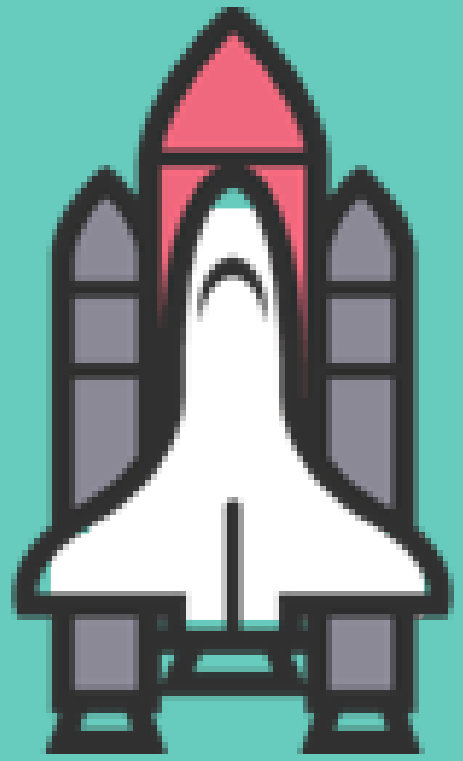
Shell Scripts

For Beginners



Why Shell Scripts?

Automate

Time

Productivity

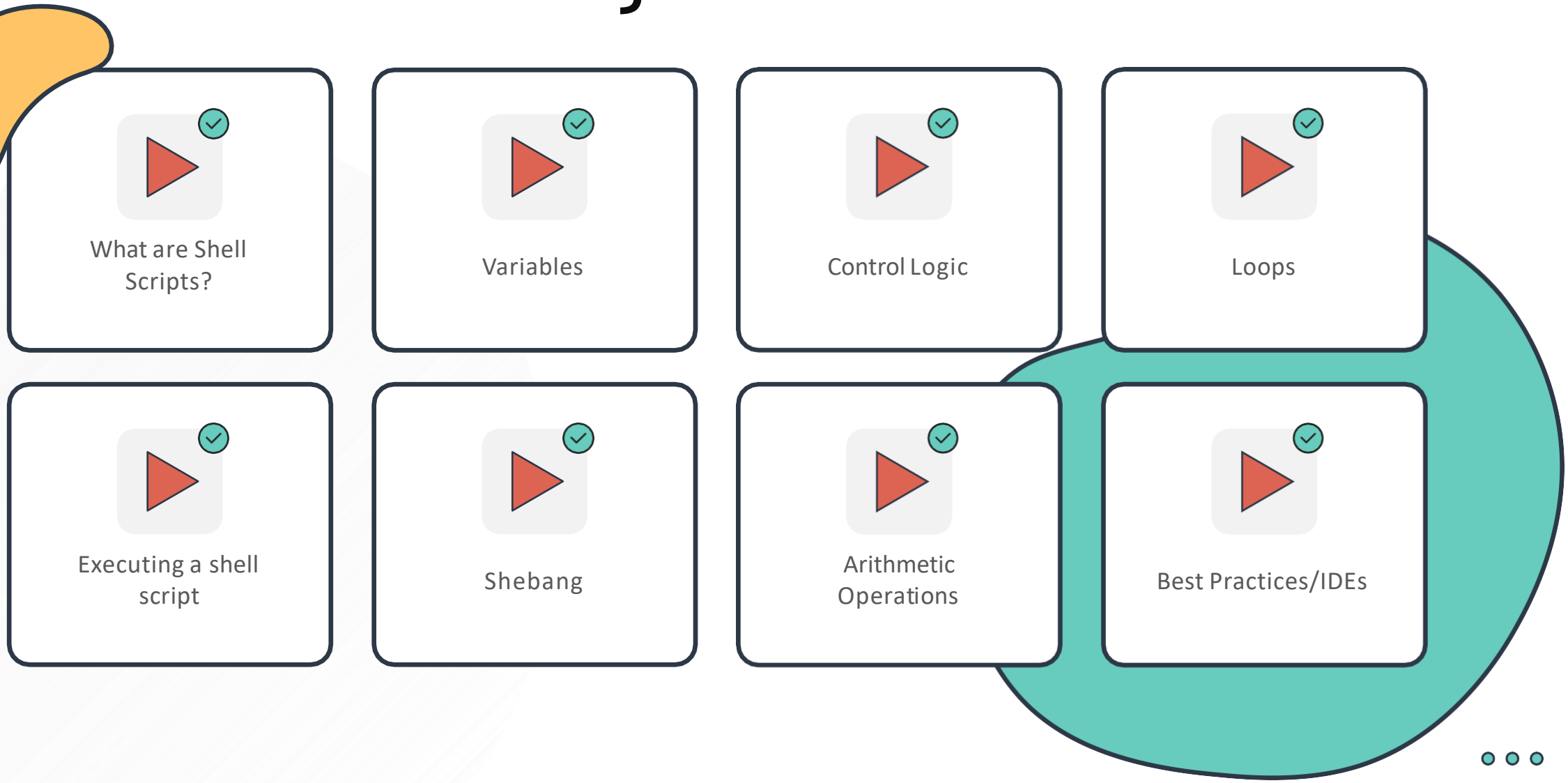
Why Shell Scripts?

