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| Special Characters | |
| & | Background job |
| # | Comment |
| ~ | Home Directory |
| ! | Logical NOT |
| ‘ | Quote (Strong) |
| “ | Quote (Weak) |
| < | Redirect input |
| > | Redirect output |
| >> | Redirect output + append to file |
| | | Redirect (pipe) output to next command |
| / | Separator for pathname directories |
| ; | Separator for shell commands |
| [ ] | Start and end a character-set wildcard |
| { } | Start and end a command block |
| ( ) | Start and end a subshell |
| (( )) | Perform arithmetic |
| \* | Wildcard |
| ? | Wildcard – single character |
| $ | Variable expression |
| \ | Escape a special character |
| n>&m | Descriptor n is a copy of ouput file descriptor m |
| n<&m | Descriptor n is a copy of input file descriptor m |

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| String Operators | |
| ${varname:-word} | Returns word |
| ${varname:=word} | Sets and returns word |
| ${varname:?message} | Prints message and exits |
| ${varname:offset:length} | Returns substring |
| ${varname:+word} | If varname is defined, return word |

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| Pattern-matching operators | |
| ${varname#pattern} | Match first from the start |
| ${varname##pattern } | Match last from the start |
| ${varname%pattern} | Match first from the end |
| ${varname/pattern/replace} | Match longest and replace |
| ${varname//pattern/replace} | Match all and replace |

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| Variables | |
| $0, $1, $2, | Positional parameters |
| $@ | “$1” “$2” “$3” … |
| $\* | A string of positional params > 0 |
| $# | Number of positional params |
| $? | Exit status of last command run |

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| Functions | |
| define | function myfunction { … }  *or*  myfunction ( ) { … } |
| call | myfunction arg1 arg2 … |
| keywords | local – limit var scope |

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| If / else conditions | |
| x && y | If x runs, then run y |
| x || y | If x fails, then run y |
| x -a y | x AND y |
| x -o y | x OR y |
| -lt, -le, -eq, -gt, -ge, -ne | Integer comparisons |
| =, !=, <, > | String comparisons |
| -n str1 | str1 has length > 0 (nonzero) |
| -z str1 | str1 has length 0 (zero) |
| -d file | File exists and is a directory |
| -e file | File exists |
| -f file | File exists and is a regular file |
| -r file | User has read permission on file |
| -s file | File exists and is non empty |
| -w file | User has write permission on file |
| -x file | User has execute permission on file, or search if directory |
| -N file | File was modified since it was left read |
| -O file | User owns file |
| -G file | File’s group ID matches the user’s group ID |
| file1 -nt file2 | file1 has newer modification time than file2 |

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| Flow control sentences | |
| if | if *condition*; then  *commands*;  fi |
| for | for ((*init*; *condition*; *increment*)); do  *commands*;  done |
| for | for *var* in *array*; do  *commands*;  done |
| case | case *expression* in  *pattern1*) *commands* ;;  *pattern2*) *commands* ;;  \*) *commands* ;;  esac |
| while | while *condition*; do  *commands*;  done |
| until | until *condition*; do  *commands*;  done |

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| Arrays | |
| Arr\_name=(‘el1’ ‘ el2’ ‘el3’) | define |
| Arr\_name[index] | Element #index |
| Arr\_name[-1] | Last element |
| Arr\_name[@] | All elements, space-separated |
| #Arr\_name[@] | Array length |
| #Arr\_name[index] | String length of the Nth element |
| Arr\_name[@]:m:n | Range (from position m, length n |
| !Arr\_name[@] | Keys of all elements |
| Arr\_name=("${Arr\_name[@]}” “newElement”) | Push |
| Arr\_name+=('newElement’) | Also Push |
| unset Arr\_name[n] | Remove one item |

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| Dictionaries | |
| declare –A dict | Define |
| dict[key]=”value” | Define value of a key |
| dict[key] | Value of a key |
| dict[@a] | All values |
| !dict[@] | All keys |
| #dict[@] | Number of elements |
| Unset dict[key] | Delete the key |

