

Bash scripting cheatsheet

Introduction

This is a quick reference to getting started with Bash scripting.

Learn bash in y minutes

(learnxinyminutes.com)

Example

```
#!/usr/bin/env bash
NAME="John"
echo $NAME
echo "Hello $NAME!"
```

Variables

```
NAME="John"
echo $NAME
echo "$NAME"
echo "${NAME}!"
```

Functions

```
get_name() {
    echo "John"
}

echo "You are $(get_name)"
```

See: Functions

Brace expansion

echo {A,B}.js	
{A,B}	Same as A B
{A,B}.js	Same as A.js B.js
{1..5}	Same as 1 2 3 4 5

See: Brace expansion

String quotes

```
NAME="John"
echo "Hi $NAME" #=> Hi John
echo 'Hi $NAME' #=> Hi $NAME
```

Conditional execution

```
git commit && git push
git commit || echo "Commit failed"
```

Strict mode

```
set -euo pipefail
IFS=$'\n\t'
```

See: Unofficial bash strict mode

Shell execution

```
echo "I'm in $(pwd)"
echo "I'm in `pwd`"
# Same
```

See Command substitution

Conditionals

```
if [[ -z "$string" ]]; then
    echo "String is empty"
elif [[ -n "$string" ]]; then
    echo "String is not empty"
fi
```

See: Conditionals

Parameter expansions

Basics

```
name="John"
echo ${name}
echo ${name/J/j} #=> "john" (substitution)
echo ${name:0:2} #=> "Jo" (slicing)
echo ${name::2} #=> "Jo" (slicing)
echo ${name: -1} #=> "Joh" (slicing)
echo ${name:(-1)} #=> "n" (slicing from right)
echo ${name:(-2):1} #=> "h" (slicing from right)
echo ${food:-Cake} #=> $food or "Cake"
```

```
length=2
echo ${name:0:length} #=> "Jo"
```

See: Parameter expansion

```
STR="/path/to/foo.cpp"
echo ${STR%.cpp} # /path/to/foo
echo ${STR%.cpp}.o # /path/to/foo.o
echo ${STR%/*} # /path/to

echo ${STR##*.} # cpp (extension)
echo ${STR##*/} # foo.cpp (basepath)

echo ${STR##*?} # path/to/foo.cpp
echo ${STR##*?/} # foo.cpp

echo ${STR//foo/bar} # /path/to/bar.cpp

STR="Hello world"
echo ${STR:6:5} # "world"
echo ${STR: -5:5} # "world"

SRC="/path/to/foo.cpp"
```

Substitution

`\${FOO%suffix}`	Remove suffix
`\${FOO#prefix}`	Remove prefix
`\${FOO%*suffix}`	Remove long suffix
`\${FOO##prefix}`	Remove long prefix
`\${FOO/from/to}`	Replace first match
`\${FOO//from/to}`	Replace all
`\${FOO%from/to}`	Replace suffix
`\${FOO#/from/to}`	Replace prefix

Comments

```
# Single line comment
:
This is a
multi line
comment
'
```

Length

```
#${FOO} Length of $FOO
```

Default values

`\${FOO:-val}`	\$FOO, or val if unset (or null)
`\${FOO:=val}`	Set \$FOO to val if unset (or null)
`\${FOO:+val}`	val if \$FOO is set (and not null)
`\${FOO:?message}`	Show error message and exit if \$FOO is unset (or null)
Omitting the : removes the (non)nullity checks, e.g. \${FOO-val} expands to val if unset otherwise \$FOO.	

Substrings

`\${FOO:0:3}`	Substring (position, length)
`\${FOO:(-3):3}`	Substring from the right

Manipulation

```
STR="HELLO WORLD!"
echo ${STR,,} #=> "hELLO WORLD!" (lowercase 1st)
echo ${STR,,} #=> "hello world!" (all lowercase)

STR="hello world!"
echo ${STR^} #=> "Hello world!" (uppercase 1st)
echo ${STR^^} #=> "HELLO WORLD!" (all uppercase)
```

```
BASE=${SRC##*/}    #=> "foo.cpp" (basepath)
DIR=${SRC%$BASE}   #=> "/path/to/" (dirpath)
```

Loops

Basic for loop

```
for i in /etc/rc.*; do
  echo $i
done
```

Reading lines

```
cat file.txt | while read line; do
  echo $line
done
```

C-like for loop

```
for ((i = 0 ; i < 100 ; i++)); do
  echo $i
done
```

Forever

```
while true; do
  ...
done
```

Ranges

```
for i in {1..5}; do
  echo "Welcome $i"
done
```

With step size

```
for i in {5..50..5}; do
  echo "Welcome $i"
done
```

Functions

Defining functions

```
myfunc() {
  echo "hello $1"
}

# Same as above (alternate syntax)
function myfunc() {
  echo "hello $1"
}

myfunc "John"
```

Returning values

```
myfunc() {
  local myresult='some value'
  echo $myresult
}

result=$(myfunc)"
```

Arguments

\$#	Number of arguments
\$*	All positional arguments (as a single word)
\$@	All positional arguments (as separate strings)
\$1	First argument
\$_	Last argument of the previous command

Note: \$@ and \$* must be quoted in order to perform as described. Otherwise, they do exactly the same thing (arguments as separate strings).

