greater than 10 (-gt).
safa@safa056:~$ ./setup.sh 9 Student
9 is NOT greater than 10 (-gt).
safa@safa056:~$
```

- task11_b4_vim.png

```
#!/bin/bash
num=$1
str=$2
if [ "$num" -lt 10 ]; then
    echo "$num is less than 10 (-lt)."
else
    echo "$num is NOT less than 10 (-lt)."
fi
~
```

- task11_b4_run.png

```
safa@safa056:~$ ./setup.sh 5 Student
5 is less than 10 (-lt).
safa@safa056:~$ ./setup.sh 11 Student
11 is NOT less than 10 (-lt).
safa@safa056:~$
```

- task11_b5_vim.png

```
#!/bin/bash
num=$1
str=$2
if [ "$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
~
```

- task11_b5_run.png

```
safa@safa056:~$ ./setup.sh 10 Student
10 is greater than or equal to 10 (-ge).
safa@safa056:~$ ./setup.sh 8 Student
8 is NOT greater than or equal to 10 (-ge).
safa@safa056:~$
```

- task11_b6_vim.png

```
#!/bin/bash
num=$1
str=$2
if [ "$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
~
```

- task11_b6_run.png

```
safa@safa056:~$ ./setup.sh 10 Student
10 is less than or equal to 10 (-le).
safa@safa056:~$ ./setup.sh 12 Student
12 is NOT less than or equal to 10 (-le).
safa@safa056:~$
```

- task11_b7_vim.png

```

#!/bin/bash
num=$1
str=$2
if [ "$str" = "Student" ]; then
    echo "Second argument equals 'Student' ( = )."
else
    echo "Second argument does NOT equal 'Student' ( = )."
fi
~
~

```

- task11_b7_run.png

```

safa@safa056:~$ ./setup.sh 10 Student
Second argument equals 'Student' ( = ).
safa@safa056:~$ ./setup.sh 10 Test
Second argument does NOT equal 'Student' ( = ).
```

- task11_b8_vim.png

```

#!/bin/bash
num=$1
str=$2
if [ "$str" != "Student" ]; then
    echo "Second argument is not equal to 'Student' ( != )."
else
    echo "Second argument equals 'Student' ( != false)."
fi
~
~
```

- task11_b8_run.png

```

safa@safa056:~$ ./setup.sh 10 Test
Second argument is not equal to 'Student' ( != ).
```

```
safa@safa056:~$ ./setup.sh 10 Student
```

```
Second argument equals 'Student' ( != false).
```

- task11_b9_vim.png

```

#!/bin/bash
num=$1
str=$2
if [ -z "$str" ]; then
    echo "Second argument is empty (zero-length)."
else
    echo "Second argument is not empty."
fi
~
```

- task11_b9_run.png

```

safa@safa056:~$ vim setup.sh
safa@safa056:~$ ./setup.sh 10 Student
Second argument is not empty.
safa@safa056:~$ ./setup.sh 10
Second argument is empty (zero-length).
```

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

- task12_b1_vim.png

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

- task12_b1_run.png

```
safa@safa056:~$ ./setup.sh
safa@safa056:~$
```

- task12_b2_vim.png

```
## Script to demonstrate printing all user-entered arguments using $*
# Print all arguments using $*
echo "Printing all arguments using \$*:"
```

```
for arg in $*; do
    echo "Argument: $arg"
done
```

```
~
```

- task12_b2_run.png

```
safa@safa056:~$ ./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

- task13_b1_vim.png

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

- task13_b1_run.png

```
safa@safa056:~$ ./setup.sh
safa@safa056:~$
```

- task13_b2_vim.png

```
# 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"
```

- task13_b2_run.png

```
safa@safa056:~$ ./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
safa@safa056:~$
```

- task13_b3_vim.png

```
# 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
~
```

- task13_b3_run.png

```
safa@safa056:~$ vim setup.sh
safa@safa056:~$ ./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): q
Function final total: 7
safa@safa056:~$
```

