Task 1-
Regex symbols

? - This indicates *zero or one* occurrence of the preceding element. For example, colou?r, matches both "color" and "colour".

***** - This indicates zero or more occurrences of the preceding element. For example, ab*c, matches "ac", "abc", "abbc", "abbbc", and so on.

+ - This indicates one or more occurrences of the preceding element. For example, ab+c, matches "abc", "abbc", "abbbc", and so on, but not "ac".

^ - Matches the starting position within the string. It matches the starting position of any line.

$ - Matches the ending position of the string or the position just before a string-ending newline. It matches the ending position of any line.

e.g.

- ^[0-9] - everything that starts from a digit
- [0-9]$ - everything that ends with a digit

Task 2 -

Features of the Linux Operating system:

Free and Open Source, Multiuser Capacity, Multitasking, Security, Graphical User Interface (GUI), File System, Application Support, Frequent New Updates, Portability, Performance, Lightweight Infrastructure, Live CD/USB, Support's customized keyboard, Compatible with cloud computing, Interoperability, Shell

Task 3 - What is Kernel?

In a Linux OS, the kernel is the core program that manages all the computer's hardware and provides services to other programs.This provides a platform for programs and various services to run on top of it.

Task 4 - What is BASH?

BASH stands for Bourne Again SHell. It's a command-line interpreter and scripting language used on Linux and other Unix-like operating systems. Bash is the default shell

for most Linux distributions and is used for interacting with the system through text-based commands or executing scripts.

Task 5 -

Difference between LInux and Windows

Linx	Windows
Open source OS	Not open source OS
Free of cost	Paid
More efficient and stable, especially for servers and developers.	Less efficient due to resource-intensive processes.
Uses forward slash (/) for directory separation	Uses backslash (\) for directory separation
Root user has all administrative privileges.	Administrator user has all administrative privileges.

Task 6 - What are the basic components of Linux? Describe each in detail with diagrams

The core components of Linux include the Kernel, Shell, System Libraries, System Utilities, and Hardware.

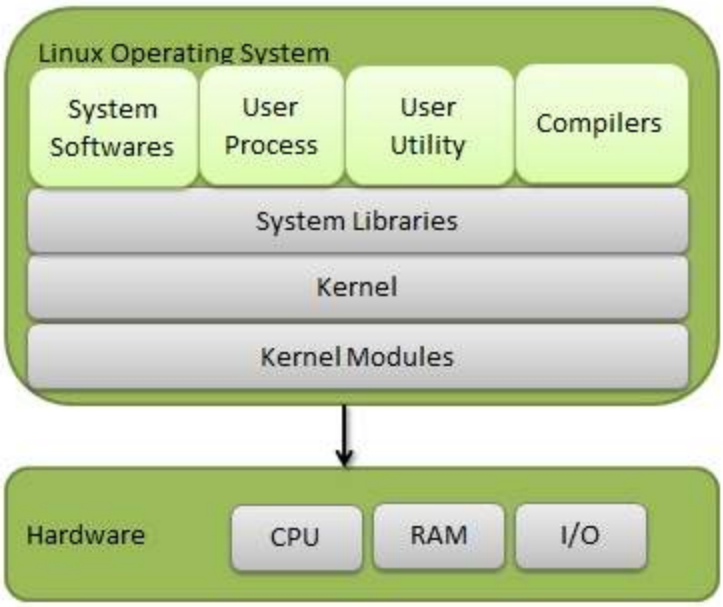
1. Kernel:
Role: The Kernel is the core of the Linux operating system, acting as the central controller between hardware and software.
Functions: It manages system resources like memory, CPU, input/output, and network interfaces.
Key Features:
Process Management: Handles the creation, scheduling, and termination of processes.
Memory Management: Allocates and manages memory for processes, including virtual memory.
Device Drivers: Provides interfaces for interacting with hardware devices.
File System Management: Manages how files are stored and accessed.
Security: Implements security mechanisms like user authentication and access control.
Networking: Facilitates network communication between the system and other devices.

2. Shell:
Role: The Shell is the command-line interpreter that allows users to interact with the Linux operating system by entering commands.
Function: The Shell interprets commands and executes them, interfacing with the Kernel.
Common Shells: Bash, Zsh, and Korn Shell are popular examples.

