Part A

What will the following commands do?

1. echo "Hello, World!"

Ans: **Explanation**

* The echo command **prints** text to the terminal.
* The text inside "" (double quotes) is displayed as output.

| **Option** | **Description** | **Example** | **Output** |
| --- | --- | --- | --- |
| echo "text" | Prints the given text. | echo "Hello, World!" | Hello, World! |
| echo -n "text" | Prints text **without a newline**. | echo -n "No New Line" | No New Line (cursor stays on the same line) |
| echo -e "text" | Enables **escape sequences** like \n (new line) and \t (tab). | echo -e "Line1\nLine2" | Line1  Line2 |
| echo -E "text" | Disables escape sequences (default behavior). | echo -E "Hello\nWorld" | Hello\nWorld (does not interpret \n) |
| echo -e "Col1\tCol2" | Adds **tabs** between words. | echo -e "Name\tAge" | Name Age |

1. name="Productive"

**Explanation**

* This **assigns** the string "Productive" to the variable name in **Bash**.
* **No spaces are allowed** around = (i.e., name = "Productive" ❌ would cause an error).

| **Option** | **Description** | **Example** | **Output** |
| --- | --- | --- | --- |
| name="John" | Assigns a value to a variable (**no spaces around =**). | echo "$name" | John |
| $variable | Accesses the **value** of a variable. | echo "Hello, $name" | Hello, John |
| ${variable} | Alternative way to use a variable. | echo "${name}123" | John123 |
| unset variable | Deletes the variable from memory. | unset name | (Variable is removed) |
| readonly variable | Makes a variable **read-only** (cannot be changed). | readonly age=30 | (Now age cannot be modified) |
| export variable | Makes the variable **available to child processes**. | export PATH=$PATH:/new/path | Adds /new/path to PATH |

1. touch file.txt

 The touch command is used to **create an empty file** or **update the timestamp** of an existing file.

 If file.txt **does not exist**, touch creates it.

 If file.txt **already exists**, touch updates its **last modified timestamp** without changing its contents.

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| touch file.txt | Creates a **new empty file** or updates the timestamp. | touch newfile.txt |
| touch file1 file2 | Creates multiple files. | touch a.txt b.txt |
| touch -c file.txt | **Does not create** the file if it doesn't exist. | touch -c missing.txt |
| touch -m file.txt | Updates **only the modification time**, not access time. | touch -m example.txt |
| touch -a file.txt | Updates **only the access time**, not modification time. | touch -a readme.txt |
| touch -t YYYYMMDDhhmm file.txt | Sets a **specific timestamp**. | touch -t 202403011200 file.txt |
| touch -r old.txt new.txt | Copies timestamp from another file. | touch -r ref.txt copy.txt |

1. ls -a

* The ls command lists **files and directories** in the current directory.
* The -a (**all**) option **shows hidden files** (files starting with .).
* In Linux, hidden files are **configuration files** (e.g., .bashrc, .gitignore).

| **File/Directory** | **Meaning** |
| --- | --- |
| . | The **current directory** |
| .. | The **parent directory** |
| .bashrc | A hidden configuration file |
| .profile | Another hidden file |
| document.txt | A **regular file** |
| folder/ | A **directory** |

1. rm file.txt

**Explanation**

* The rm (**remove**) command **deletes a file** in Linux.
* Once deleted, **it cannot be recovered** unless you have a backup.
* If file.txt is **write-protected**, it will ask for **confirmation** before deleting.
* **Command Options**

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| rm file.txt | Deletes a file. | rm myfile.txt |
| rm -i file.txt | Asks before deleting. | rm -i important.txt |
| rm -f file.txt | Force delete **without confirmation**. | rm -f log.txt |
| rm -v file.txt | Shows **verbose output** (what’s deleted). | rm -v oldfile.txt |
| rm \*.txt | Deletes **all .txt files** in the directory. | rm \*.log |

1. cp file1.txt file2.txt.

* The cp (**copy**) command is used to **copy files and directories**.
* file1.txt is copied to file2.txt, creating a **duplicate**.
* If file2.txt **already exists**, it will be **overwritten** **without confirmation** (unless -i is used).

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| cp file1 file2 | Copies a file. | cp a.txt b.txt |
| cp -i file1 file2 | **Asks before overwriting**. | cp -i report.doc backup.doc |
| cp -v file1 file2 | **Shows what’s being copied**. | cp -v notes.txt copy.txt |
| cp -r dir1 dir2 | Copies a **directory** recursively. | cp -r src/ backup/ |
| cp -u file1 file2 | **Copies only if the destination is older**. | cp -u data.txt backup.txt |

1. mv file.txt /path/to/directory/

* the mv (**move**) command is used to **move or rename files and directories**.
* This command **moves** file.txt from its current location to /path/to/directory/.
* If a file **with the same name** exists in /path/to/directory/, it **will be overwritten without confirmation** (unless -i is used).