- task13_b4_vim.png

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

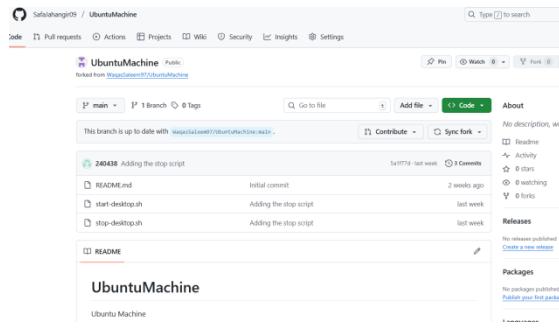
# Demonstrate sum_args function
echo "Now demonstrating sum_args function:"
sum_args 3 4
result=$?
echo "sum_args(3,4) returned: $result"
~
```

- task13_b4_run.png

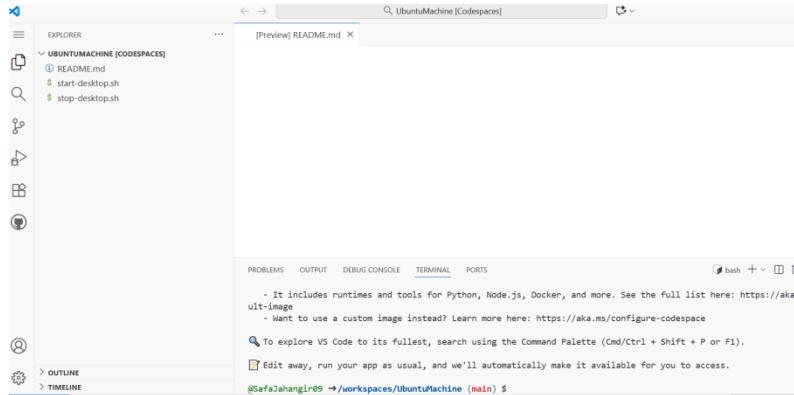
```
safa@safa056:~$ ./setup.sh
Now demonstrating sum_args function:
sum_args(3,4) returned: 7
safa@safa056:~$
```

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

- task14_fork.png



- task14_codespace_launch.png



- task14_start_script_ls.png

```
@SafaJahangir09 → /workspaces/UbuntuMachine (main) $ ls -l start-desktop.sh stop-desktop.sh
-rwxrwxrwx 1 codespace root 1333 Nov  6 09:36 start-desktop.sh
-rwxrwxrwx 1 codespace root  428 Nov  6 09:36 stop-desktop.sh
○ @SafaJahangir09 → /workspaces/UbuntuMachine (main) $
```

- task14_start_run.png

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

@SafaJahangir09 → /workspaces/UbuntuMachine (main) $ ./start-desktop.sh
79 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
xfce4 is already the newest version (4.18).
xfce4-goodies is already the newest version (4.18.2build1).
x11vnc is already the newest version (0.9.16-10).
xvfb is already the newest version (2:21.1.12-1ubuntu1.5).
novnc is already the newest version (1:1.3.0-2).
websockify is already the newest version (0.10.0+dfsg1-5build2).
dbus-x11 is already the newest version (1.14.10-4ubuntu4.1).
x11-xserver-utils is already the newest version (7.7+10build2).
0 upgraded, 0 newly installed, 0 to remove and 79 not upgraded.
[✓] XFCE desktop environment is running!
🌐 Access it via the Codespaces HTTPS port (6080)
○ @SafaJahangir09 → /workspaces/UbuntuMachine (main) $
```

