

Cloud Computing Lab

Nayab khazin

BSE-V B

2023-BSE-046

LAB 06

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

- task1_set_root_password.png

```
[root] password for sarav  
New password:  
Retype new password:  
passwd: password updated successfully
```

- task1_su_root.png

```
user@nayab: $ su -  
user@nayab  
root@nayab :~# whoami whoami  
root  
root@naayab :~# id  
uid=0(root) gid=0(root) groups=0(root)
```

- task1_exit_to_user.png

```
uid=0(root) gid=0(ro b) group  
user@nayab :~# exit  
logout  
user@nayaab:~$ whoami
```

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

- task2_adduser_tom.png

```
user@nayab:~$ 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

```

gnssmcsq:x:333:3333:gnssmcsq:/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:/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:tomm,11,121233,122423,1:/home/tom:/bin/bash

```

- 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:

```

- task2_verify_shadow.png

```

colord:!:20384:::::::
pulse:!:20384:::::::
cups-browsed:!:20384:::::::
xrdp:!:20384:::::::
tom:$y$j9T$wDbkuT7YE6UzUvYB3bS7f1$.u0Tv9RIuGIwzPR05mhekL00UhAa190NBFuQF7wI.t4:20391:0:99999:7:::

```

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

- task3_groupadd.png

```

developer:x:1002:
devops:x:1003:
designer:x:1004:

```

- task3_change_primary_group.png

```

ap designer does not exist
~$ sudo usermod -g designer tom
~$ id tom
uid=1001(tom) gid=1004(designer) groups=1004(designer),100(users)
~$

```

- task3_add_secondary_groups.png

```

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

```

- task3_reset_secondary_groups.png

```
~$ user@nayab
gid=1004(designer) groups=1004(desig
~$ groups tom
r tom
~$
```

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

- task4_add_users.png

```
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:
passwd: 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' ...
```

- task4_scooby_su_auth_failure.png

```
user@nayab:~$ sudo useradd
user@nayab:~$ su - scooby
password:
: Authentication failure
```

- task4_set_password_scooby.png

```
user@nayab:~$
user@nayab:~$ sudo passwd scooby
new password:
retype new password:
passwd: password updated successfully
```

- task4_scooby_su_no_home.png

```
passwd updated successfully
~$ su - scooby
cannot change directory to /home/scooby: No such file or directory
```

- task4_scooby_no_home.png

```
tom:x:1001:1004::tom,,11,12,1200,122420,1:/home/tom:/bin/bash
jerry:x:1005:1005:jerrykelin,6,8798,46587,7:/home/jerry:/bin/
scooby:x:1006:1006::/home/scooby:/bin/sh
```

- task4_scooby_create_home.png

```
$ sudo mkdir -p /home/scooby
$ sudo chown scooby:scooby /home/scooby
$ ls -ld /home/scooby
scooby scooby 4096 Oct 30 11:49 /home/scooby
$
```

- task4_scooby_login_success.png

```

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/scooby:/bin/sh
scooby:x:1006:1006::/home/scooby:/bin/sh

```

- task4_add_groups.png

```

info: Selecting GID from range 1000 to 59999 ...
info: Adding group `jolly' (GID 1007) ...

```

- task4_verify_groups.png

```

jerry:x:1005:
scooby:x:1006:
jolly:x:1007:
anime:x:1008:

```

- task4_delete_groups.png

```

designer:x:1004:
jerry:x:1005:
scooby:x:1006:

```

- 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:/usr/sbin/nologin
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:1001:1004:tomm,11,121233,122423,1:/home/tom:/bin/bash

```

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

- task5_create_student.png

```

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' ...

```

- task5_create_files.png

```

~$ touch file1
~$ mkdir -p dir1
~$ touch dir1/file2
~$ ls -l

-rw-r--r-- 1 student 4096 Oct 30 12:04 dir1
-rw-r--r-- 1 student 0 Oct 30 12:03 file1

```

- task5_chown_file1.png