3. System Libraries:
Role: System Libraries provide a set of pre-written code that applications can use without needing to implement the functionality themselves.
Function: They offer a way for applications to interact with the Kernel without needing to directly access it.
Examples: GLIBC (GNU C Library) is a common system library.

4. System Utilities:
Role: System Utilities are small programs that perform specific, often system-related tasks.
Function: They provide users with tools for system maintenance, configuration, and management.
Examples: Commands like ls, cp, mkdir, and rm are system utilities.

5. Hardware:
Role: The Hardware is the physical components of the computer system, such as the CPU, RAM, hard disk, and peripherals.
Function:
The Kernel interacts directly with the Hardware to manage resources and execute processes.



Task 7 - Is it legal to edit Kernel ? When do you think we have to in case?

Yes, it is legal to edit the Linux Kernel. Linux is released under the GNU General Public License (GPL), which allows for modification and redistribution. You can modify the kernel, its device drivers, and other components.

Task 8 - what is LILO? Explain

LILO (Linux Loader), is a boot loader used to load the Linux kernel and start the operating system when a computer boots up

Task 9 - What is a shell? How many shells are there and what are they ? can you explain

A shell is a program that provides a user interface for interacting with an operating system (OS). It acts as a command-line interpreter, allowing users to type commands and execute them. There are numerous types of shells,
Bash (Bourne Again Shell)
csh (C shell)
zsh (Z shell)
FISh (Friendly Interactive Shell).

Task 10 - What is swap space?

Swap space, also known as virtual memory, is a storage area on a computer's hard drive or SSD that acts as an extension of its physical RAM (Random Access Memory). It's used when the RAM is full, when RAM is full, the operating system can move inactive data (processes or files) to swap space. This frees up RAM for currently running applications, preventing the system from crashing or becoming unresponsive.

Task 11 - What is Mount ? how do you mount and unmount file system in Linux?

In Linux, "mount" refers to attaching a file system (like a USB drive or a network share) to a directory in your existing file system.

mount /dev/sdb1 /mnt/new_drive (mounts the first partition of the second hard drive to /mnt/new_drive).

umount /mnt/new_drive (unmounts the file system mounted at /mnt/new_drive)

Task 12 - What is chmod command ? how to use it?

The chmod command in Linux changes file permissions, determining who can read, write, or execute a file or directory.

chmod [who] [permissions] [file/directory]