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| mv file.txt /path/ | Moves a file to a directory. | mv report.txt /home/user/ |
| mv oldname.txt newname.txt | Renames a file. | mv notes.txt summary.txt |
| mv -i file.txt /path/ | **Asks before overwriting** if the file exists. | mv -i data.txt /backup/ |
| mv -v file.txt /path/ | **Shows what’s being moved**. | mv -v log.txt /var/logs/ |
| mv -u file.txt /path/ | **Moves only if the destination is older**. | mv -u script.sh /scripts/ |

1. chmod 755 script.sh

* The chmod (**change mode**) command is used to **modify file permissions** in Linux.
* 755 sets **read, write, and execute** permissions for the **owner**, and **read and execute** permissions for **group and others**.
* This is commonly used to make script.sh executable for everyone.

| User | Permissions (755) | Explanation |
| --- | --- | --- |
| Owner | 7 = rwx | Read, Write, Execute |
| Group | 5 = r-x | Read & Execute (No Write) |
| Others | 5 = r-x | Read & Execute (No Write) |

1. grep "pattern" file.txt

* The grep (**Global Regular Expression Print**) command **searches for a specific pattern** in file.txt.
* It prints **all lines** in file.txt that contain "pattern".

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| grep "text" file.txt | Searches "text" in file.txt. | grep "error" log.txt |
| grep -i "text" file.txt | **Case-insensitive** search. | grep -i "warning" syslog |
| grep -w "word" file.txt | Matches **whole words only**. | grep -w "root" users.txt |
| grep -n "text" file.txt | **Shows line numbers**. | grep -n "failed" auth.log |
| grep -l "text" \*.txt | Lists **files containing text**. | grep -l "TODO" \*.sh |
| grep -r "text" dir/ | Searches recursively in **all files** inside a directory. | grep -r "ERROR" /var/logs/ |
| grep -A 2 "text" file.txt | Shows **2 lines after** the match. | grep -A 2 "404" logs.txt |
| grep -B 2 "text" file.txt | Shows **2 lines before** the match. | grep -B 2 "error" logs.txt |
| grep -C 2 "text" file.txt | Shows **2 lines before & after**. | grep -C 2 "error" logs.txt |

1. kill PID

* The kill command **terminates a process** using its **Process ID (PID)**.
* PID is the **unique ID assigned** to a running process in Linux.
* By default, kill PID sends **signal 15 (SIGTERM)** to **gracefully terminate** the process.

| **Signal** | **Number** | **Description** | **Usage Example** |
| --- | --- | --- | --- |
| SIGTERM | 15 | **Gracefully stops** a process. | kill 1234 |
| SIGKILL | 9 | **Force kills** a process immediately. | kill -9 1234 |
| SIGHUP | 1 | **Reloads** a process. | kill -1 1234 |
| SIGSTOP | 19 | **Pauses** a process. | kill -19 1234 |
| SIGCONT | 18 | **Resumes** a paused process. | kill -18 1234 |

1. mkdir mydir && cd mydir && touch file.txt && echo "Hello, World!" > file.txt && cat file.txt

**Explanation**

This is a **chained command** using &&, meaning:

* Each command runs **only if the previous command succeeds**.
* It **creates a directory**, moves into it, creates a file, writes text, and displays the file content.

**Step-by-Step Breakdown**

| **Command** | **Explanation** |
| --- | --- |
| mkdir mydir | Creates a directory named mydir. |
| cd mydir | Moves into mydir. |
| touch file.txt | Creates an empty file named file.txt. |
| echo "Hello, World!" > file.txt | Writes "Hello, World!" into file.txt. |
| cat file.txt | Displays the content of file.txt. |

1. ls -l | grep ".txt"

* ls -l → Lists **all files and directories** in **long format** (including permissions, size, date).
* grep ".txt" → **Filters** the output to **show only files containing .txt** in their names.

1. cat file1.txt file2.txt | sort | uniq

* This command **combines the contents** of file1.txt and file2.txt, **sorts** them, and removes **duplicate lines**.

| **Command** | **Description** |
| --- | --- |
| cat file1.txt file2.txt | Displays the content of both files. |
| sort | Sorts the combined output (required for uniq to work). |
| uniq | Removes **duplicate lines** (only works on adjacent lines). |

1. ls -l | grep "^d"

* ls -l → Lists **files and directories** in **long format**.
* grep "^d" → Filters **only directories**.

| **Pattern** | **Explanation** |
| --- | --- |
| ^ | Matches **the beginning of the line**. |
| d | Indicates a **directory** in ls -l output. |

1. grep -r "pattern" /path/to/directory/

* grep → Searches for a specific **pattern** in files.
* -r (**recursive**) → Searches inside all **files and subdirectories**.
* "pattern" → The **text or keyword** you want to find.
* /path/to/directory/ → The **directory** where the search starts.

