**🔹 Foundational Skills**

1. **Basic Commands**
   * ls, cd, pwd, cp, mv, rm, mkdir, rmdir
   * cat, less, more, head, tail
   * man, which, whoami, id
2. **File & Directory Management**
   * File permissions (chmod, chown, umask)
   * Understanding file types (ls -l, file, symbolic vs hard links)
   * Hidden files and dotfiles
3. **Text File Editing**
   * nano, vim, emacs (choose one to master)
   * Searching text with grep, find, locate
4. **Package Management**
   * Debian-based: apt, dpkg
   * RHEL-based: yum, dnf, rpm
   * Arch-based: pacman, yay

**🔹 Intermediate Skills**

1. **User & Group Management**
   * adduser, usermod, groupadd, passwd
   * /etc/passwd, /etc/group, /etc/shadow
2. **Process Management**
   * ps, top, htop, kill, nice, renice, jobs, bg, fg
3. **Disk & File System Management**
   * df, du, mount, umount
   * fdisk, lsblk, blkid, mkfs, fsck
   * LVM basics
4. **Networking**
   * ip, ifconfig, ping, netstat, ss, traceroute, dig, nslookup
   * Configuring static IPs, DNS, gateways
5. **System Services**
   * systemctl, service, journalctl
   * Enabling, disabling, starting, stopping services
6. **Logs and Monitoring**
   * System logs: /var/log/
   * dmesg, uptime, iostat, vmstat, free, watch

**🔹 Scripting and Automation**

1. **Shell Scripting (Bash)**

* Variables, conditionals, loops
* Functions, exit codes, error handling
* Cron jobs: crontab, scheduling scripts

1. **Environment Customization**

* .bashrc, .profile, environment variables ($PATH, $HOME)

**🔹 Advanced Topics**

1. **Security**

* File permissions, sudo, su
* SSH configuration and hardening
* Firewall: ufw, iptables, firewalld
* SELinux or AppArmor basics

1. **System Performance Tuning**

* top, iotop, strace, perf
* Kernel parameters: sysctl

1. **Kernel & Boot Process**

* GRUB, initramfs, systemd targets
* Rebuilding the kernel (advanced)

1. **Virtualization & Containers**

* VirtualBox, KVM, QEMU
* Docker: images, containers, volumes, networking
* Podman, LXC

1. **Configuration Management**

* Ansible, Puppet, Chef, SaltStack (learn one)

1. **Linux Filesystem Internals**

* /proc, /sys, /dev
* Inodes, superblocks

**🔹 Bonus / Optional Topics**

* **Linux for Developers**
  + GCC, GDB, Makefiles, Git, CMake
  + Debugging with strace, lsof, valgrind
* **Linux for Networking**
  + IPTables/NFTables
  + VPN setup, OpenSSL, WireGuard
* **Linux in the Cloud**
  + Linux servers on AWS, GCP, Azure
  + Cloud-init, SSH keys, Infrastructure as Code (Terraform)

**🔧 1. File and Directory Management**

| **Command** | **Description** | **Key Options** | **Examples** |
| --- | --- | --- | --- |
| ls | List directory contents | -l, -a, -h, --color | ls -lah |
| cd | Change directory | .., /, ~ | cd /var/log |
| pwd | Print working directory | N/A | pwd |
| mkdir | Make directories | -p (parents) | mkdir -p /tmp/dir1/dir2 |
| rmdir | Remove empty directories | N/A | rmdir empty\_dir |
| rm | Remove files/directories | -r, -f | rm -rf /tmp/test |
| cp | Copy files/directories | -r, -a, -v | cp -a source/ dest/ |
| mv | Move/rename files | N/A | mv old.txt new.txt |
| find | Find files | -name, -type, -exec | find . -name "\*.log" |
| stat | Display detailed file info | N/A | stat myfile.txt |

**📄 2. File Viewing & Manipulation**

| **Command** | **Description** | **Key Options** | **Examples** |
| --- | --- | --- | --- |
| cat | Concatenate & view files | N/A | cat file.txt |
| tac | View file in reverse | N/A | tac file.txt |
| less | View large files | Search with / | less /var/log/syslog |
| more | Similar to less | N/A | more file.txt |
| head | Show first N lines | -n | head -n 20 file.txt |
| tail | Show last N lines | -f for live updates | tail -f access.log |
| cut | Extract columns | -d, -f | cut -d ':' -f 1 /etc/passwd |
| awk | Pattern scanning & processing | '{print $1}' | awk '{print $2}' file.txt |
| sed | Stream editing | 's/foo/bar/g' | sed 's/old/new/g' file.txt |
| wc | Word/line count | -l, -w, -c | wc -l file.txt |