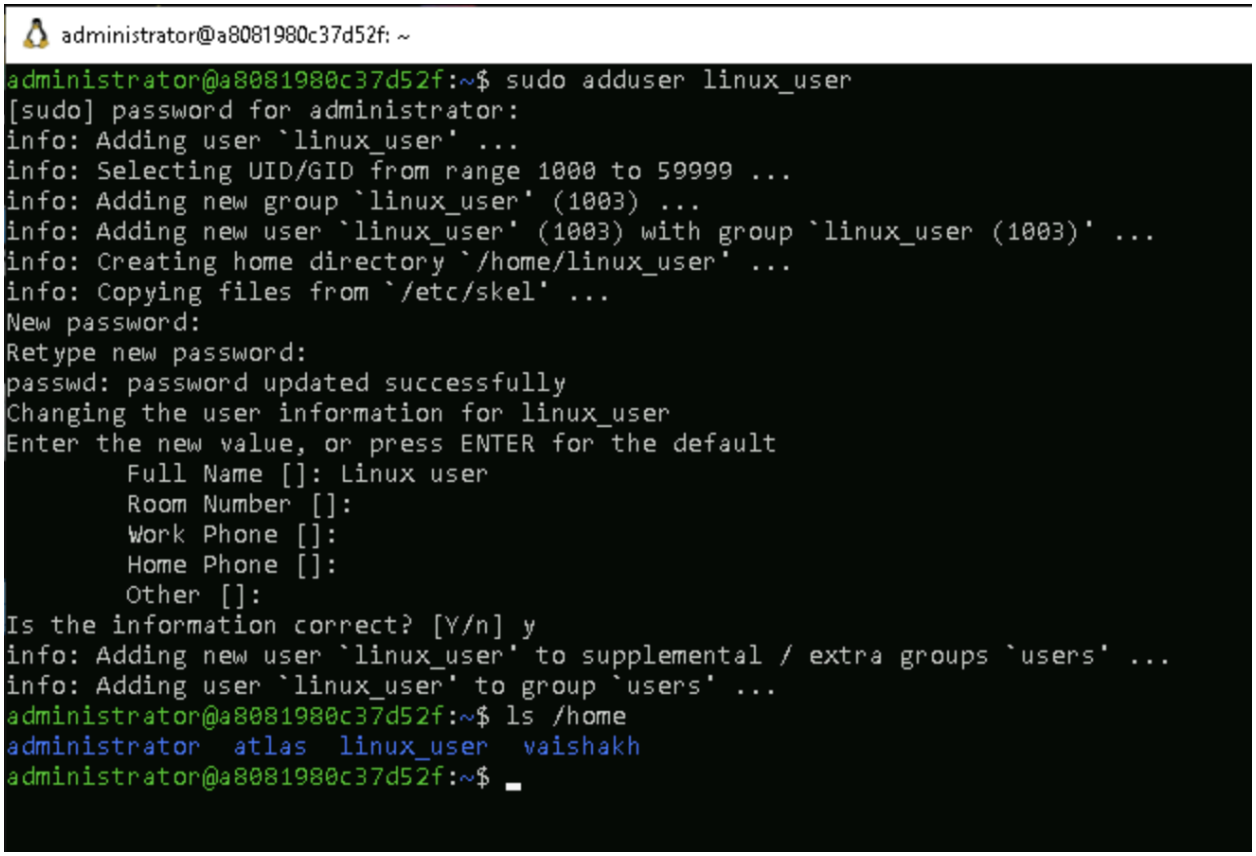
chmod [octal number] [file/directory]

First digit specifies the permission for Owner.
Second digit specifies the permission for the Group.
Third digit specifies the permission for Others.

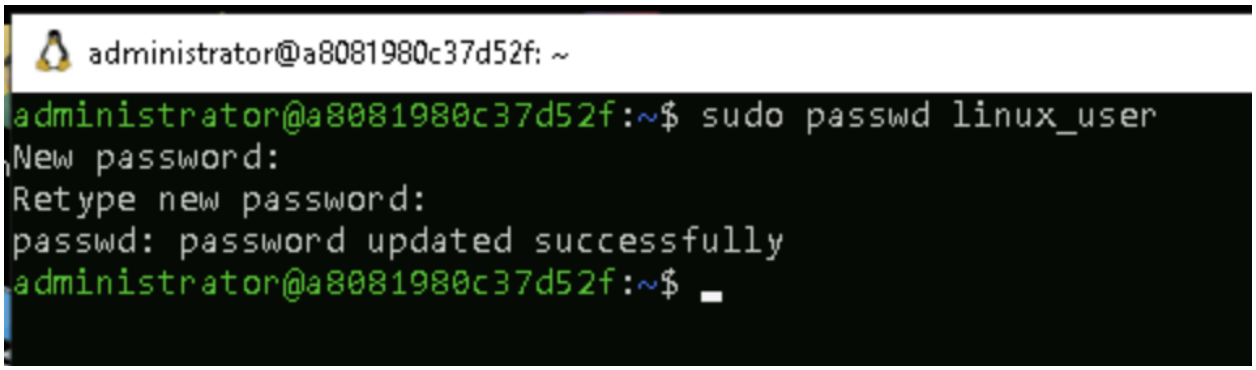
The digits are calculated by adding the values of the individual permissions
4 Read Permission
2 Write Permission
1 Execute Permission

Eg: chmod 777 file.txt will give (4+2+1) to Owner, (4+2+1) to the Group, (4+2+1) to Others.