1. cat file1.txt file2.txt | sort | uniq –d

* cat file1.txt file2.txt → **Concatenates** (combines) the contents of file1.txt and file2.txt.
* sort → **Sorts** the lines **alphabetically** (required for uniq to work correctly).
* uniq -d → **Displays only duplicate lines** (lines that appear in both files).

1. chmod 644 file.txt

The chmod (**change mode**) command is used to **modify file permissions** in Linux.

* 644 sets:
  + **Owner:** rw- (**Read & Write**)
  + **Group:** r-- (**Read-Only**)
  + **Others:** r-- (**Read-Only**)

This means:

* The **owner** of file.txt can **read and write** the file.
* **Group members and others** can **only read** the file.
* **No one except the owner can modify the file.**

**Understanding 644 Permissions**

| **User** | **Permission (644)** | **Explanation** |
| --- | --- | --- |
| **Owner** | 6 = rw- | **Read, Write** (No Execute) |
| **Group** | 4 = r-- | **Read-Only** |
| **Others** | 4 = r-- | **Read-Only** |

1. cp -r source\_directory destination\_directory

* The cp (**copy**) command is used to **copy files and directories**.
* The -r (**recursive**) option ensures that **all files and subdirectories** inside source\_directory are copied to destination\_directory.
* If destination\_directory **does not exist**, it will be **created automatically**.

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| cp -r source dest | **Copies a directory recursively**. | cp -r mydir /backup/ |
| cp -rv source dest | **Verbose mode** (shows copied files). | cp -rv mydir /backup/ |
| cp -rn source dest | **Does not overwrite existing files**. | cp -rn mydir /backup/ |
| cp -rp source dest | **Preserves file attributes**. | cp -rp mydir /backup/ |
| cp -u source dest | **Copies only newer files**. | cp -ru mydir /backup/ |

1. ind /path/to/search -name "\*.txt"

* The find command is used to **search for files and directories** in Linux.
* /path/to/search → Specifies the **starting directory** for the search.
* -name "\*.txt" → Finds **files ending with .txt** (case-sensitive).

| **Option** | **Description** | **Example** |
| --- | --- | --- |
| find /path -name "\*.txt" | **Finds all .txt files** (case-sensitive). | find /data -name "\*.txt" |
| find /path -iname "\*.txt" | **Finds .txt files (case-insensitive)**. | find /data -iname "\*.TXT" |
| find /path -type d -name "folder" | Finds a **directory** named "folder". | find / -type d -name "backup" |
| find /path -size +10M -name "\*.log" | Finds .log files **larger than 10MB**. | find /var/log -size +10M -name "\*.log" |
| find /path -mtime -7 -name "\*.txt" | Finds .txt files **modified in the last 7 days**. | find /home -mtime -7 -name "\*.txt" |
| find /path -empty -type f | Finds **empty files**. | find /tmp -empty -type f |
| find /path -exec command {} \; | Executes a command on found files. | find /logs -name "\*.log" -exec rm {} \; |

1. chmod u+x file.txt

* The chmod (**change mode**) command is used to **modify file permissions**.
* u+x means:
  + **u (user/owner)** → Applies to the **file owner**.
  + **+x (add execute)** → Adds **execute** permission to the owner.
* This allows the owner to **run the file as a script or program**.

**chmod u+x vs. Other Permission Modifications**

| **Command** | **Effect** |
| --- | --- |
| chmod u+x file.txt | Adds **execute** permission for the **owner**. |
| chmod g+x file.txt | Adds **execute** permission for the **group**. |
| chmod o+x file.txt | Adds **execute** permission for **others**. |
| chmod a+x file.txt | Adds **execute** permission for **everyone**. |
| chmod u-x file.txt | Removes **execute** permission from the **owner**. |

1. echo $PATH

* The $PATH variable stores a **list of directories** where the system looks for executable files.
* Running echo $PATH **displays the current search paths** for executables.

| **Part** | **Description** |
| --- | --- |
| /usr/local/sbin | Stores system administrator commands. |
| /usr/local/bin | Stores locally installed programs. |
| /usr/bin | Stores common system binaries (e.g., ls, grep). |
| /bin | Stores essential user binaries (e.g., cat, echo). |
| /home/user/scripts | Custom scripts added by the user. |