## A. Navigation & File Management

### 1. pwd

**Purpose:** Print your current working directory.  
**Usage:**

pwd

**Example Output:**

arduino

/home/username

### 2. ls

**Purpose:** List files and directories.  
**Common Options:**

* -l: Long listing (shows permissions, owner, size, date).
* -a: Include hidden files (those beginning with a dot).
* -h: Human‑readable sizes (K, M, G).
* -R: Recursively list subdirectories.  
  **Usage Examples:**

ls

ls -lha /var/log

ls -R /etc

### 3. cd

**Purpose:** Change the current directory.  
**Usage:**

cd /path/to/directory

**Shortcuts:**

* cd ~ – Go to home directory.
* cd .. – Move one level up.  
  **Example:**

cd ~/projects/myapp

### 4. mkdir

**Purpose:** Create a new directory.  
**Options:**

* -p: Create parent directories as needed.
* -v: Verbose output.  
  **Usage Example:**

mkdir -pv ~/projects/myapp/logs

### 5. rmdir

**Purpose:** Remove an empty directory.  
**Usage Example:**

rmdir ~/projects/myapp/old\_logs

### 6. rm

**Purpose:** Remove files or directories (permanently deletes them).  
**Options:**

* -r: Recursively delete directories.
* -f: Force deletion without prompting.
* -i: Interactive mode (prompt before each deletion).  
  **Usage Examples:**

rm unwanted\_file.txt

rm -ri ~/projects/myapp/temp

rm -rf /tmp/old\_stuff # Use with caution!

### 7. cp

**Purpose:** Copy files or directories.  
**Options:**

* -R or -r: Recursively copy directories.
* -i: Interactive mode.
* -v: Verbose output.  
  **Usage Examples:**

cp file1.txt file1\_backup.txt

cp -R ~/projects/myapp/config /backup/myapp\_config

cp -iv file1.txt file2.txt

### 8. mv

**Purpose:** Move or rename files and directories.  
**Usage Examples:**

mv oldname.txt newname.txt

mv ~/downloads/report.pdf ~/projects/reports/

### 9. touch

**Purpose:** Create an empty file or update its timestamp.  
**Usage Example:**

touch newfile.txt

### 10. cat, tac, less, more

* **cat:** Display the content of a file.

cat file.txt

* **tac:** Display file content in reverse line order.

tac file.txt

* **less/more:** View file content page by page.

less /var/log/syslog

more /var/log/syslog

### 11. ln

**Purpose:** Create hard or symbolic links between files.  
**Usage Example:**

ln -s /usr/bin/python3 ~/bin/python # Symbolic link

ln /path/to/originalfile.txt /path/to/hardlink.txt # Hard link

### 12. tree (if installed)

**Purpose:** Display directory structure in a tree format.  
**Usage Example:**

tree ~/projects/myapp

## B. Searching & Text Processing

### 13. find

**Purpose:** Recursively search for files/directories based on criteria.  
**Usage Examples:**

find /var/log -type f -name "\*.log"

find /home -type f -size +10M

### 14. grep

**Purpose:** Search for text patterns using regular expressions.  
**Usage Examples:**

grep -Ri "error" /var/log

grep "pattern" file.txt

dmesg | grep -i "usb"

### 15. awk

**Purpose:** Powerful text-processing language for extracting and reporting data.  
**Usage Examples:**

awk -F: '{print $1}' /etc/passwd

awk -F, '{sum += $3} END {print "Total:", sum}' data.csv

### 16. sed

**Purpose:** Stream editor for filtering and transforming text.  
**Usage Examples:**

sed 's/old/new/g' file.txt

sed 's/old/new/g' file.txt > file\_modified.txt

### 17. cut

**Purpose:** Extract columns/fields from text.  
**Usage Example:**

cut -d: -f1 /etc/passwd

### 18. sort

**Purpose:** Sort lines in a file.  
**Usage Examples:**

sort -n numbers.txt

sort -r file.txt

### 19. uniq

**Purpose:** Filter duplicate adjacent lines.  
**Usage Example:**

sort file.txt | uniq -c

### 20. diff and cmp

* **diff:** Compare two files line by line.