Task 13 - Can you add a new user account? Create a new user in different ways and paste ss



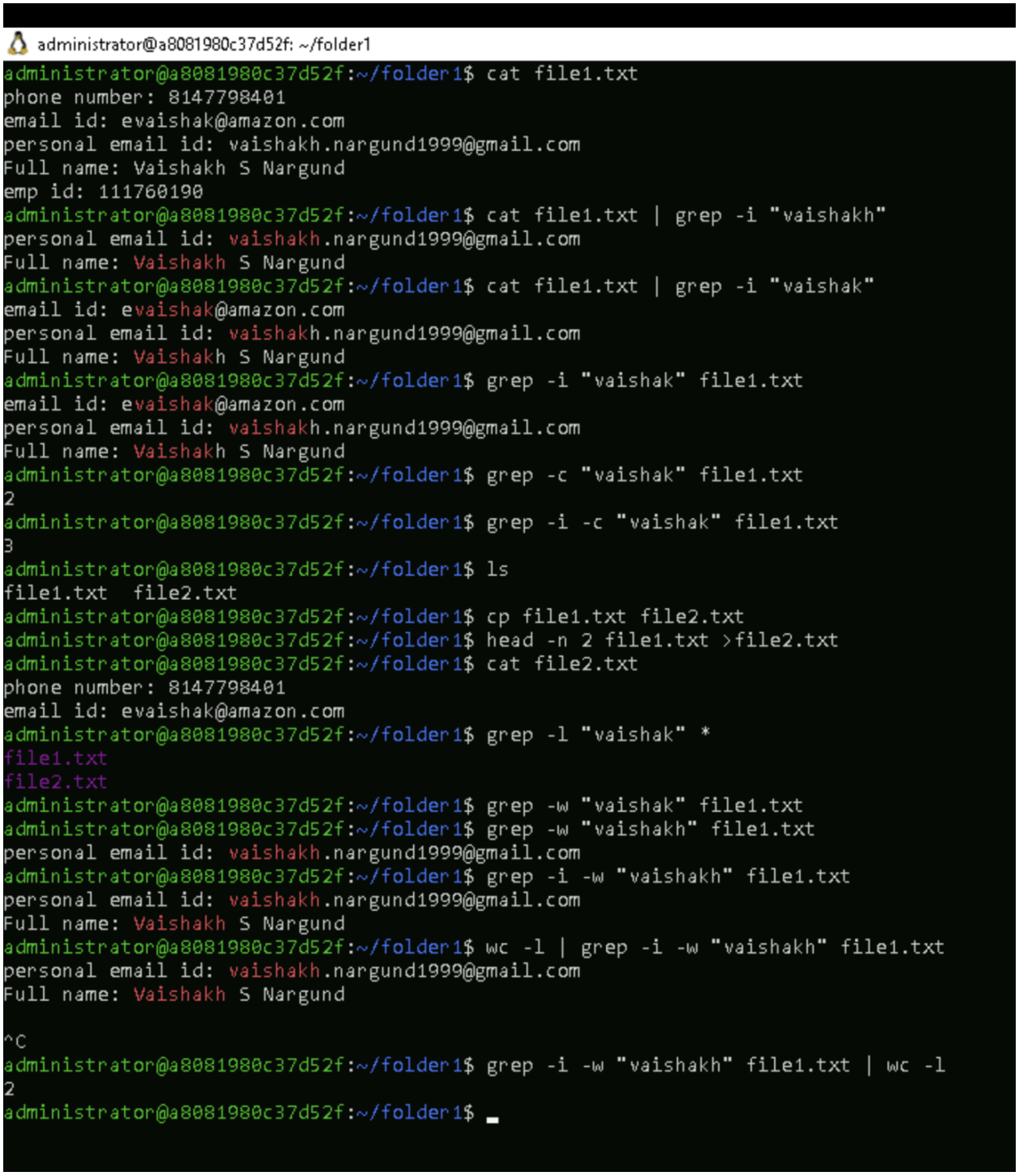
Task 14 - Can you change the password of a user?
How do you do that?



Task 15 - Difference between Process and Thread?

A process is a program in execution, while a thread is a unit of execution within a process. Processes are independent, with their own memory space, while threads within the same process share memory and resources. Threads are lighter than processes, meaning they require fewer resources and have faster context switching.