```

/home/student: Permission denied
~$ sudo chown tom /home/student/file1
~$ ls -l file1

```

- task5_chgrp_file1.png

```

-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1

```

Task 6 – Change permissions using symbolic mode

- task6_su_student.png

```

-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1

```

- task6_chmod_remove_rwx.png

```

sudo chmod -rwx /home/student/file1
/home/student/file1: new permissions are ---w---, not -----
ls -l file1

```

- task6_chmod_add_r.png

```

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

```

- task6_chmod_u_plus_x.png

```

$ sudo chmod u+x /home/student/file1
$ ls -l file1

```

- task6_chmod_ug_plus_w.png

```

~$ sudo chmod ug+w /home/student/file1
~$ ls -l file1
-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1

```

- task6_chmod_ugo_minus_rwx.png

```

-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1

```

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

- task7_student_context.png

```

-rw-rw-r-- 1 tom devops 0 Oct 30 12:03 file1

```

- task7_chmod_set_all_rwx.png

```
-rwxrwxrwx 1 tom devops 0 Oct 30 12:03 file1
```

- task7_remove_exec_go.png

```
-rwxrw-rw- 1 tom devops 0 Oct 30 12:03 file1
```

- task7_remove_all_perms.png

```
----- 1 tom devops 0 Oct 30 12:03 file1
```

Task 8 – Change permissions using numeric (octal) mode

- task8_chmod_777.png

```
-rwxrwxrwx 1 tom devops 0 Oct 30 12:03 file1
```

- task8_chmod_700.png

```
-rwx----- 1 tom devops 0 Oct 30 12:03 file1
```

- task8_chmod_744.png

```
-rwxr--r-- 1 tom devops 0 Oct 30 12:03 file1
```

- task8_chmod_640.png

```
-rw-r----- 1 tom devops 0 Oct 30 12:03 file1
```

- task8_chmod_664.png

```
-rw-r--r-- 1 tom devops 0 Oct 30 12:03 file1
```

- task8_chmod_775.png

```
-rwxr-xr-x 1 tom devops 0 Oct 30 12:03 file1
```

- task8_chmod_750.png

```
-rwxr-x--- 1 tom devops 0 Oct 30 12:03 file1
```

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

- task9_grep_less.png

```

kernel: workqueue: blk_mq_run_work_fn hogged CPU for >10s
systemd-timesyncd[15461]: Contacted time server 185.125.192.100
kernel: workqueue: e1000_watchdog [e1000] hogged CPU for >10s
systemd[1]: unattended-upgrades.service: Deactivated successfully.
systemd[1]: Stopping session-1.scope - Session 1 of User safa056.
systemd[1]: Stopping session-10.scope - Session 10 of User safa056.
systemd[1]: Stopping session-c1.scope - Session c1 of User safa056.
systemd[1]: Removed slice system-modprobe.slice - Slice /system/modprobe.
systemd[1]: Stopped target multi-user.target - Multi-User System.
systemd[1]: Stopped target getty.target - Login Prompts.
systemd[1]: Stopped target nss-lookup.target - Host and Network Name Lookups.
systemd[1]: Stopped target sound.target - Sound Card.
systemd[1]: Stopped target timers.target - Timer Units.
systemd[1]: dpkg-db-backup.timer: Deactivated successfully.
systemd[1]: Stopped dpkg-db-backup.timer - Daily dpkg database backup timer.
systemd[1]: e2scrub_all.timer: Deactivated successfully.
systemd[1]: Stopped e2scrub_all.timer - Periodic ext4 Online Metadata Check for All Filesystems.
systemd[1]: fstrim.timer: Deactivated successfully.
systemd[1]: Stopped fstrim.timer - Discard unused filesystem blocks.
systemd[1]: fwupd-refresh.timer: Deactivated successfully.

```

- task9_grep_more.png