- task14_ports_view.png

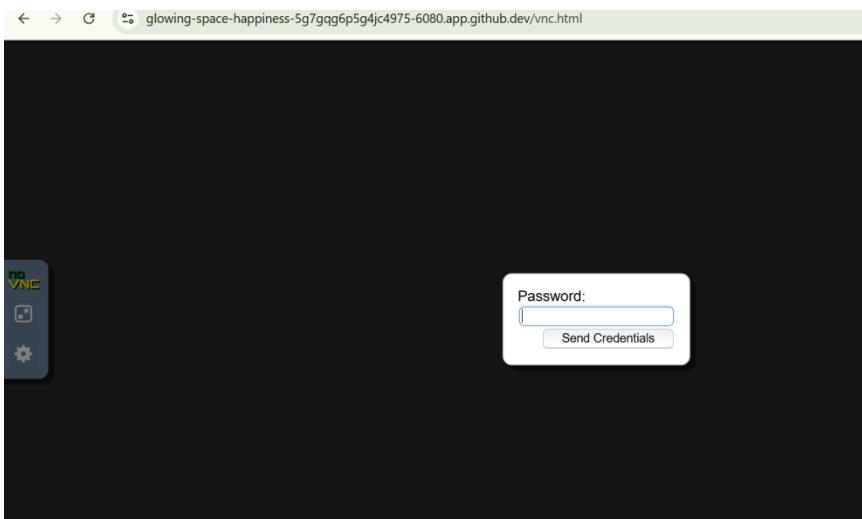
Port	Forwarded Address	Running Process	Visibility	Origin
5900	https://glowing-spa...	x11vnc -display :1 -rfbauth /home/codespac...	⊕ Public	Auto Forwarded
5901	https://glowing-spa...	x11vnc -display :1 -rfbauth /home/codespac...	⊕ Private	Auto Forwarded
6080	https://glowing-spa...	/usr/bin/python3 /usr/bin/websockify --web...	⊕ Private	Auto Forwarded
	Add Port			

- task14_vnc_url.png

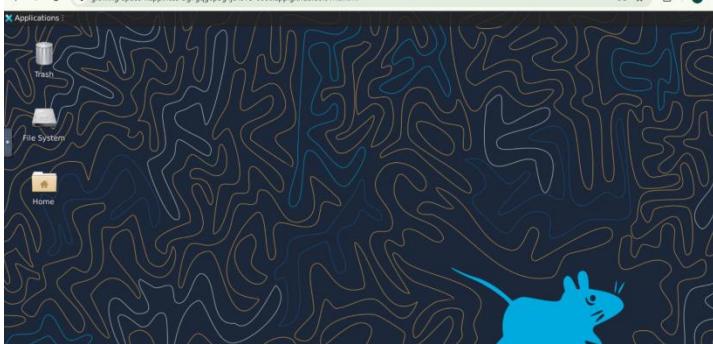
Directory listing for /

- [app/](#)
- [core/](#)
- [include/](#)
- [utils/](#)
- [vendor/](#)
- [vnc.html](#)
- [vnc_auto.html@](#)
- [vnc_lite.html](#)

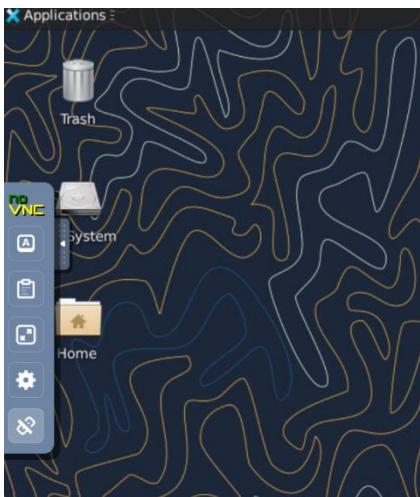
- task14_vnc_password_prompt.png



- task14_vnc_desktop.png



- task14_vnc_connect.png



- task14_stop_run.png

```
● @SafaJahangir09 →/workspaces/UbuntuMachine (main) $ ./stop-desktop.sh
[*] Stopping noVNC server...
Terminating WebSockets proxy (21483)
[*] Stopping x11vnc server...
In exit
Terminating child 23304
Process Process-34:
caught signal: 15
[*] Stopping XFCE desktop session...
```

Exam Evaluation Questions

1. Group Management and Membership

Q1_groups_created.png

```
safa@safa056:~$ sudo addgroup g1
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `g1' (GID 1006) ...
safa@safa056:~$ sudo addgroup g2
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `g2' (GID 1007) ...
safa@safa056:~$ sudo addgroup g3
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `g3' (GID 1008) ...
[sudo] password for safa:
```