Task 16 - usage of grep



Task 17 -

```
linux_user
administrator@a8081980c37d52f:~/folder1$ awk -F: '{ if ($7 == "/bin/bash"){ print $1 }}' /etc/passwd
root
administrator
vaishakh
atlas
linux_user
```

Task 18 -

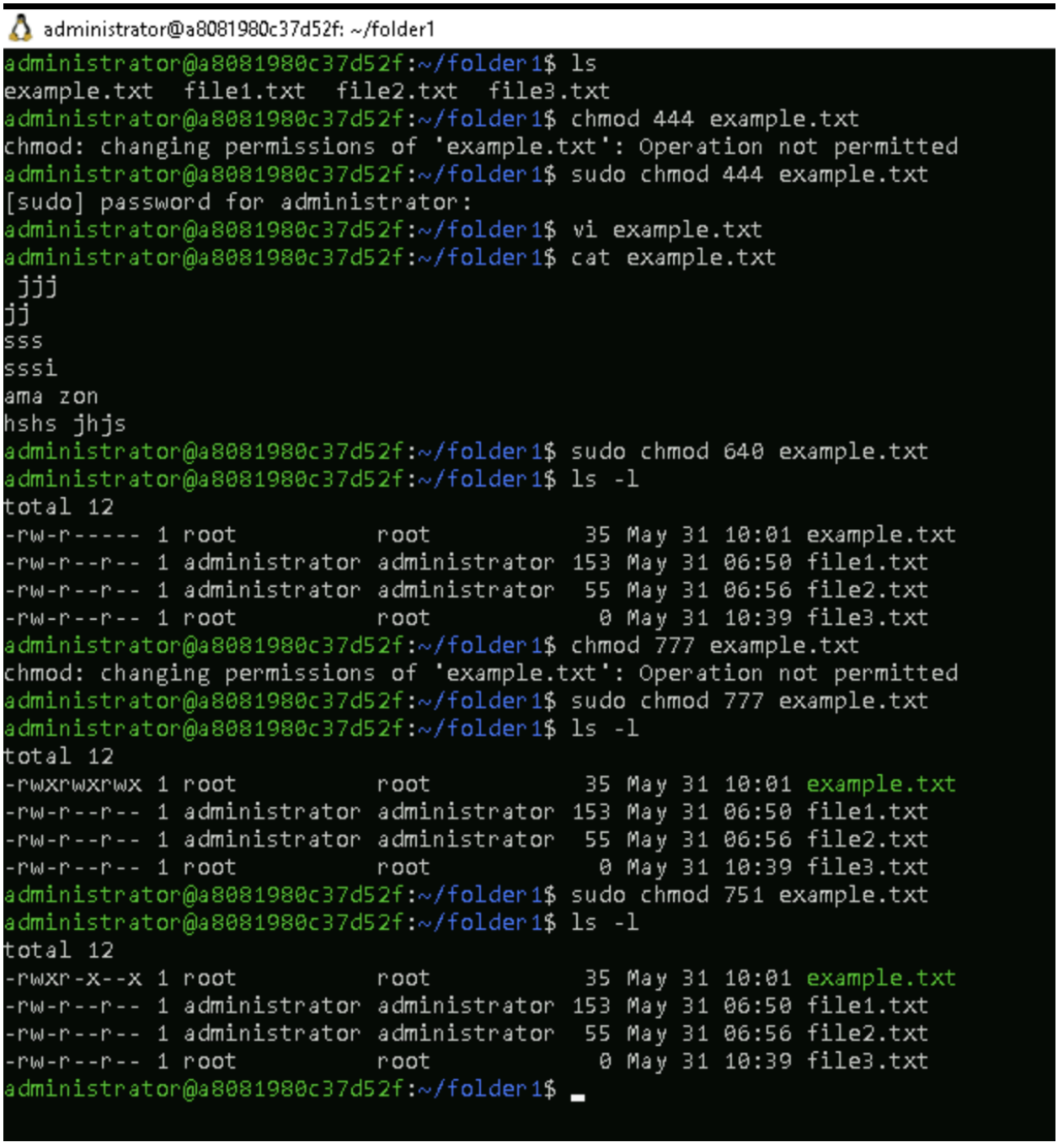
root@a8081980c37d52f: /home/administrator/folder1

```
root@a8081980c37d52f:/home/administrator/folder1# ls -l
total 12
-rw-r--r-- 1 root          root          35 May 31 10:01 example.txt
-rw-r--r-- 1 administrator administrator 153 May 31 06:50 file1.txt
-rw-r--r-- 1 administrator administrator  55 May 31 06:56 file2.txt
root@a8081980c37d52f:/home/administrator/folder1#
```

Task 19 -

By default, newly created files in Linux have the following permissions:
Owner: Read and write access (rw-).
Group: Read-only access (r--).
Others: Read-only access (r--).