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| Useful Commands | |
| Type <cmd> | Determine type of command:  -a ; displays all the locations |
| Builtin <cmd> | Run builtin commands explicitly |
| Which <cmd> | Locate the executable of a command:  -a ; show all locations |
| Clear | Clear the terminal screen |
| Echo “str1” | Print message to terminal screen:  -e ; uses escape sequences like (\n = newline, \t = tab)  -n ; supresses automatic newline after print |
| Printf <format> <variables> | Print messages to terminal screen. Formatting be like:  %s – String  %-Xs – String wide X chars, left aligned  %Xs – String wide X chars, right aligned  %d – Integer (%-Xd, %Xd)  %f – Float  %.Xf - Round to X decimal spaces |
| Date <options> <+format> | Will display date and time. Formats (“+%Y-%m-%d”):  %Y – Year, %m – month, %d – day, %H – hours, %M – minutes, %S – seconds, (%A uppercase for full name) %a – DayOfTheWeek, (%B) %b - Month  Options (-d “yesterday”):  “yesterday”, “next Monday”, |
| Read <options>  <variable> | Read input from user or file and store into variable (read var1). Options:  -p “Text” : print before input  -a : store the input in array |
| History <options> | Display the command history for that session. Options:  -c : clear the history  -X : print the last X commands  -a : appends history to bash history file  -d X : deletes the command with index X from history |
| Sleep <num\_time> | Delay the execution of a script. Num\_time:  Xs : delay for X second(s) (default)  Xm : delay for X minute(s)  Xh : delay for X hour(s) |
| Man <command> | Opens the manual pages for the <command>. |
| Ls <options> <path> | List the files and directories in the current working directory or given path. Options:  -l : list detailed view for files  -a : show all files, even hidden  -alp : ??? |
| pwd | Display the current working directory. |
| Cd <directory> | Change the current working directory. <directory>:  ‘/path’ : changes directory to path  ‘..’ : changes to parent directory of the current one  ‘~username’ : changes to home directory for username  ‘-’ : changes to previous working directory used |
| Mkdir <directory> | Creates new directory. <directory> can be:  ‘d1’ : creates new directory called d1  ‘d1’ ‘d2’ ‘d3’ : creates more directories in the current one  -p ‘d1/d2’ : creates d1 and another directory d2 as d1’s child |
| Rmdir <directory> | Works the same as mkdir, but it deletes the directory if it is empty. |
| Cat <file> | Display the contents of the file on the terminal. <file>:  ‘file.txt’ : displays file.txt  ‘f1.txt’ ‘f2.txt’ : displays files consecutively  -n ‘file.txt’ : displays file.txt with numbered lines |
| More, less, od, hexdump | More and less are both text viewers, od gives octal output and hexdump hexadecimal. |
| Vi, vim, emacs, nano | File editors. Use ‘man file\_editor’ to learn how to use them. |
| Cp <source> <destination> | Copy files or directories from source to destination.  Cp file /path : copy file to path  Cp –r directory /path : copy directory with all its contents to path |
| Mv <source> <destination> | Moves files or directories from source to destination.  Mv file /path : move file to path  Mv directory /path : move directory to path  Mv file.txt newfile.txt : renames file.txt to newfile.txt |
| Uniq <options> <file> | Removes all consecutive lines. Options:  -c : also counts the amount of duplicates  -i : ignores the case  -d : outputs only duplicates  -u : outputs only the unique |
| Rev <file> | Reverse the characters in each line of the input stream or file |
| Tr <options> <set1> <set2> <file> | Translate or delete characters. Set1 is translateed to Set2.  -d : removes the characters  -c : complement the Set1 |
| Wc <options> <file> | Counts the number of lines, words, bytes. Options:  -l : only counts the lines  -w : only counts the words  -c : only counts the bytes |
| Grep <options> <pattern> <file> | Search for specific pattern or regular expression. Options:  -i : ignore case  -v : invert the match (print only the lines not matching the pattern)  -w : match only whole words  -n : print the line numbers for each match  -r : search recursively through directories |
| Shift <X> | Shift the positional parameters to the left. X is number of positions to shift. |
| Jobs <options> | Display a list of jobs that are currently running in the background or are suspended. -l : also displays PID of a job  -p : displays only the PIDs  -r : displays the running jobs  -s : displays the stopped jobs |
| Fg <JID> | Bring a job that is running in the background the foreground. |
| Bg <JID> | Start a suspended job in the background. |
| Disown  %<JID> | Remove jobs from shell’s job control. (disown %2 : removes job with JID 2) |
| Ulimit <options> | Display the resource limits of the current shell and its children.  -a : displas all current limits |