- Automate Daily Backups
- Automate Installation and Patching of software on multiple servers
- Monitor system periodically
- Raise alarms and send notifications
- Troubleshooting and Audits
- Many More

Who is this for?

- Systems Administrators
- Developers
- IT Engineers
- Absolute Beginners
- **No Programming Experience**

Objectives

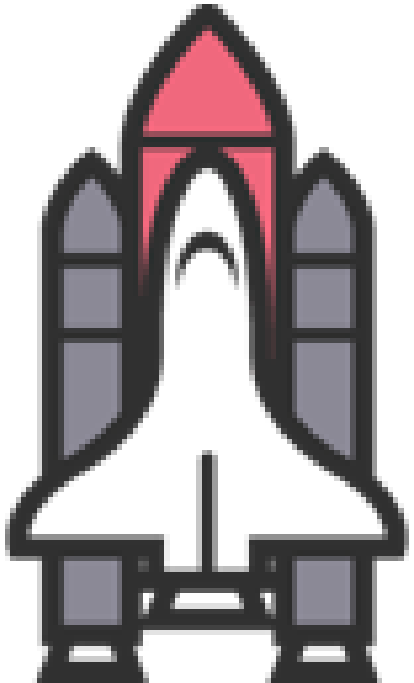

What are Shell Scripts?
Variables
Control Logic
Loops
Executing a shell script
Shebang
Arithmetic Operations
Best Practices/IDEs

