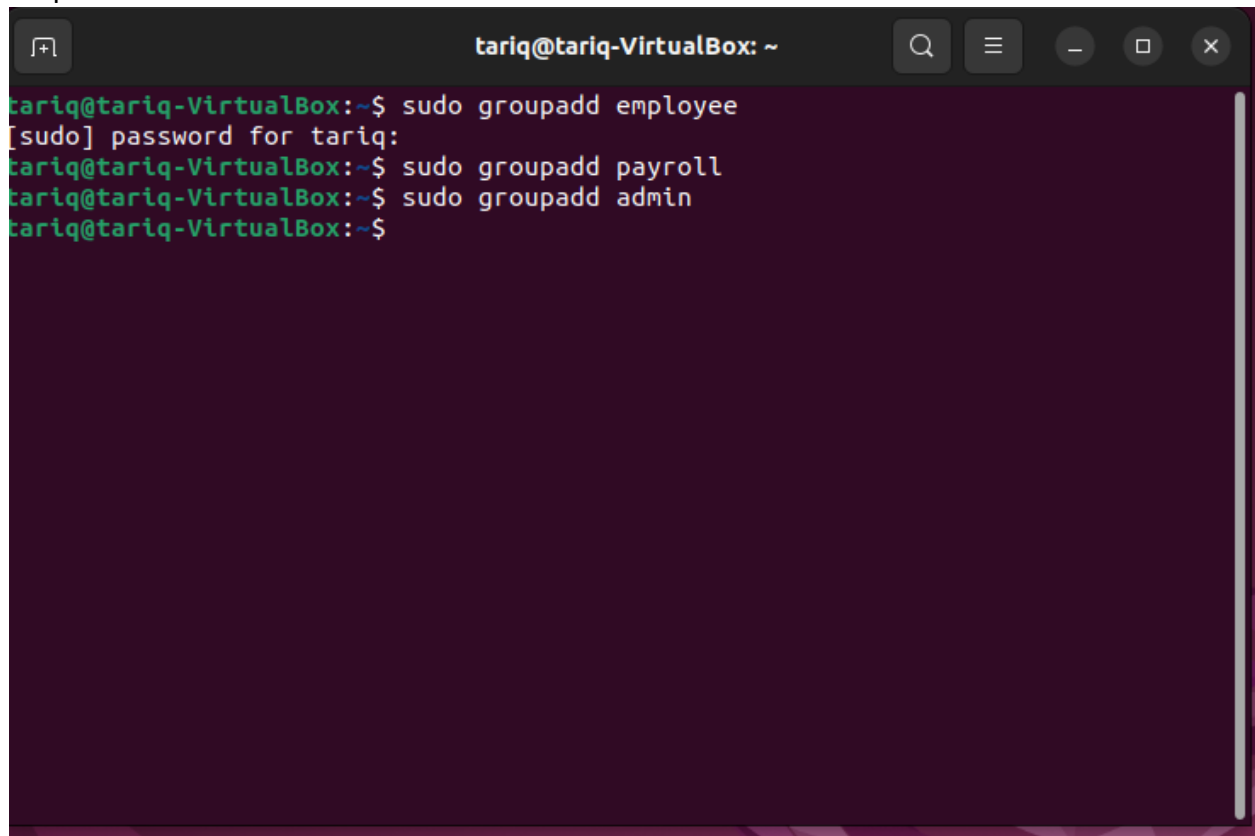


Step 1 -

A terminal window titled 'tariq@tariq-VirtualBox: ~' with standard window controls. The terminal shows a sequence of commands to create three groups: 'employee', 'payroll', and 'admin'. The first command 'sudo groupadd employee' is followed by a password prompt '[sudo] password for tariq:'. The subsequent two commands, 'sudo groupadd payroll' and 'sudo groupadd admin', are executed without prompts. The prompt returns to the root shell '~\$' after each command.

```
tariq@tariq-VirtualBox:~$ sudo groupadd employee
[sudo] password for tariq:
tariq@tariq-VirtualBox:~$ sudo groupadd payroll
tariq@tariq-VirtualBox:~$ sudo groupadd admin
tariq@tariq-VirtualBox:~$
```

Step 2 -

```
tariq@tariq-VirtualBox: ~  
tariq@tariq-VirtualBox:~$ sudo groupadd employee  
[sudo] password for tariq:  
tariq@tariq-VirtualBox:~$ sudo groupadd payroll  
tariq@tariq-VirtualBox:~$ sudo groupadd admin  
tariq@tariq-VirtualBox:~$ sudo useradd -m -d /home/sophia -g employee -s /bin/bash sophia  
tariq@tariq-VirtualBox:~$ sudo useradd -m -d /home/olivia -g payroll -s /bin/bash olivia  
tariq@tariq-VirtualBox:~$ sudo useradd -m -d /home/emma -g admin -s /bin/bash emma  
tariq@tariq-VirtualBox:~$ sudo passwd sophia  
New password:  
BAD PASSWORD: The password is shorter than 8 characters  
Retype new password:  
passwd: password updated successfully  
tariq@tariq-VirtualBox:~$ sudo passwd olivia  
New password:  
BAD PASSWORD: The password is shorter than 8 characters  
Retype new password:  
passwd: password updated successfully  
tariq@tariq-VirtualBox:~$ sudo passwd emma  
New password:  
BAD PASSWORD: The password fails the dictionary check - it is based on a dictionary word  
Retype new password:  
passwd: password updated successfully  
tariq@tariq-VirtualBox:~$
```