Task 20,21,22,23,24



Task 25 -

```
administrator@a8081980c37d52f:~/folder1$ chown -c vaishakh example.txt
chown: changing ownership of 'example.txt': Operation not permitted
administrator@a8081980c37d52f:~/folder1$ sudo chown -c vaishakh example.txt
changed ownership of 'example.txt' from root to vaishakh
administrator@a8081980c37d52f:~/folder1$
```

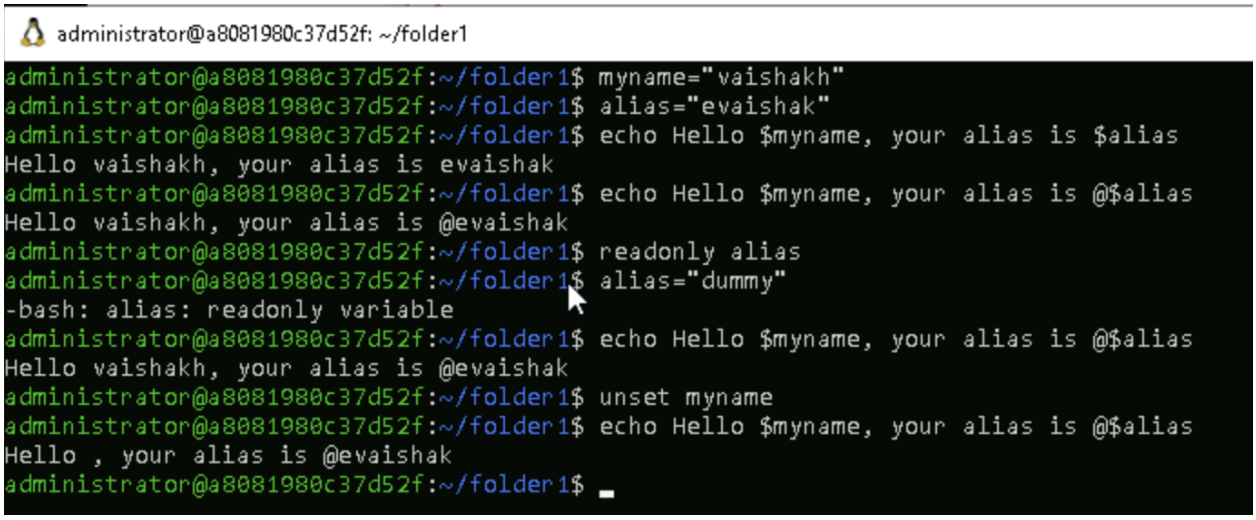
Task 26 - what is process

A process is a program that is currently running or executing.