Pre-Requisites

- Linux Basics
- Command line basics
- No programming knowledge required

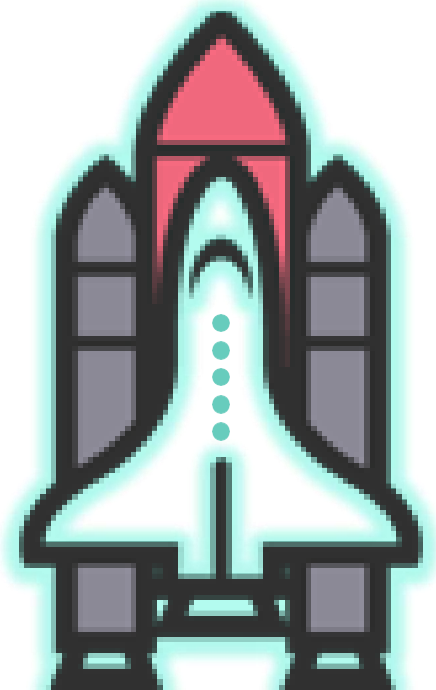
Introduction

Shell Scripting



Launch Sequence

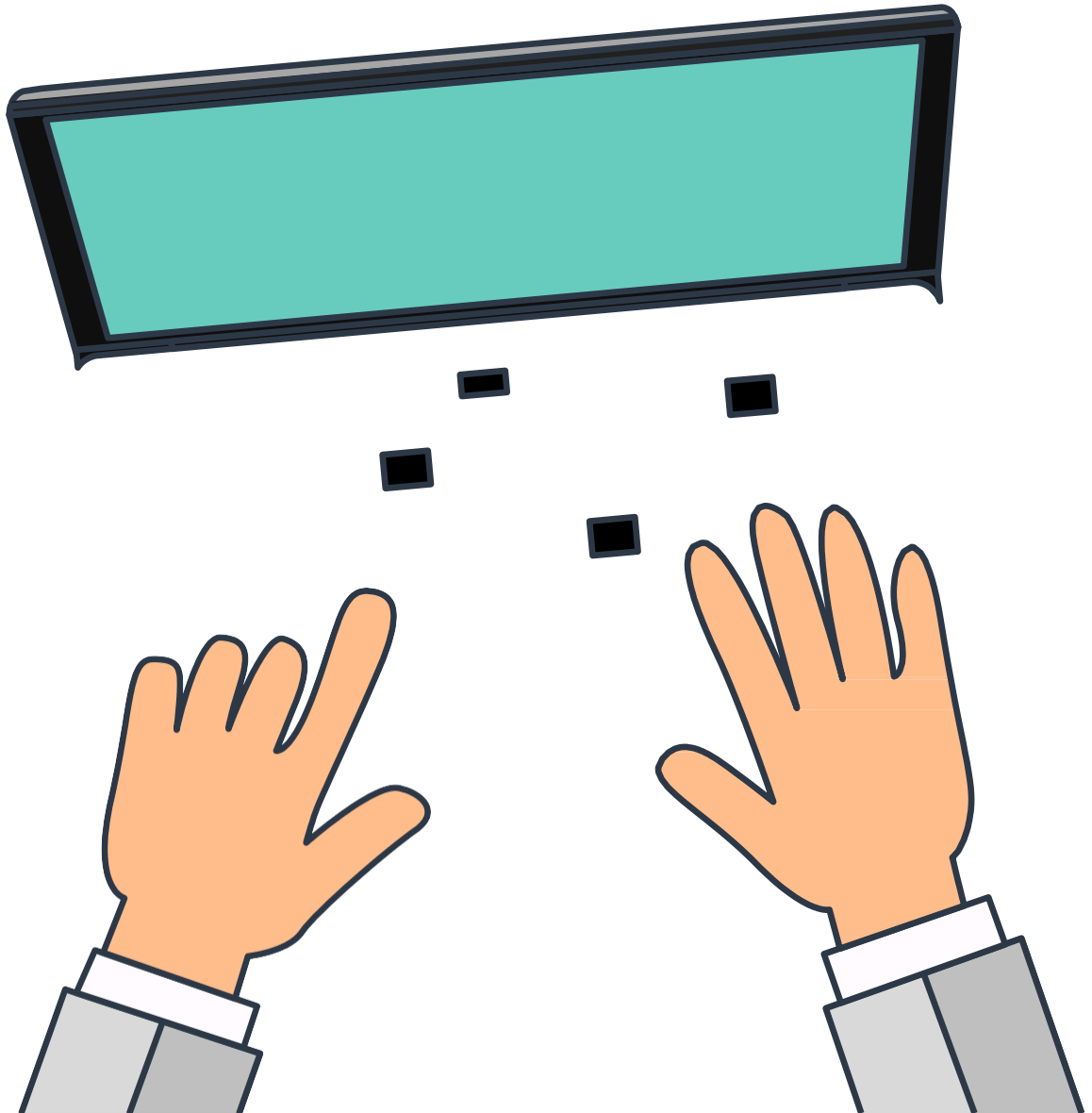
1. Start Auxiliary Power
2. Switch to Internal Power
3. Auto Sequence Start
4. Main Engine Start
5. Lift Off



Launch Sequence

1. Start Auxiliary Power	rocket-start-power	ls	rocket-ls
2. Switch to Internal Power	rocket-internal-power	useradd	rocket-add
3. Auto Sequence Start	rocket-start-sequence	mkdir	rocket-del
4. Main Engine Start	rocket-start-engine	which	rocket-status
5. Lift Off	rocket-lift-off	dir	rocket-debug

HANDS-ON LABS



Creating your first Script

Shell Scripting

Creating your First Script

```
$ mkdir lunar-mission
```

```
$ rocket-add lunar-mission
```

```
$ rocket-start-power lunar-mission
$ rocket-internal-power lunar-mission
$ rocket-start-sequence lunar-mission
$ rocket-start-engine lunar-mission
$ rocket-lift-off lunar-mission
```

```
$ rocket-status lunar-mission
```

```
$ bash create-and-launch-rocket.sh
```

create-and-launch-rocket.sh

```
✔ mkdir lunar-mission

✔ rocket-add lunar-mission

✔ rocket-start-power lunar-mission
✔ rocket-internal-power lunar-mission
✔ rocket-start-sequence lunar-mission
✔ rocket—start-engine lunar-mission
✔ rocket-lift-off lunar-mission

✔ rocket-status lunar-mission
```