Q1_group_changes.png

```
safa@safa056:~$ sudo usermod -g g3 -G g1,g2 examuser
safa@safa056:~$
```

Q1_group_verification.png

```
safa@safa056:~$ id examuser
uid=1009(examuser) gid=1008(g3) groups=1008(g3),1006(g1),1007(g2)
safa@safa056:~$ cat /etc/group
root:x:0:
```

```
student:x:1005:
g1:x:1006:examuser
g2:x:1007:examuser
g3:x:1008:
examuser:x:1009:
safa@safa056:~$
```

2. Ownership and Permission Tasks

Q2_chown_chgrp.png

```
safa@safa056:~$ mkdir -p workspace
safa@safa056:~$ touch workspace/secret.txt
safa@safa056:~$ sudo chown examuser:g1 workspace/secret.txt
safa@safa056:~$
```

Q2_symbolic_numeric.png

```
safa@safa056:~$ sudo chmod g-rwx,o-rwx workspace/secret.txt
[sudo] password for safa:
[sudo] password for safa:
```

```
safa@safa056:~$ sudo chmod 700 workspace/secret.txt
[sudo] password for safa:
[sudo] password for safa:
```

Q2_permissions_ls.png

```
safa@safa056:~$ ls -l workspace/secret.txt
-rwx----- 1 examuser g1 0 Nov  6 10:13 workspace/secret.txt
safa@safa056:~$
```

3. Pipes, Grep, and Redirection Practice

Q3_grep_pipe.png

```
safa@safa056:~$ sudo journalctl | grep -i 'error|fail' | head -n 20
Sep 27 11:59:17 safaf056 kernel: ACPI: _OSC evaluation for CPUs failed, trying _PDC
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:15.3: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:15.4: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:15.5: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:15.6: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:15.7: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:16.3: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:16.4: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:16.5: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:16.6: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:16.7: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:17.3: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:17.4: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:17.5: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:17.6: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:17.7: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:18.2: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:18.3: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:18.4: bridge window [io size 0x1000]: failed to assign
Sep 27 11:59:18 safaf056 kernel: pci 0000:00:18.5: bridge window [io size 0x1000]: failed to assign
safa@safa056:~$
```

Q3_redirect_overwrite_append.png

```
safa@safa056:~$ sudo journalctl | grep -i 'fail' >> ~/logs/errors.txt
```

Q3_pager_view.png

```
file watch) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
Sep 27 11:59:20 safaf056 systemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enabled
(timer based) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
Sep 27 11:59:33 safaf056 multipathd[472]: uevent trigger error
Sep 27 11:59:43 safaf056 multipathd[472]: uevent trigger error
Sep 27 11:59:53 safaf056 multipathd[472]: uevent trigger error
Sep 27 12:03:14 safaf056 kernel: RAS: Correctable Errors collector initialized.
Sep 27 12:03:15 safaf056 multipathd[476]: uevent trigger error
Sep 27 12:03:16 safaf056 systemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
(file watch) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
Sep 27 12:03:16 safaf056 systemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enabled
(timer based) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
Sep 27 12:03:30 safaf056 multipathd[476]: uevent trigger error
Sep 27 12:03:40 safaf056 multipathd[476]: uevent trigger error
Sep 27 12:03:50 safaf056 multipathd[476]: uevent trigger error
Oct 16 16:19:46 safaf056 kernel: RAS: Correctable Errors collector initialized.
Oct 16 16:19:47 safaf056 multipathd[470]: uevent trigger error
Oct 16 16:19:49 safaf056 systemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
(file watch) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
Oct 16 16:19:49 safaf056 systemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enabled
(timer based) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
Oct 16 16:20:02 safaf056 multipathd[470]: uevent trigger error
Oct 16 16:20:12 safaf056 multipathd[470]: uevent trigger error
Oct 16 16:20:22 safaf056 multipathd[470]: uevent trigger error
Oct 17 04:38:25 safaf056 kernel: RAS: Correctable Errors collector initialized.
Oct 17 04:38:25 safaf056 multipathd[479]: uevent trigger error
Oct 17 04:38:27 safaf056 systemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
(file watch) was skipped because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
```