```

2025-10-30T11:17:56.847306+00:00 safa056 systemd[1]: Stopping session-1.scope - Session 1 of User safa056.
2025-10-30T11:17:56.850318+00:00 safa056 systemd[1]: Stopping session-10.scope - Session 10 of User safa056.
2025-10-30T11:17:56.900539+00:00 safa056 systemd[1]: Stopping session-c1.scope - Session c1 of User safa056.
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 Lookups.
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 timer.
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 Check for All Filesystems.
--More--

```

- task9_grep_head.png

```

2025-10-30T11:17:57.007961+00:00 safa056 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 safa056 multipathd[481]: sda: failed to get udev uid: No data available
2025-10-30T11:18:45.415834+00:00 safa056 multipathd[481]: sda: failed to get sysfs uid: No such file or directory
2025-10-30T11:18:45.415846+00:00 safa056 multipathd[481]: sda: failed to get sgio uid: No such file or directory
2025-10-30T11:18:45.416106+00:00 safa056 multipathd[481]: sda: failed to get udev uid: No data available
2025-10-30T11:18:45.416122+00:00 safa056 multipathd[481]: sda: failed to get path uid
2025-10-30T11:18:45.416133+00:00 safa056 multipathd[481]: uevent trigger error
2025-10-30T11:18:45.574689+00:00 safa056 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 safa056 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).
2025-10-30T11:18:45.585222+00:00 safa056 kernel: ACPI: OSC evaluation for CPUs failed, trying PDC

```

- task9_redirect_overwrite.png

```

~$ sudo grep -i systemd /var/log/syslog > ~/syslog_systemd.txt

```

- task9_redirect_append.png

```

systemd[1]: rsyslog.service: Sent signal SIGHUP to rsyslogd.
systemd[1]: logrotate.service: Deactivated successfully.
systemd[1]: Finished logrotate.service - Rotate log files.
systemd-timesyncd[15461]: Contacted time server 185.125.192.100
systemd[1]: unattended-upgrades.service: Deactivated successfully.
systemd[1]: Stopping session-1.scope - Session 1 of User safa056.
systemd[1]: Stopping session-10.scope - Session 10 of User safa056.
systemd[1]: Stopping session-c1.scope - Session c1 of User safa056.
systemd[1]: Removed slice system-modprobe.slice - Slice /system/modprobe.
systemd[1]: Stopped target multi-user.target - Multi-User System.
systemd[1]: Stopped target getty.target - Login Prompts.
systemd[1]: Stopped target nss-lookup.target - Host and Network Name Lookups.
systemd[1]: Stopped target sound.target - Sound Card.
systemd[1]: Stopped target timers.target - Timer Units.
systemd[1]: dpkg-db-backup.timer: Deactivated successfully.
systemd[1]: Stopped dpkg-db-backup.timer - Daily dpkg database backup timer.
systemd[1]: e2scrub_all.timer: Deactivated successfully.
systemd[1]: Stopped e2scrub_all.timer - Periodic ext4 Online Metadata Check for All Filesystems.
systemd[1]: fstrim.timer: Deactivated successfully.
systemd[1]: Stopped fstrim.timer - Discard unused filesystem blocks.
systemd[1]: fwupd-refresh.timer: Deactivated successfully.
systemd[1]: Stopped fwupd-refresh.timer - Refresh firmware.
systemd[1]: logrotate.timer: Deactivated successfully.
systemd[1]: Stopped logrotate.timer - Daily rotation of log files.
systemd[1]: man-db.timer: Deactivated successfully.
systemd[1]: Stopped man-db.timer - Daily man-db regeneration.
systemd[1]: ufw.timer: Deactivated successfully.

```

- task9_journalctl_alternative.png

```
2025-10-31T05:04:04.391816+00:00 safa056 systemd-networkd[648]: ens33: DHCPv4 address 192.168.1.100 assigned
2025-10-31T05:04:04.394605+00:00 safa056 systemd-timesyncd[673]: Network configuration changed
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