diff file1.txt file2.txt

* **cmp:** Compare two files byte by byte.

cmp file1.bin file2.bin

### 21. xargs

**Purpose:** Convert input from standard input into command arguments.  
**Usage Example:**

find . -name "\*.bak" | xargs rm -f

### 22. tee

**Purpose:** Duplicate standard output to both screen and file.  
**Usage Example:**

ls -l | tee listing.txt

### 23. paste

**Purpose:** Merge lines of files side by side.  
**Usage Example:**

paste file1.txt file2.txt > merged.txt

### 24. wc

**Purpose:** Count lines, words, and characters in a file.  
**Usage Examples:**

wc -l file.txt

wc file.txt

### 25. tr

**Purpose:** Translate or delete characters.  
**Usage Examples:**

echo "hello world" | tr 'a-z' 'A-Z'

echo "abc123def" | tr -d '0-9'

### 26. fold

**Purpose:** Wrap long lines to a fixed width.  
**Usage Example:**

fold -w 80 longfile.txt

## C. System Information & Process Management

### 27. uname

**Purpose:** Display system and kernel information.  
**Usage Example:**

uname -a

### 28. top & htop

**Purpose:** Monitor system processes in real time.  
**Usage Examples:**

top

htop # (if installed)

### 29. ps

**Purpose:** List running processes.  
**Usage Example:**

ps aux | less

### 30. kill, pkill, killall

**Purpose:** Terminate processes.  
**Usage Examples:**

kill -9 1234

pkill -9 firefox

killall apache2

### 31. nice & renice

**Purpose:** Run commands with altered CPU priority.  
**Usage Examples:**

nice -n 10 backup.sh

renice -n 5 -p 1234

### 32. jobs, fg, bg

**Purpose:** Manage background and suspended jobs.  
**Usage Examples:**

jobs

fg %1

bg %1

### 33. strace

**Purpose:** Trace system calls of a process (debugging tool).  
**Usage Example:**

strace -o ls\_trace.log ls

### 34. lsof

**Purpose:** List open files and the processes using them.  
**Usage Example:**

lsof -i :80

### 35. dmesg

**Purpose:** Dump kernel ring buffer messages.  
**Usage Example:**

dmesg | less

### 36. free

**Purpose:** Display memory usage.  
**Usage Example:**

free -h

### 37. uptime

**Purpose:** Show system uptime and load averages.  
**Usage Example:**

uptime

### 38. lscpu

**Purpose:** Display CPU architecture information.  
**Usage Example:**

lscpu

### 39. lsblk

**Purpose:** List block devices and mount points.  
**Usage Example:**

lsblk

### 40. vmstat, iostat, sar

**Purpose:** Monitor system performance.  
**Usage Examples:**

vmstat 5

iostat -xz 5

sar -u 5 5

## D. Networking

### 41. ping

**Purpose:** Test network connectivity.  
**Usage Example:**

ping -c 4 google.com

### 42. ifconfig & ip

**Purpose:** Configure and display network interfaces.  
**Usage Examples:**

ifconfig eth0 # Legacy command

ip addr show eth0 # Modern command

### 43. netstat & ss

**Purpose:** Display network connections and routing info.  
**Usage Examples:**

netstat -tuln

ss -tuln

### 44. traceroute

**Purpose:** Trace the route packets take to a destination.  
**Usage Example:**

traceroute example.com

### 45. nslookup & dig

**Purpose:** DNS lookup utilities.  
**Usage Examples:**

nslookup example.com

dig example.com +short

### 46. scp

**Purpose:** Securely copy files between hosts using SSH.  
**Usage Example:**

scp file.txt user@remote:/path/to/destination

### 47. rsync

**Purpose:** Synchronize files and directories efficiently.  
**Usage Example:**

rsync -avz ~/projects/ user@remote:/backup/projects/

### 48. sftp

**Purpose:** Interactive secure file transfer session over SSH.  
**Usage Example:**

sftp user@remote

Then use commands like ls, get, put inside the sftp prompt.