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

Q4_step1_var1.png

```
safa@safa056:~$ ./setup.sh
Variable 1: Task Four Check
safa@safa056:~$ cat setup.sh
#!/bin/bash
var1="Task Four Check"
echo "Variable 1: $var1"
```

Q4_step2_allfiles.png

```
safa@safa056:~$ vim setup.sh
safa@safa056:~$ ./setup.sh
Variable 1: Task Four Check

All Files:

safa@safa056:~$ cat setup.sh
#!/bin/bash
var1="Task Four Check"
echo "Variable 1: $var1"
allfiles=$(ls -l)
echo -e "\nAll Files:\n$allfiles"
safa@safa056:~$
```

Q4_step3_dirfile_checks.png

```
safa@safa056:~$ ./setup.sh

Final Permissions:
drwxrwxr-x 2 safaf safaf 4096 Oct 31 11:55 dir1
-rwx----- 1 safaf safaf 0 Oct 31 11:55 dir1/file2
safa@safa056:~$
```

5. Script: Comparisons and String Tests

Q5_eq_examples.png

```
safa@safa056:~$ ./setup.sh 10 test
--- 1. Numeric Equality (-eq) Tests ---
Testing 10 -eq 10:
  Result (True case): 10 is equal to 10.
  Result (False case): 10 is NOT equal to 5.
safa@safa056:~$ ./setup.sh 15 test
--- 1. Numeric Equality (-eq) Tests ---
Testing 15 -eq 10:
  Result (False case): 15 is NOT equal to 5.
safa@safa056:~$
```

Q5_numeric_tests.png

```
safa@safa056:~$ ./setup.sh 15 test
--- 2. Numeric Range Tests (using 15) ---
  15 -ne 5 (True)
  15 -ne 10 (False)
  15 -gt 10 (True)
  15 -ge 10 (True)
safa@safa056:~$ ./setup.sh 5 test
--- 2. Numeric Range Tests (using 5) ---
  5 -ne 10 (False)
  5 -lt 10 (True)
  5 -le 10 (True)
  5 -le 5 (False)
safa@safa056:~$
```

Q5_string_tests.png

```
safa@safa056:~$ vim setup.sh
safa@safa056:~$ ./setup.sh 10 match
  match = 'match' (True)
  -z match (False: string is NOT empty)
safa@safa056:~$ ./setup.sh 10 ""
  != 'match' (True)
  -z (True: string is empty)
safa@safa056:~$
```

6. Script: For Loop and Argument Handling

Q6_script_forloop_vim.png

```
safa@safa056:~$ cat setup.sh
#!/bin/bash
for arg in "$@"; do
    echo "Argument Found: $arg"
done
safa@safa056:~$
```

Q6_forloop_run.png

```
safa@safa056:~$ ./setup.sh first_word "multi word phrase" three-words "last one"
Argument Found: first_word
Argument Found: multi word phrase
Argument Found: three-words
Argument Found: last one
safa@safa056:~$ cat setup.sh
```

7. Script: While Loop Summation and Functions

Q7_while_session.png

```
safa@safa056:~$ vim setup.sh
safa@safa056:~$ ./setup.sh
--- Interactive Summation ---
Enter numbers to add (or 'q' to quit):
Enter number or 'q': 5
Running Total: 5
Enter number or 'q': 676
Running Total: 681
Enter number or 'q': 33
Running Total: 714
Enter number or 'q': q
Stopping. Final Total: 714
safa@safa056:~$
```

Q7_function_sum.png

```
safa@safa056:~$ vim setup.sh
safa@safa056:~$ ./setup.sh
--- Function Summation Demonstration --
Input 1: 15
Input 2: 27
Result captured in variable: 42
safa@safa056:~$ ■
```