See [Special parameters](#).

Raising errors

```
myfunc() {
  return 1
}

if myfunc; then
  echo "success"
else
  echo "failure"
fi
```

Conditionals

Conditions

Note that [[is actually a command/program that returns either 0 (true) or 1 (false). Any program that obeys the same logic (like all base utils, such as grep(1) or ping(1)) can be used as condition, see examples.

[[-z STRING]]	Empty string
[[-n STRING]]	Not empty string
[[STRING == STRING]]	Equal
[[STRING != STRING]]	Not Equal
[[NUM -eq NUM]]	Equal
[[NUM -ne NUM]]	Not equal
[[NUM -lt NUM]]	Less than
[[NUM -le NUM]]	Less than or equal
[[NUM -gt NUM]]	Greater than
[[NUM -ge NUM]]	Greater than or equal

File conditions

[[-e FILE]]	Exists
[[-r FILE]]	Readable
[[-h FILE]]	Symlink
[[-d FILE]]	Directory
[[-w FILE]]	Writable
[[-s FILE]]	Size is > 0 bytes
[[-f FILE]]	File
[[-x FILE]]	Executable
[[FILE1 -nt FILE2]]	1 is more recent than 2
[[FILE1 -ot FILE2]]	2 is more recent than 1
[[FILE1 -ef FILE2]]	Same files

Example

```
# String
if [[ -z "$string" ]]; then
  echo "String is empty"
elif [[ -n "$string" ]]; then
  echo "String is not empty"
else
  echo "This never happens"
fi

# Combinations
if [[ X && Y ]]; then
  ...
fi

# Equal
if [[ "$A" == "$B" ]]

# Regex
if [[ "A" =~ . ]]

if (( $a < $b )); then
  echo "$a is smaller than $b"
fi

if [[ ! -p "file.txt" ]]; then
```

[[STRING == STRING]]	Regexp
((NUM < NUM))	Numeric conditions
More conditions	
[[-o noclobber]]	If OPTIONNAME is enabled
[[! EXPR]]	Not
[[X && Y]]	And
[[X Y]]	Or

```
if [ -e file ]
echo "file exists"
fi
```

Arrays

Defining arrays

```
Fruits=(Apple Banana Orange)
Fruits[0]=Apple
Fruits[1]=Banana
Fruits[2]=Orange
```

Operations

```
Fruits+="${Fruits[@]} Watermelon" # Push
Fruits+=("Watermelon") # Also Push
Fruits=( ${Fruits[@]//[^/]*$} ) # Remove by regex match
unset Fruits[2] # Remove one item
Fruits=( "${Fruits[@]}" ) # Duplicate
Fruits=( "${Fruits[@]}" "${Veggies[@]}" ) # Concatenate
lines=(cat logfile) # Read from file
```

Working with arrays

```
echo ${Fruits[0]} # Element #0
echo ${Fruits[-1]} # Last element
echo ${Fruits[@]} # All elements, space-separated
echo ${#Fruits[@]} # Number of elements
echo ${#Fruits} # String length of the 1st element
echo ${#Fruits[3]} # String length of the Nth element
echo ${Fruits[@]:3:2} # Range (from position 3, length 2)
echo ${!Fruits[@]} # Keys of all elements, space-separated
```

Iteration

```
for i in "${arrayName[@]}"; do
  echo $i
done
```

Dictionaries

Defining

```
declare -A sounds
sounds[dog]="bark"
sounds[cow]="moo"
sounds[bird]="tweet"
sounds[wolf]="howl"
```

Declares sound as a Dictionary object (aka associative array).

Working with dictionaries

```
echo ${sounds[dog]} # Dog's sound
echo ${sounds[@]} # All values
echo ${!sounds[@]} # All keys
echo ${#sounds[@]} # Number of elements
unset sounds[dog] # Delete dog
```

Iteration

Iterate over values
for val in "\${sounds[@]}"; do echo \$val done
Iterate over keys
for key in "\${!sounds[@]}"; do echo \$key done

Options

Options

```
set -o noclobber # Avoid overlay files (echo "hi" > foo)
set -o errexit # Used to exit upon error, avoiding cascading errors
set -o pipefail # Unveils hidden failures
set -o nounset # Exposes unset variables
```

Glob options

```
shopt -s nullglob # Non-matching globs are removed ('*.foo' => '')
shopt -s failglob # Non-matching globs throw errors
shopt -s nocaseglob # Case insensitive globs
shopt -s dotglob # Wildcards match dotfiles ("*.sh" => ".foo.sh")
shopt -s globstar # Allow ** for recursive matches ('lib/**/*.*' => 'l
```

Set GLOBIGNORE as a colon-separated list of patterns to be removed from glob matches.