### 49. curl

**Purpose:** Transfer data from or to a server using various protocols.  
**Usage Examples:**

curl -O https://example.com/file.iso

curl -I https://example.com

curl -X POST -d "name=alice&age=30" https://example.com/api

### 50. wget

**Purpose:** Non‑interactive file downloader.  
**Usage Example:**

wget -c https://example.com/file.tar.gz

### 51. iptables & ufw

**Purpose:** Manage firewall rules.  
**Usage Examples:**

sudo iptables -A INPUT -p tcp --dport 22 -j ACCEPT

sudo ufw enable

sudo ufw allow 22

### 52. tcpdump

**Purpose:** Capture network packets for analysis.  
**Usage Example:**

sudo tcpdump -i eth0 -nn -c 100

### 53. ethtool

**Purpose:** Retrieve or change network interface settings.  
**Usage Example:**

sudo ethtool eth0

### 54. iwconfig

**Purpose:** Configure wireless network interfaces.  
**Usage Example:**

iwconfig wlan0

## E. Disk & Filesystem Management

### 55. df

**Purpose:** Report disk space usage of mounted filesystems.  
**Usage Example:**

df -h

### 56. du

**Purpose:** Estimate disk usage of files and directories.  
**Usage Example:**

du -sh ~/projects

### 57. fdisk & parted

**Purpose:** Partition management tools.  
**Usage Examples:**

sudo fdisk /dev/sda

sudo parted /dev/sda

### 58. mkfs

**Purpose:** Create a filesystem on a partition.  
**Usage Example:**

sudo mkfs.ext4 /dev/sda1

### 59. fsck

**Purpose:** Check and repair filesystem inconsistencies.  
**Usage Example:**

sudo fsck -f /dev/sda1

### 60. tune2fs

**Purpose:** Adjust ext2/3/4 filesystem parameters.  
**Usage Example:**

sudo tune2fs -c 30 /dev/sda1

### 61. mount, umount, remount

**Purpose:** Mount and unmount filesystems.  
**Usage Examples:**

sudo mount /dev/sda1 /mnt

sudo umount /mnt

sudo mount -o remount,rw /mnt

### 62. lsblk & blkid

**Purpose:** List block devices and display their attributes (UUID, filesystem type).  
**Usage Examples:**

lsblk

sudo blkid /dev/sda1

### 63. smartctl

**Purpose:** Check drive health using S.M.A.R.T.  
**Usage Example:**

sudo smartctl -a /dev/sda

### 64. swapoff and swapon

**Purpose:** Disable and enable swap space.  
**Usage Examples:**

sudo swapoff /dev/sda2

sudo swapon /dev/sda2

## F. Package & Software Management

### 65. apt, apt-get, apt-cache (Debian/Ubuntu)

**Usage Examples:**

sudo apt update

sudo apt upgrade

sudo apt install vim

sudo apt remove package-name

sudo apt-cache search "nginx"

### 66. yum and dnf (CentOS/RHEL/Fedora)

**Usage Examples:**

sudo yum update

sudo yum install httpd

sudo dnf install nginx

### 67. rpm

**Usage Example:**

sudo rpm -ivh package.rpm

### 68. pacman (Arch Linux)

**Usage Examples:**

sudo pacman -Syu

sudo pacman -S package-name

### 69. snap

**Usage Examples:**

sudo snap install vlc

sudo snap list

### 70. flatpak

**Usage Examples:**

flatpak install flathub org.libreoffice.LibreOffice

flatpak run org.libreoffice.LibreOffice

### 71. brew (Linuxbrew)

**Usage Examples:**

brew install package-name

brew update

### 72. dpkg

**Usage Examples:**

sudo dpkg -i package.deb

sudo dpkg -r package-name

## G. Shell Environment & Scripting

### 73. alias and unalias

**Purpose:** Create and remove command shortcuts.  
**Usage Examples:**

alias ll="ls -lha"

unalias ll

### 74. export and env

**Purpose:** Set and display environment variables.  
**Usage Examples:**

export PATH=$PATH:/opt/mybin

env

### 75. read

**Purpose:** Read user input in shell scripts.  
**Usage Example:**

read -p "Enter your name: " username

echo "Hello, $username!"