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

- task10_b1_run.png

```
:~$ ./setup.sh
:~$
```

- task10_b2_vim.png

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

- task10_b2_run.png

```
var1: Hello from Lab 6
```

- task10_b3_vim.png

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

- task10_b3_run.png


```
371 Oct 16 17:17 answers.md
4096 Oct 24 04:35 Desktop
4096 Oct 24 04:35 Documents
4096 Oct 24 04:35 Downloads
  0 Oct 31 05:15 journal_errors.txt
4096 Oct 17 05:53 lab4
4096 Oct 24 11:47 Lab5
4096 Oct 24 04:35 Music
4096 Oct 24 04:35 Pictures
4096 Oct 24 04:35 Public
 102 Oct 31 11:51 setup.sh
4096 Oct 23 15:17 snap
189436 Oct 31 05:13 syslog_systemd.txt
4096 Oct 24 04:35 Templates
4096 Oct 23 16:15 thinclient_drives
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

```
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

```
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

```
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 safa safa 0 Oct 31 11:55 dir1/file2
```

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

```
$ chmod +x setup.sh
$ ./setup.sh 10 Student
$
```

- 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

```
:-$ ./setup.sh 7 Student
al 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)."

```

- task11_b2_run.png

```
al to 10 (-ne).
:~$ ./setup.sh 10 Student
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)."

```

- task11_b3_run.png

```
than 10 (-gt).
$ ./setup.sh 9 Student
er than 10 (-gt).
```

- 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)."

```

- task11_b4_run.png

```
ss than 10 (-lt).
:~$ ./setup.sh 11 Student
```

- 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)."

```

- task11_b5_run.png

```
~$ ./setup.sh 8 Student
ater than or equal to 10 (-ge).
~$
```

- 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

```
~$ ./setup.sh 12 Student
s than or equal to 10 (-le).
~$
```

- 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

```
~$ ./setup.sh 10 Test
t equals 'Student' ( = ).
$ ./setup.sh 10 Test
t 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)."
```

- task11_b8_run.png

```
ent is not equal to 'Student' ( != ).
~$ ./setup.sh 10 Student
ent 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

```
./setup.sh 10 Student
t is not empty.
$ ./setup.sh 10
t 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_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

```
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_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

```
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
```

- 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

```
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
```

- task13_b4_vim.png

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

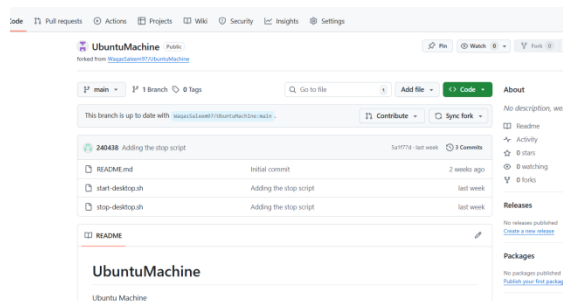
# Demonstrate sum_args function
echo "Now demonstrating sum_args function:"
sum_args 3 4
result=$?
echo "sum_args(3,4) returned: $result"
```

- task13_b4_run.png

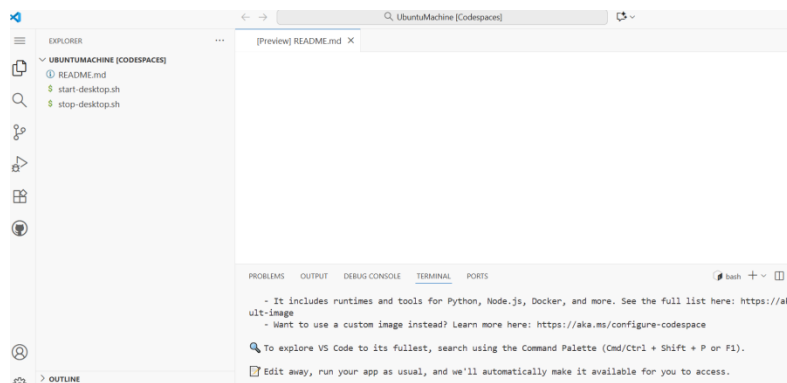
```
Now demonstrating sum_args function:  
sum_args(3,4) returned: 7
```

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

- task14_fork.png



- task14_codespace_launch.png



- task14_start_script_ls.png