History

Commands

history	Show history
shopt -s histverify	Don't execute expanded result immediately

Operations

Expansions

!\$	Expand last parameter of most recent command
!*	Expand all parameters of most recent command
! -n	Expand nth most recent command
!n	Expand nth command in history

	Execute last command again
!!:s/<FROM>/<TO>/	Replace first occurrence of <FROM> to <TO> in most recent command
!!:gs/<FROM>/<TO>/	Replace all occurrences of <FROM> to <TO> in most recent command
!\$:t	Expand only basename from last parameter of most recent command
!\$:h	Expand only directory from last parameter of most recent command
!! and !\$ can be replaced with any valid expansion.	

!<command>	Expand most recent invocation of command <command>
------------	--

Slices

!!:n	Expand only nth token from most recent command (command is 0; first argument is 1)
!^	Expand first argument from most recent command
!\$	Expand last token from most recent command
!!:n-m	Expand range of tokens from most recent command
!!:n-\$	Expand nth token to last from most recent command
!!	can be replaced with any valid expansion i.e. !cat, !-2, !42, etc.

Miscellaneous

Numeric calculations

```
$((a + 200))      # Add 200 to $a
$((($RANDOM%200)) # Random number 0..199
```

Inspecting commands

```
command -V cd
#=> "cd is a function/alias/whatever"
```

Trap errors

```
trap 'echo Error at about $LINENO' ERR
```

or

```
traperr() {
    echo "ERROR: ${BASH_SOURCE[1]} at about ${BASH_LINENO[0]}"
}

set -o errtrace
trap traperr ERR
```

Source relative

```
source "${0%/*}/../share/foo.sh"
```

Transform strings

-c	Operations apply to characters not in the given set
-d	Delete characters
-s	Replaces repeated characters with single occurrence
-t	Truncates
[:upper:]	All upper case letters
[:lower:]	All lower case letters
[:digit:]	All digits
[:space:]	All whitespace
[:alpha:]	All letters
[:alnum:]	All letters and digits
Example	
echo "Welcome To Devhints" tr [:lower:] [:upper:]	WELCOME TO DEvhints

Heredoc

```
cat <<END
hello world
END
```

Subshells

```
(cd somedir; echo "I'm now in $PWD")
pwd # still in first directory
```

Redirection

```
python hello.py > output.txt      # stdout to (file)
python hello.py >> output.txt    # stdout to (file), append
python hello.py > error.log       # stderr to (file)
python hello.py >&1                # stderr to stdout
python hello.py >/dev/null        # stderr to (null)
python hello.py >>/dev/null       # stdout and stderr to (null)

python hello.py < foo.txt         # feed foo.txt to stdin for python
diff <(ls -r) <(ls)              # Compare two stdout without files
```

Case/switch

```
case "$1" in
    start | up)
        vagrant up
        ;;
*)
    echo "Usage: $0 {start|stop|ssh}"
    ;;
esac
```

printf

```
printf "Hello %s, I'm %s" Sven Olga
#=> "Hello Sven, I'm Olga"

printf "%1 + 1 = %d" 2
#=> "1 + 1 = 2"

printf "This is how you print a float: %f" 2
#=> "This is how you print a float: 2.000000"
```

Directory of script

```
DIR="${0%/*}"
```

Getting options

```
while [[ "$1" =~ ^- \&& ! "$1" == "--" ]]; do case $1 in
    -V | --version )
        echo $version
        exit
        ;;
    -s | --string )
        shift; string=$1
        ;;
    -f | --flag )
        flag=1
        ;;
esac; shift; done
if [[ "$1" == '--' ]]; then shift; fi
```

Special variables

\$?	Exit status of last task
\$!	PID of last background task
\$\$	PID of shell
\$0	Filename of the shell script
\$_	Last argument of the previous command
\${PIPESTATUS[n]}	return value of piped commands (array)
See Special parameters.	

Reading input

```
echo -n "Proceed? [y/n]: "
read ans
echo $ans

read -n 1 ans # Just one character
```

Go to previous directory

```
pwd # /home/user/foo
cd bar/
pwd # /home/user/foo/bar
cd -
pwd # /home/user/foo
```

Check for command's result

```
if ping -c 1 google.com; then
  echo "It appears you have a working internet connection"
fi
```

Grep check

```
if grep -q 'foo' ~/.bash_history; then
  echo "You appear to have typed 'foo' in the past"
fi
```

Also see

- [Bash-hackers wiki](#) (bash-hackers.org)
- [Shell vars](#) (bash-hackers.org)
- [Learn bash in y minutes](#) (learninyminutes.com)
- [Bash Guide](#) (mywiki.wooledge.org)
- [ShellCheck](#) (shellcheck.net)

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