Bash scripting cheatsheet

Introduction

Example

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

name="John"
echo "Hello $name!"
```

Variables

```
name="John"
echo $name  # see below
echo "$name"
echo "${name}!"
```

Generally quote your variables unless they contain wildcards to expand or command fragments.

```
wildcard="*.txt"
options="iv"
cp -$options $wildcard /tmp
```

String quotes

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

Shell execution

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

Conditional execution

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

Functions

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

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

Conditionals

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

Strict mode

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

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`
`{{1..3},{7..9}}`	Same as `1 2 3 7 8 9`

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"
base=${src##*/}   #=> "foo.cpp" (basepath)
dir=${src%$base}  #=> "/path/to/" (dirpath)
```

Prefix name expansion

```
prefix_a=one
prefix_b=two
echo ${!prefix_*}  # all variables names starting with `prefix_`
prefix_a prefix_b
```

Indirection

```
name=joe
pointer=name
echo ${!pointer}
joe
```

Substitution

`${foo%suffix}`	Remove suffix
`${foo#prefix}`	Remove prefix
`${foo%%suffix}`	Remove long suffix
`${foo/%suffix}`	Remove long suffix
`${foo##prefix}`	Remove long prefix
`${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
'
```

Substrings

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

Length

`${#foo}`	Length of `$foo`

Manipulation

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

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

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`.

Loops

Basic for loop

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

C-like for loop

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

Reading lines

```
while read -r line; do
  echo "$line"
done <file.txt
```

Forever

```
while true; do
  ···
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)
```

Raising errors

```
myfunc() {
  return 1
}
```

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

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).

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
`[[ STRING =~ STRING ]]`	Regexp
`(( NUM < NUM ))`	Numeric conditions

More conditions

`[[ -o noclobber ]]`	If OPTIONNAME is enabled
`[[ ! EXPR ]]`	Not
`[[ X && Y ]]`	And
`[[ X || Y ]]`	Or

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 [[ -e "file.txt" ]]; then
  echo "file exists"
fi
```

Arrays

Defining arrays

```
Fruits=('Apple' 'Banana' 'Orange')
```

```
Fruits[0]="Apple"
Fruits[1]="Banana"
Fruits[2]="Orange"
```

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
```

Operations

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

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/**/*.rb' => 'lib/a/b/c.rb')
```

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

Expansions

`!$`	Expand last parameter of most recent command
`!*`	Expand all parameters of most recent command
`!-n`	Expand `n`th most recent command
`!n`	Expand `n`th command in history
`!<command>`	Expand most recent invocation of command`<command>`

Operations

`!!`	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.

Slices

`!!:n`	Expand only `n`th 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 `n`th 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

declare -i count  # Declare as type integer
count+=1          # Increment
```

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 2> error.log           # stderr to (file)
python hello.py 2>&1                   # stderr to stdout
python hello.py 2>/dev/null            # stderr to (null)
python hello.py >output.txt 2>&1       # stdout and stderr to (file), equivalent to &>
python hello.py &>/dev/null            # stdout and stderr to (null)
echo "$0: warning: too many users">&2  # print diagnostic message to stderr
```

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

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

Inspecting commands 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
```

Case/switch

```
case "$1" in
   start | up)
     vagrant up
    ;;

  *)
    echo "Usage: $0 {start|stop|ssh}"
    ;;
esac
```

Source relative

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

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"

printf '%s\n' '#!/bin/bash' 'echo hello' >file
# format string is applied to each group of arguments
printf '%i+%i=%i\n' 1 2 3  4 5 9
```

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
```

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
```

Heredoc

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

Reading input

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

The -r option disables a peculiar legacy behavior with backslashes.

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

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)

s.

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
```