Step 3 -

```
tariq@tariq-VirtualBox:~$ sudo groupadd Abrow174  
tariq@tariq-VirtualBox:~$ sudo usermod -a -G Abrow174 sophia  
tariq@tariq-VirtualBox:~$ sudo usermod -a -G Abrow174 olivia  
tariq@tariq-VirtualBox:~$ sudo usermod -a -G Abrow174 emma  
tariq@tariq-VirtualBox:~$ groups sophia  
sophia : employee Abrow174  
tariq@tariq-VirtualBox:~$ groups olivia  
groups: 'olivia': no such user  
tariq@tariq-VirtualBox:~$ groups olivia  
olivia : payroll Abrow174  
tariq@tariq-VirtualBox:~$ groups emma  
emma : admin Abrow174  
tariq@tariq-VirtualBox:~$
```

Step 4 -

```
tariq@tariq-VirtualBox:~$ sudo mkdir /home/cyse_project
tariq@tariq-VirtualBox:~$ sudo chown root:Abrow174 /home/cyse_project
tariq@tariq-VirtualBox:~$ sudo chmod 775 /home/cyse_project
tariq@tariq-VirtualBox:~$ ls -ld /home/cyse_project
drwxrwxr-x 2 root Abrow174 4096 Dec  6 19:28 /home/cyse_project
tariq@tariq-VirtualBox:~$
```

Step 5 -

```
tariq@tariq-VirtualBox:~$ sudo chmod 770 /home/cyse_project
tariq@tariq-VirtualBox:~$ ls -ld /home/cyse_project
drwxrwx--- 2 root Abrow174 4096 Dec  6 19:28 /home/cyse_project
tariq@tariq-VirtualBox:~$
```

Step 6 -

```
sophia@tariq-VirtualBox:~$ umask 027
sophia@tariq-VirtualBox:~$ umask
0027
sophia@tariq-VirtualBox:~$ touch test
sophia@tariq-VirtualBox:~$ touch test_file.txt
sophia@tariq-VirtualBox:~$ ls -l test_file.txt
-rw-r----- 1 sophia employee 0 Dec  6 19:38 test_file.txt
sophia@tariq-VirtualBox:~$
```

Step 7 -

```
sophia@tariq-VirtualBox:~$ echo "Assistant" > Sophia_homework
sophia@tariq-VirtualBox:~$ cat Sophia_homework
Assistant
sophia@tariq-VirtualBox:~$ ls -l Sophia_homework
-rw-r----- 1 sophia employee 10 Dec  6 19:40 Sophia_homework
sophia@tariq-VirtualBox:~$
```

Step 8 -

```
tariq@tariq-VirtualBox:~$ sudo su
root@tariq-VirtualBox:/home/tariq# cp /home/sophia/Sophia_homework /home/cyse_pr
ject
root@tariq-VirtualBox:/home/tariq# ls -l /home/cyse_project/Sophia_homework
-rw-r----- 1 root root 10 Dec  6 19:51 /home/cyse_project/Sophia_homework
root@tariq-VirtualBox:/home/tariq#
```

Step 9 -

```
emma@tariq-VirtualBox:~$ cat /home/cyse_project/Sophia_homework
cat: /home/cyse_project/Sophia_homework: Permission denied
emma@tariq-VirtualBox:~$
```

```
emma@tariq-VirtualBox:~$ exit
logout
tariq@tariq-VirtualBox:~$
```

Step 10 -

Task B

Step 1 -

```
tariq@tariq-VirtualBox:~$ sudo su
root@tariq-VirtualBox:/home/tariq# chmod g+s /home/cyse_project
root@tariq-VirtualBox:/home/tariq# ls -ld /home/cyse_project
drwxrws--- 2 root Abrow174 4096 Dec  6 19:43 /home/cyse_project
root@tariq-VirtualBox:/home/tariq#
```

Step 2 -

```
root@tariq-VirtualBox:/home/tariq# su - sophia
sophia@tariq-VirtualBox:~$ cp Sophia_homework /home/cyse_project/Sophia_homework
2
sophia@tariq-VirtualBox:~$
```

Step 3 -

```
emma@tariq-VirtualBox:~$ cat /home/cyse_project/Sophia_homework2
Assistant
emma@tariq-VirtualBox:~$
```

Task C

Step 1 -

```
emma@tariq-VirtualBox:~$ sudo su
[sudo] password for emma:
root@tariq-VirtualBox:/home/emma# chmod g-r /home/cyse_project
root@tariq-VirtualBox:/home/emma# ls -ld /home/cyse_project
drwx-ws--- 2 root Abrow174 4096 Dec  6 20:00 /home/cyse_project
root@tariq-VirtualBox:/home/emma#
```

Step 2 -

```
root@tariq-VirtualBox:/home/emma# su - sophia
sophia@tariq-VirtualBox:~$ cp Sophia_homework /home/cyse_project/Sophia_homework
3
sophia@tariq-VirtualBox:~$
```

Step 3 -

```
sophia@tariq-VirtualBox:~$ su - olivia
Password:
olivia@tariq-VirtualBox:~$ cat /home/cyse_project/Sophia_homework3
Assistant
olivia@tariq-VirtualBox:~$
```

Extra Credit

Step 1 -

```
olivia@tariq-VirtualBox:~$ rm /home/cyse_project/Sophia_homework
rm: remove write-protected regular file '/home/cyse_project/Sophia_homework'?
olivia@tariq-VirtualBox:~$
```

Step 2 -

```
root@tariq-VirtualBox:/home/emma# chmod +t /home/cyse_project
root@tariq-VirtualBox:/home/emma# ls -ld /home/cyse_project
drwx-ws--T 2 root Abrow174 4096 Dec  6 20:06 /home/cyse_project
root@tariq-VirtualBox:/home/emma#
```

Step 3 - If Olivia attempts to delete the file using the rm command, she will receive an error message indicating that she does not have the necessary permissions to remove the file. The sticky bit permission ensures that only the file owner can delete or rename their files within the directory.