**🔍 3. Search & Filter Tools**

| **Command** | **Description** | **Key Options** | **Examples** |
| --- | --- | --- | --- |
| grep | Search in files | -r, -i, -E | grep -i "error" logs.txt |
| egrep | Extended grep | Supports regex | `egrep "foo |
| fgrep | Fixed string grep | Faster, no regex | fgrep "exact" file |
| locate | Fast file finding | Uses a DB | locate passwd |
| updatedb | Update DB for locate | N/A | sudo updatedb |
| which | Locate binary in PATH | N/A | which python3 |
| type | Show command type | N/A | type ls |

**⚙️ 4. Permissions and Ownership**

| **Command** | **Description** | **Key Options** | **Examples** |
| --- | --- | --- | --- |
| chmod | Change file permissions | +x, 755, u+x | chmod +x script.sh |
| chown | Change file owner | user:group | chown root:admin file.txt |
| chgrp | Change group ownership | N/A | chgrp admin file.txt |
| umask | Default permission mask | N/A | umask 022 |

**📦 5. Package Management**

**🐧 Debian/Ubuntu (APT)**

| **Command** | **Description** |
| --- | --- |
| apt update | Update repo cache |
| apt upgrade | Upgrade all packages |
| apt install pkg | Install a package |
| apt remove pkg | Remove a package |
| dpkg -i file.deb | Install .deb manually |

**🔴 Red Hat/CentOS (YUM/DNF)**

| **Command** | **Description** |
| --- | --- |
| yum install / dnf install | Install package |
| rpm -i | Install RPM |
| yum update | Update packages |

**🧵 6. Processes & System Monitoring**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| ps | Show running processes | ps aux |
| top | Live process view | top |
| htop | Enhanced top (interactive) | htop |
| kill | Send signal to PID | kill -9 1234 |
| killall | Kill by name | killall firefox |
| nice / renice | Adjust priority | nice -n 10 command |
| jobs | Background jobs | jobs |
| bg / fg | Resume jobs | fg %1 |

**🌐 7. Networking**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| ping | Check host reachability | ping google.com |
| traceroute | Path to host | traceroute 8.8.8.8 |
| netstat | Network stats (deprecated) | netstat -tuln |
| ss | Modern socket stats | ss -tulnp |
| ip | Network config | ip addr, ip route |
| ifconfig | Legacy interface tool | ifconfig eth0 |
| curl | Transfer data | curl https://example.com |
| wget | Download files | wget https://... |
| scp | Secure copy | scp file user@host:/path |
| rsync | Sync files | rsync -avz src/ dest/ |

**📁 8. Archiving & Compression**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| tar | Archive files | tar -czvf archive.tar.gz folder/ |
| gzip / gunzip | Compress files | gzip file.txt |
| zip / unzip | Zip files | zip archive.zip file |
| xz / unxz | High compression | xz file |

**🖥️ 9. Disk Usage & Filesystems**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| df | Disk space | df -h |
| du | Directory size | du -sh /var/log |
| mount / umount | Mount/Unmount | mount /dev/sdb1 /mnt |
| lsblk | Block device info | lsblk |
| blkid | Block device UUID | blkid |
| fdisk / parted | Partitioning | fdisk /dev/sda |

**👤 10. User Management**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| adduser / useradd | Add new user | adduser john |
| passwd | Set/change password | passwd john |
| usermod | Modify user | usermod -aG sudo john |
| deluser / userdel | Delete user | userdel john |
| groupadd | Add group | groupadd devs |

**📜 11. Scripting and Automation**

| **Feature** | **Description** | **Example** |
| --- | --- | --- |
| #!/bin/bash | Shebang line | Start scripts |
| cron | Schedule tasks | crontab -e |
| at | Schedule one-time job | at 10:00 PM |
| sleep | Delay execution | sleep 5 |
| alias | Create shortcuts | alias ll='ls -la' |
| source | Reload shell script | source ~/.bashrc |

**🔒 12. Security**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| sudo | Run as superuser | sudo apt update |
| su | Switch user | su - |
| ufw | Firewall tool | ufw enable, ufw allow 22 |
| iptables | Advanced firewall | iptables -L |
| ssh | Secure shell | ssh user@host |

**⛏️ 13. Development Tools**

| **Tool** | **Description** | **Examples** |
| --- | --- | --- |
| make | Build automation | make |
| gcc | GNU compiler | gcc file.c -o output |
| gdb | GNU debugger | gdb ./program |
| strace | Syscall tracing | strace ./app |
| lsof | List open files | lsof -i :80 |

**🧰 14. System Info**

| **Command** | **Description** | **Examples** |
| --- | --- | --- |
| uname -a | Kernel info | uname -a |
| uptime | System uptime | uptime |
| hostname | Get/set hostname | hostname |
| whoami | Current user | whoami |
| id | User/group ID | id |
| env | Environment vars | env |
| free -h | Memory usage | free -h |
| dmesg | Kernel ring buffer | `dmesg |