```
➔ /workspaces/UbuntuMachine (main) $ ls -l start-desktop.sh stop-desktop.sh  
drwxr-xr-x 2 root 1333 Nov  6 09:36 start-desktop.sh  
drwxr-xr-x 2 root 428 Nov  6 09:36 stop-desktop.sh  
➔ /workspaces/UbuntuMachine (main) $
```

- task14_start_run.png

```
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)
```

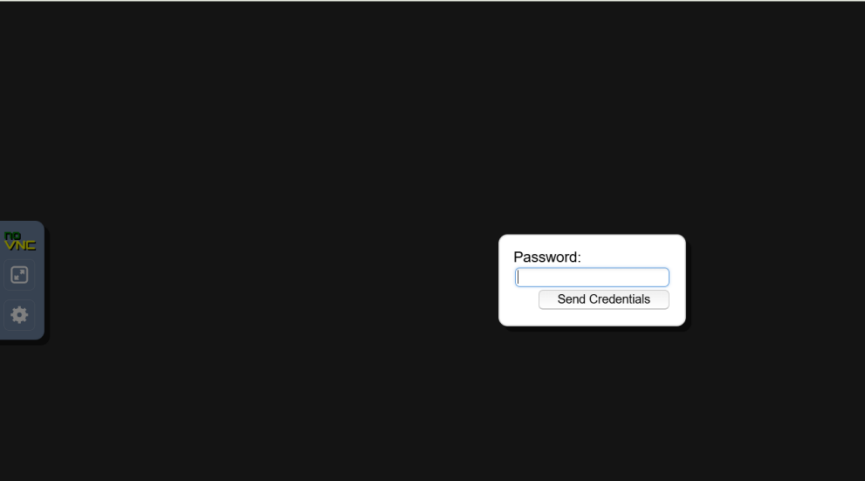
- task14_ports_view.png

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/websocketify --web...	Private	Auto Forwarded
<div>Add Port</div>				

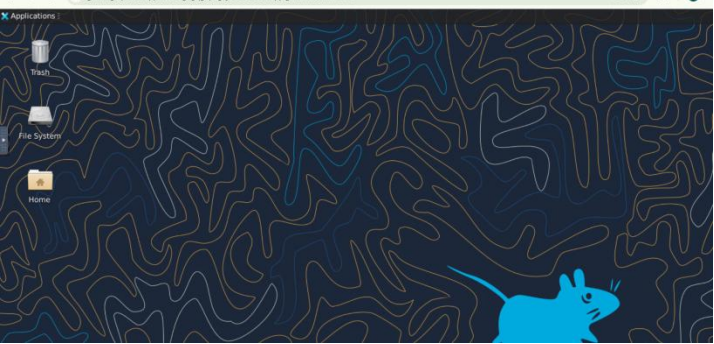
task14_vnc_url.png



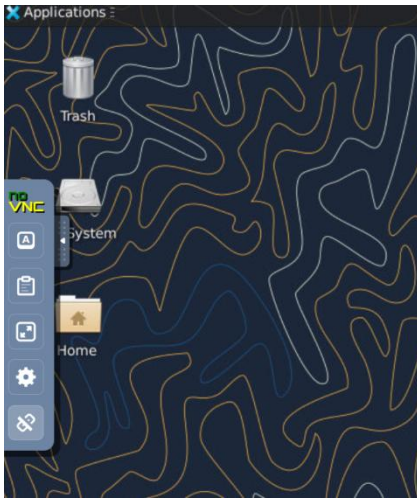
task14_vnc_password_prompt.png



task14_vnc_desktop.png



task14_vnc_connect.png



- task14_stop_run.png

```
[*] 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

```
~$ sudo addgroup g1
Adding new group `g1' (GID 1006) ...
~$ sudo addgroup g2
Adding new group `g2' (GID 1007) ...
~$ sudo addgroup g3
Adding new group `g3' (GID 1008) ...
~$
```