### 76. test or [ ]

**Purpose:** Evaluate conditional expressions in scripts.  
**Usage Example:**

[ "$a" -eq "$b" ] && echo "Equal" || echo "Not equal"

### 77. nohup

**Purpose:** Run commands immune to hangups (keep running after logout).  
**Usage Example:**

nohup long\_running\_script.sh > output.log 2>&1 &

### 78. screen and tmux

**Purpose:** Terminal multiplexers to manage multiple sessions.  
**Usage Examples:**

# Start a new screen session:

screen -S mysession

# Start a new tmux session:

tmux new -s mysession

### 79. printf

**Purpose:** Format and print output (similar to C’s printf).  
**Usage Example:**

printf "User: %s\n" "$USER"

### 80. seq

**Purpose:** Generate a sequence of numbers (useful in loops).  
**Usage Example:**

seq 1 10

### 81. cron

**Purpose:** Schedule recurring tasks.  
**Usage Example:**

crontab -e

# Add a job: Run backup.sh every day at 2 AM:

0 2 \* \* \* /usr/local/bin/backup.sh

### 82. at

**Purpose:** Schedule a one‑time task.  
**Usage Example:**

echo "shutdown -h now" | at 23:00

## H. Advanced & Miscellaneous Commands

### 83. man, whatis, type, which

**Usage Examples:**

man grep

whatis ls

type cd

which python3

### 84. bc and expr

**Purpose:** Calculator tools for arithmetic operations.  
**Usage Examples:**

echo "scale=2; 10/3" | bc

expr 5 + 3

### 85. yes, sleep, timeout

**Purpose:** Control output and timing in scripts.  
**Usage Examples:**

yes "continue" | head -n 5

sleep 5

timeout 30 ping google.com

### 86. strace and lsof

**Usage Examples:**

strace -o ls\_trace.log ls

lsof -i :80

### 87. dmidecode, lspci, lsusb, smartctl

**Usage Examples:**

sudo dmidecode | less

lspci

lsusb

sudo smartctl -a /dev/sda

### 88. modprobe, lsmod, insmod, rmmod

**Usage Examples:**

lsmod

sudo modprobe e1000

sudo rmmod e1000

### 89. git

**Purpose:** Distributed version control system.  
**Usage Example:**

git clone https://github.com/user/repo.git

cd repo

git status

git add .

git commit -m "Fix bug"

git push origin main

### 90. curl (Advanced)

**Usage Examples:**

curl -I https://example.com

curl -X POST -d "name=alice&age=30" https://example.com/api

### 91. rsnapshot

**Purpose:** Filesystem snapshot tool for backups (configured via /etc/rsnapshot.conf).  
**Usage Example:**

sudo rsnapshot daily

### 92. neofetch / screenfetch

**Purpose:** Display system information and distribution logos.  
**Usage Example:**

neofetch

# Or:

screenfetch

### 93. cal

**Purpose:** Display a calendar.  
**Usage Example:**

cal 2025

### 94. dirname and basename

**Purpose:** Extract directory and file names from a full path.  
**Usage Examples:**

dirname /home/alice/file.txt # Outputs: /home/alice

basename /home/alice/file.txt # Outputs: file.txt

### 95. tr

**Purpose:** Translate or delete characters.  
**Usage Example:**

echo "hello world" | tr '[:lower:]' '[:upper:]'

### 96. od

**Purpose:** Dump files in various formats (e.g., octal, hex).  
**Usage Example:**

od -c file.txt

### 97. seq (Advanced)

**Purpose:** Generate a sequence with formatting.  
**Usage Example:**

seq -w 001 100

### 98. xargs (Advanced)

**Usage Example:**

find . -type f -empty | xargs -I {} echo "Deleting {}" && rm {}

### 99. gettext

**Purpose:** Extract translatable strings from programs (for localization).  
**Usage Example:**

gettext "Hello, World!"

### 100. Additional Diff and Compare Utilities

* **diff -u:** Unified diff format (useful for patch files).

diff -u file1.txt file2.txt

* **cmp -l:** List differences byte by byte.

cmp -l file1.bin file2.bin

## Final Thoughts

This guide covers over 100 Linux commands along with extended explanations and code examples across various categories. Regular practice in a safe test environment (such as a virtual machine or Docker container) will build proficiency and confidence. For more details on any command, consult its manual with man <command> or use <command> --help.

Happy Linux-ing!