Bash Shell and scripting

START HERE

`cmd > <file>`
Write output to a file

`cmd >> <file>`
Append output

`cmd1 | cmd2`
Pipe output onward

`cmd 2>&1`
Merge errors into output

`"$var"`
Use a variable, quoted

`$(cmd)`
Insert a command's output

`cmd1 && cmd2`
Run second only on success

`Ctrl+R`
Search command history

Read line split into words → `expand` **Expansions** braces, $var, $(cmd), globs → `redirect` **Redirections** stdin, stdout, stderr → `run` **Command** exit status in $?

CONCEPTS

Bash expands a line first (variables, globs, substitutions), then runs it. Quotes decide what gets expanded.

Exit status 0 means success, anything else failure. && , || and if all test it.

Always quote "$var": unquoted values are split at spaces and globbed.

REDIRECTION & PIPES

`cmd > <file>`
Stdout to file, overwrite
Set noclobber to refuse overwriting; >| forces it.

`cmd >> <file>`
Stdout appended to file

`cmd < <file>`
Read stdin from file

`cmd1 | cmd2`
Pipe stdout into next command

`cmd 2> <file>`
Stderr to file

`cmd > <file> 2>&1`
Stdout and stderr to file
Order matters: the 2>&1 must come after > file.

`cmd &> <file>`
Shorthand for both streams

`cmd > /dev/null 2>&1`
Discard all output

`cmd | tee <file>`
Show output and save it

`cmd <<< "<text>"`
Feed a string as stdin

`diff <(cmd1) <(cmd2)`
Process substitution as a file

`cmd |& cmd2`
Pipe stdout and stderr

`cmd <<'EOF'`
Here-document, no expansion
Unquoted EOF expands variables inside; end with a line EOF.

`exec > <file>`
Redirect the rest of the script

QUOTING & EXPANSION

`"$var"`
Expand, keep as one word

`'$var'`
Literal text, no expansion

`$(cmd)`
Command substitution

QUOTING & EXPANSION (cont.)

`*.txt`
Glob: any characters

`file?.txt`
Glob: exactly one character

`{a,b,c}`
Brace expansion list
mkdir -p proj/{src,docs} makes both.

`{1..10}`
Brace expansion range

`$((a + b))`
Arithmetic expansion

`~ / ~user`
Home directory

`\<char>`
Escape one character

`**/*.txt`
Recursive glob
Needs shopt -s globstar.

VARIABLES

`name=<value>`
Set a variable (no spaces)

`export name=<value>`
Pass to child processes

`$1 $2 ... $@`
Script arguments
Use "$@" to keep arguments separate.

`$?`
Exit status of last command

`$#`
Number of arguments

`${var:-<default>}`
Use default if unset or empty

`${#var}`
Length of value

`${var#<pat>} /`
`${var%<pat>}`
Strip prefix / suffix
Doubled ## and %% strip the longest match.

`${var/<pat>/<new>}`
Replace first match

`arr=(a b c)`
Create an array

`"${arr[@]}"`
All array elements

`local name=<value>`
Function-scoped variable

CONTROL FLOW

`if cmd; then ...; fi`
Branch on exit status

`[[ -f <file> ]]`
Test: regular file exists
Also -d directory, -e any, -s non-empty, -r/-w/-x.

CONTROL FLOW (cont.)

`[[ "$a" == "$b" ]]`
Test: strings equal

`[[ $n -lt 5 ]]`
Test: numeric compare
-eq -ne -lt -le -gt -ge; or use ((n < 5)).

`[[ -z "$s" ]] / [[ -n "$s" ]]`
Test: empty / non-empty

`for x in a b c; do ...; done`
Loop over words

`for f in *.txt; do ...; done`
Loop over files

`for ((i=0; i<n; i++)); do ...; done`
C-style loop

`while read -r line; do ...; done < <file>`
Loop over lines

`case $x in a) ...;; *) ...;; esac`
Match patterns

`cmd1 || cmd2`
Run second only on failure

`name() { ...; }`
Define a function

`[[ $s =~ <regex> ]]`
Regex match, groups in BASH_REMATCH

COMMAND LINE (READLINE)

Ctrl + R
Search history backwards
Press again for older matches.

Ctrl + A / Ctrl + E
Start / end of line

Ctrl + C
Interrupt running command

Ctrl + L Clear the screen

Ctrl + U / Ctrl + K
Cut to line start / end

Ctrl + W Cut previous word

Ctrl + Y Paste last cut text

Alt + B / Alt + F
Back / forward one word

Alt + .
Insert last argument of previous command

Ctrl + D
Exit shell or end input

Tab
Complete command or path

Ctrl + X › Ctrl + E
Edit the line in $EDITOR

COMMAND LINE (READLINE) (cont.)

`!!`
Repeat the previous command
sudo !! reruns it with sudo.

`history | grep <text>`
Find an old command

JOBS & PROCESSES

`cmd &`
Run in the background

Ctrl + Z
Suspend foreground job

`jobs`
List jobs

`bg / fg`
Resume job in back / foreground
Add %<n> to pick job number n.

`kill <pid>`
Ask a process to stop

SAFE SCRIPTS

`#!/usr/bin/env bash`
Shebang line

`set -euo pipefail`
Stop on errors and unset vars
Has caveats: -e is ignored inside conditions such as if or ||.

`trap '<cmd>' EXIT`
Run cleanup when script ends

`set -x`
Trace each command run

`source <file>` / **`. <file>`**
Run a file in current shell

Use [[ ]] over [ ] in bash scripts; it does not split or glob unquoted variables.

RECIPES

Safe script skeleton

```
#!/usr/bin/env bash
set -euo pipefail
tmp=$(mktemp)
trap 'rm -f "$tmp"' EXIT
# work with "$tmp"
```

Rename files in a loop

```
for f in *.jpeg; do
  mv -- "$f" "${f%.jpeg}.jpg"
done
```

Process a file line by line

```
while IFS= read -r line; do
  echo "got: $line"
done < input.txt
```

HELP

`help <builtin>`
Help for a builtin

`man bash`
Full manual