Q1_group_changes.png

```
~$ sudo usermod -g g3 -G g1,g2 examuser
~$
```

Q1_group_verification.png

```
$ id examuser
uid=1005(student) gid=1008(g3) groups=1008(g3),1006(g1),1007(g2)
$ cat /etc/group
```

```
student:x:1005:
g1:x:1006:examuser
g2:x:1007:examuser
g3:x:1008:
examuser:x:1009:
```

2. Ownership and Permission Tasks

Q2_chown_chgrp.png

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

Q2_symbolic_numeric.png

```
~$ sudo chmod g-rwx,o-rwx workspace/secret.txt
$ ls -ll workspace/secret.txt
```

```
:~$ sudo chmod 700 workspace/secret.txt
$ ls -ll workspace/secret.txt
```

Q2_permissions_ls.png

```
-rwx----- 1 examuser g1 0 Nov  6 10:13 workspace/secret.txt
```

3. Pipes, Grep, and Redirection Practice

Q3_grep_pipe.png

```
journalctl | grep -i -E 'error|fail' | head -n 20
kernel: ACPI: _OSC evaluation for CPUs failed, trying _PDC
kernel: pci 0000:00:15.3: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:15.4: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:15.5: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:15.6: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:15.7: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:16.3: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:16.4: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:16.5: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:16.6: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:16.7: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:17.3: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:17.4: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:17.5: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:17.6: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:17.7: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:18.2: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:18.3: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:18.4: bridge window [io size 0x1000]: failed to assign
kernel: pci 0000:00:18.5: bridge window [io size 0x1000]: failed to assign
```

Q3_redirect_overwrite_append.png

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

Q3_pager_view.png

```
cause of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
stemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enabled
because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
ltipathd[472]: uevent trigger error
ltipathd[472]: uevent trigger error
ltipathd[472]: uevent trigger error
rnel: RAS: Correctable Errors collector initialized.
ltipathd[476]: uevent trigger error
stemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
cause of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
stemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enabled
because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
ltipathd[476]: uevent trigger error
ltipathd[476]: uevent trigger error
ltipathd[476]: uevent trigger error
rnel: RAS: Correctable Errors collector initialized.
ltipathd[470]: uevent trigger error
stemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
cause of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
stemd[1]: apport-autoreport.timer - Process error reports when automatic reporting is enabled
because of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
ltipathd[470]: uevent trigger error
ltipathd[470]: uevent trigger error
ltipathd[470]: uevent trigger error
rnel: RAS: Correctable Errors collector initialized.
ltipathd[479]: uevent trigger error
stemd[1]: apport-autoreport.path - Process error reports when automatic reporting is enabled
cause of an unmet condition check (ConditionPathExists=/var/lib/apport/autoreport).
```

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

Q4_step1_var1.png

```
#!/bin/bash
var1="Task Four Check"
echo "Variable 1: $var1"
```

Q4_step2_allfiles.png

```
#!/bin/bash
var1="Task Four Check"
echo "Variable 1: $var1"
allfiles=$(ls -l)
echo -e "\nAll Files:\n$allfiles"
```

5. Script: Comparisons and String Tests

Q5_eq_examples.png

```
--- 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.
```

Q5_numeric_tests.png

```
--- 2. Numeric Range Tests (using 15) ---
15 -ne 5 (True)
15 -ne 10 (False)
15 -gt 10 (True)
15 -ge 10 (True)
```

Q5_string_tests.png

```
match = 'match' (True)
-z match (False: string is NOT empty)
```

6. Script: For Loop and Argument Handling

Q6_script_forloop_vim.png

```
#!/bin/bash
for arg in "$@"; do
    echo "Argument Found: $arg"
done
```

Q6_forloop_run.png

```
Argument Found: first_word
Argument Found: multi word phrase
Argument Found: three-words
Argument Found: last one
```

7. Script: While Loop Summation and Functions

Q7_while_session.png

```
--- 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
```

Q7_function_sum.png

```
--- Function Summation Demonstration ---  
Input 1: 15  
Input 2: 27  
Result captured in variable: 42
```