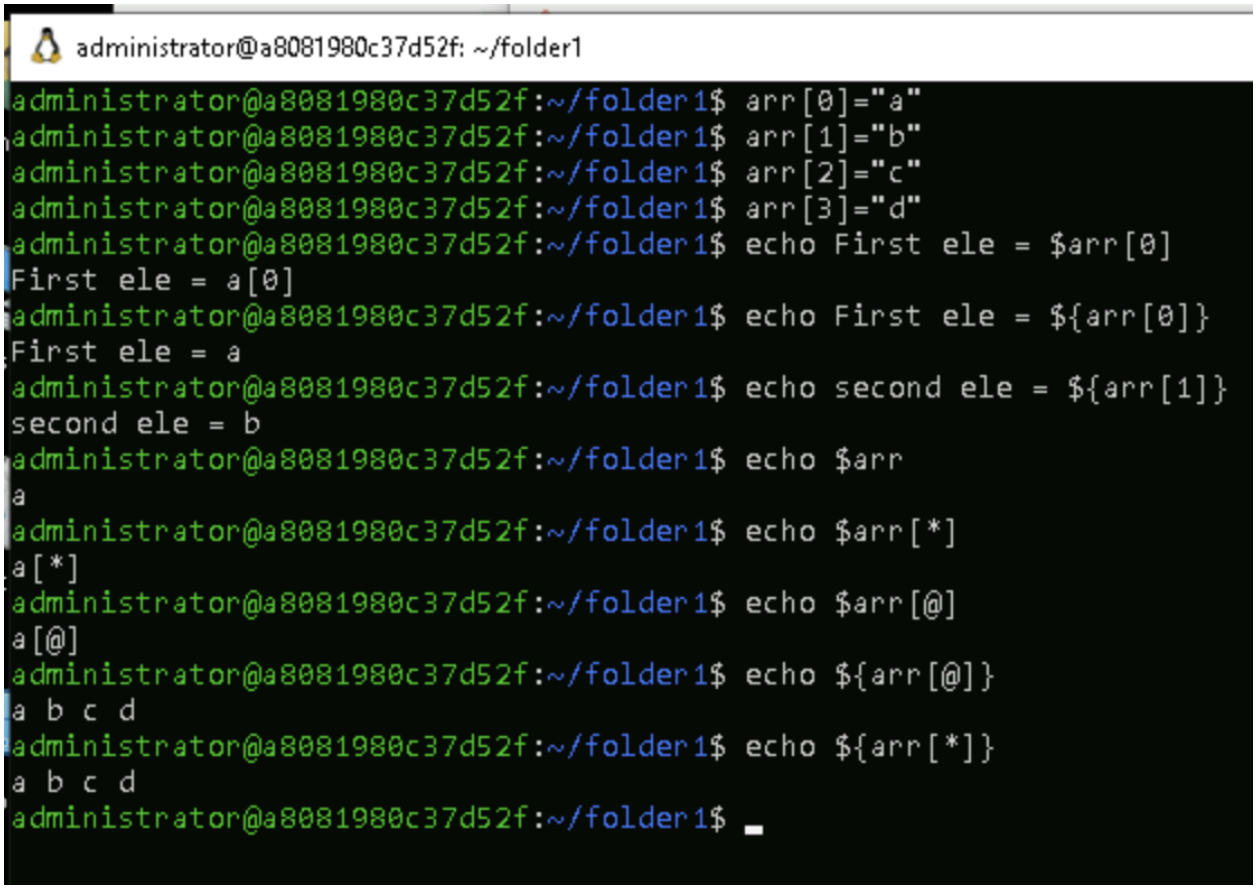
Task 27,28,29 -

```
Administrator@a8081980c37d52f MINGW64 ~
$ jobs
[1]+  Running                 sleep 60 &

Administrator@a8081980c37d52f MINGW64 ~
$ ps
      PID    PPID    PGID     WINPID   TTY         UID    STIME COMMAND
     1871    1835    1871       7100  pty0      197108 16:47:28 /usr/bin/ps
     1864    1835    1864       1972  pty0      197108 16:47:12 /usr/bin/sleep
     1834       1    1834       9644  ?         197108 16:30:45 /usr/bin/mintty
     1835    1834    1835       4436  pty0      197108 16:30:45 /usr/bin/bash

Administrator@a8081980c37d52f MINGW64 ~
$ ps -f
     UID     PID    PPID  TTY        STIME COMMAND
Administ    1864    1835 pty0     16:47:12 /usr/bin/sleep
Administ    1834       1 ?        16:30:45 /usr/bin/mintty
Administ    1835    1834 pty0     16:30:45 /usr/bin/bash
Administ    1875    1835 pty0     16:48:09 /usr/bin/ps

Administrator@a8081980c37d52f MINGW64 ~
```

Task - 30,31,32



Task 33,34



Task 35 -

Output of the script:
0
1 0
2 1 0
3 2 1 0
4 3 2 1 0
5 4 3 2 1 0
6 5 4 3 2 1 0
7 6 5 4 3 2 1 0
8 7 6 5 4 3 2 1 0
9 8 7 6 5 4 3 2 1 0