Run script as Command

```
$ bash create-and-launch-rocket.sh
```

```
$ create-and-launch-rocket
create-and-launch-rocket    : command not found
```

```
$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
```

```
$ export
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin /home/michael
```

or

```
$ export PATH=$PATH:/home/michael
```

```
$ create-and-launch-rocket
```

```
$ which create-and-launch-rocket
/home/michael/create-and-launch-
```

Executing a Script

```
$ /home/michael/ create-and-launch-rocket
-bash: ./create-and-launch-rocket: Permission denied
```

```
$ ls -l /home/michael/create-and-launch-rocket
-rw-rw-r-- 1 michael michael 19 Mar 16 09:47 create-and-launch-rocket
```

```
$ chmod +x /home/michael/create-and-launch-rocket
```

```
$ ls -l /home/michael/create-and-launch-rocket
-rwx-rwx-r-x 1 michael michael 19 Mar 16 09:47 create-and-launch-rocket
```

```
$ /home/michael/create-and-launch-rocket
```

Best Practice

“Leave out .sh extension for executables”

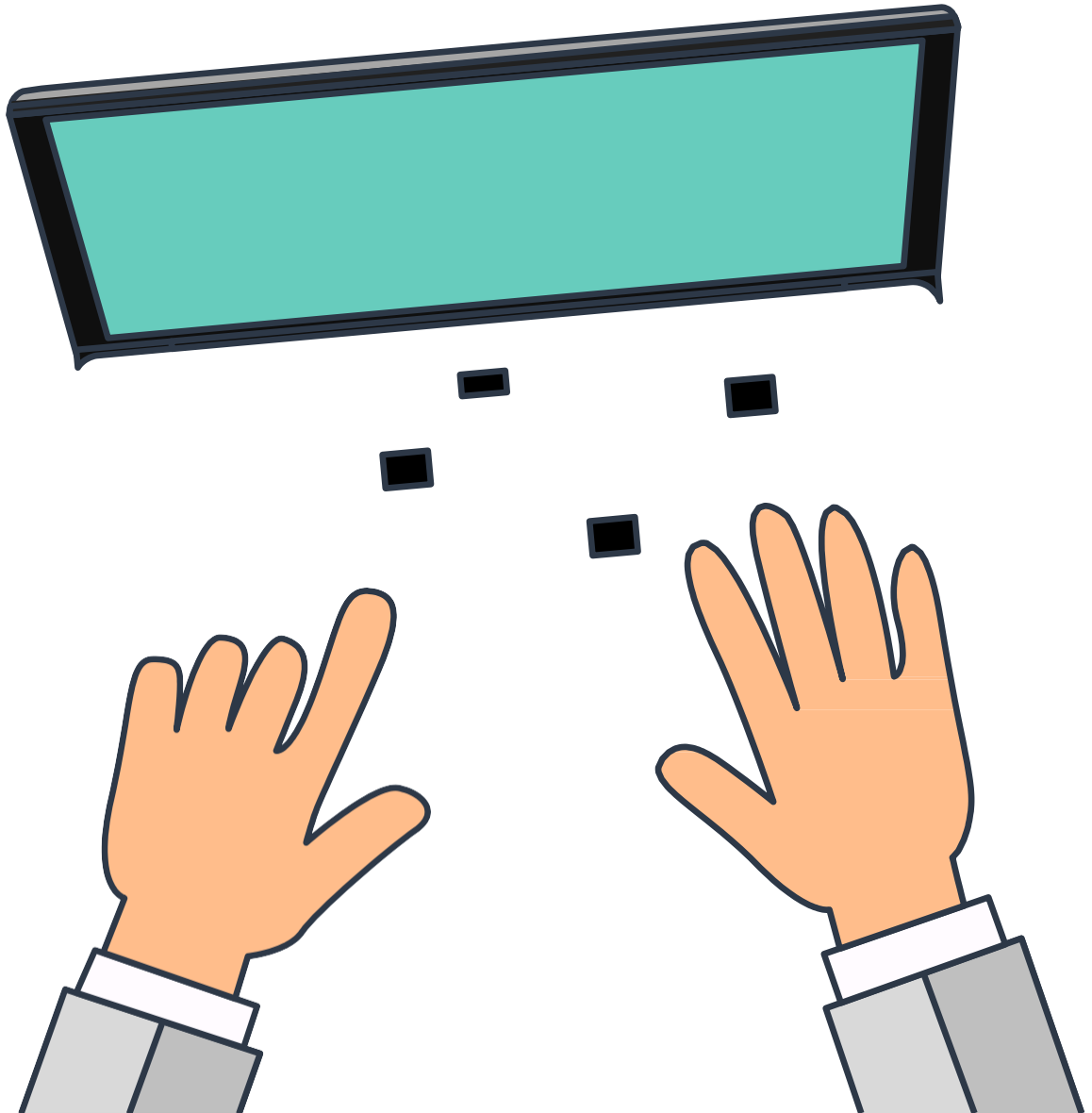
good:

create-and-launch-rocket

bad:

create-and-launch-rocket.sh

HANDS-ON LABS



Variables

Shell Scripting

VARIABLES

create-and-launch-rocket

```
mkdir lunar-mission

rocket-add lunar-mission

rocket-start-power lunar-mission
rocket-internal-power lunar-mission
rocket-start-sequence lunar-mission
rocket-start-engine lunar-mission
rocket-lift-off lunar-mission

rocket-status lunar-mission
```

VARIABLES

ALPHANUMERIC OR UNDERSCORES

`mission_name` `mission-name`

CASE SENSITIVE

`MISSION_NAME` ≠ `mission_name`

create-and-launch-rocket

```
mission_name=mars-mission
mkdir  $mission_name

rocket-add  $mission_name

rocket-start-power  $mission_name
rocket-internal-power $mission_name
rocket-crew-ready  $mission_name
rocket-start-sequence $mission name
rocket-start-engine  $mission_name
rocket-lift-off  $mission_name

rocket-status  $mission_name
```

VARIABLES

```
$ rocket-status lunar-mission
launching    success    failed
```

create-and-launch-rocket

```
mission_name=mars-mission
mkdir  $mission_name

rocket-add  $mission_name

rocket-start-power  $mission_name
rocket-internal-power $mission_name
rocket-crew-ready  $mission_name
rocket-start-sequence $mission name
rocket-start-engine  $mission_name
rocket-lift-off  $mission_name

rocket_status=$(rocket-status $mission_name)
echo "Status of launch: $rocket_status"
```

```
echo "Status of launch: $rocket_status _state"
     "Status of launch: success_state"
```

```
echo "Status of launch: ${rocket_status} _state"
     "Status of launch: success_state"
```

Best Practice

“Variable names must be in lower-case with underscores to separate words”

good:

mission_name

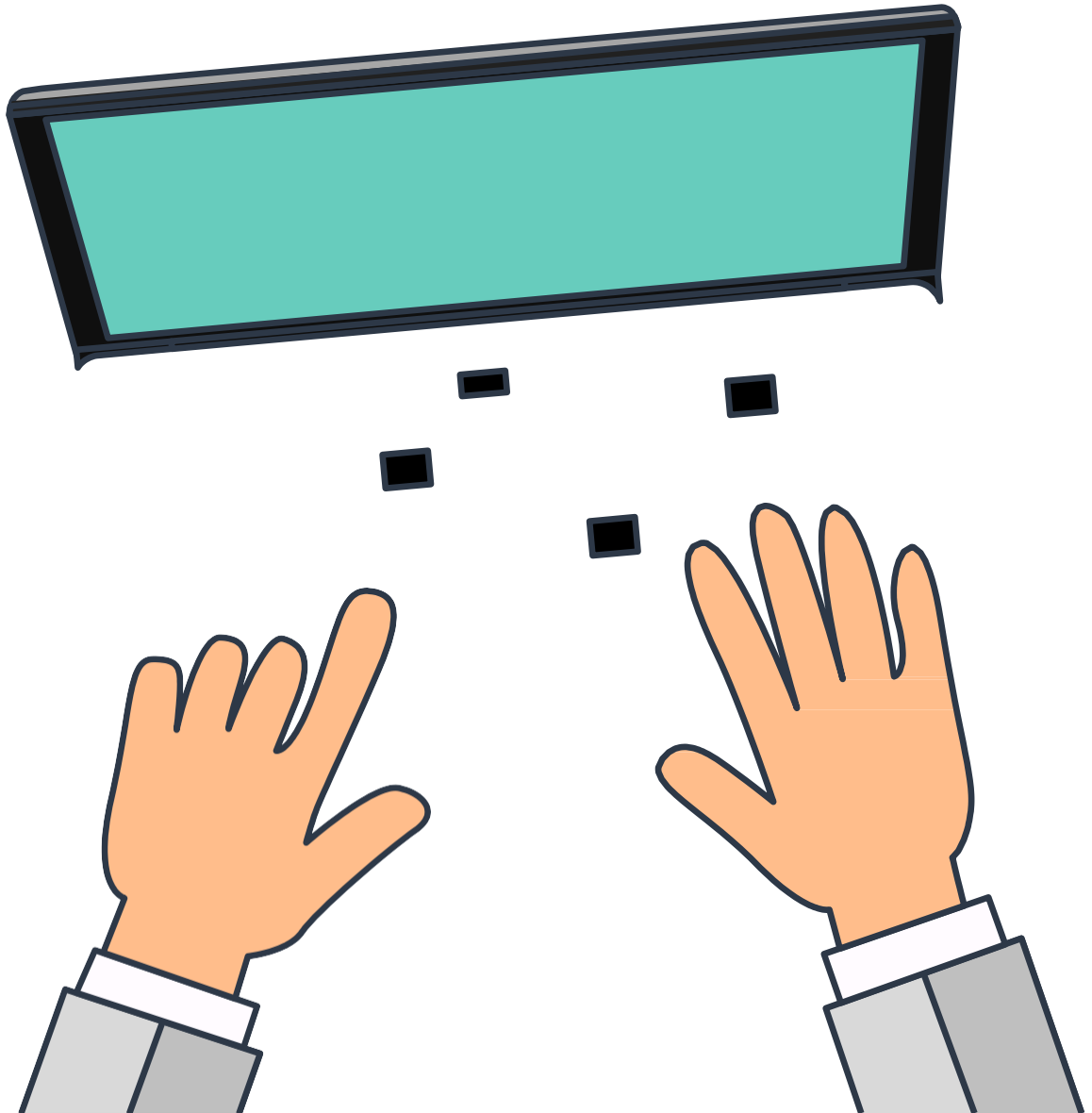
bad:

Mission_Name

Mission Name

Mission-name

HANDS-ON LABS



Command Line Arguments

Shell Scripting

Command Line Arguments

```
$ create-and-launch-rocket
```

```
$ #modify the create-and-launch-rocket
```

```
$ create-and-launch-rocket
```

```
$ #modify the create-and-launch-rocket
```

```
$ create-and-launch-rocket
```

```
$ create-and-launch-rocket saturn-mission
```

$0 $1

```
$ create-and-launch-rocket jupiter-mission
```

```
$ create-and-launch-rocket uranus-mission
```

create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket-status $mission_name

rocket_status=$(rocket-status $mission_name
echo "Status of launch: $rocket_status"
```

Command Line Arguments

create-and-launch-

```
mission_name= $1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket-status $mission_name

rocket_status=$(rocket-status $mission_name)
echo "Status of launch: $rocket_status"
```

create-and-launch-

```
mkdir  $1

rocket-add  $1

rocket-start-power $1
rocket-internal-power  $1
rocket-start-sequence  $1
rocket-start-engine $1
rocket-lift-off $1

rocket-status  $1

rocket_status=$(rocket-status  $1
echo "Status of launch: $rocket_status"
```

Best Practice

Design your script to be re-usable.”

“Script should not require to be edited before running.”

“Use command line arguments to pass inputs.”

Input

Shell Scripting

```
$ create-and-launch-rocket saturn-mission
```

```
$ create-and-launch-rocket
Enter the mission name:  saturn-mission
```

```
$ create-and-launch-rocket
saturn-mission
```

create-and-launch-

```
read mission_name

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket-status $mission_name

rocket_status=$(rocket-status $mission_name)
echo "Status of launch: $rocket_status"
```

```
$ create-and-launch-rocket saturn-mission
```

```
$ create-and-launch-rocket
Enter the mission name:  saturn-mission
```

```
$ create-and-launch-rocket
saturn-mission
```

```
$ create-and-launch-rocket
Enter the mission name:  saturn-mission
```

create-and-launch-

```
read -p "Enter mission name:" mission_name

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket-status $mission_name

rocket_status=$(rocket-status $mission_name)
echo "Status of launch: $rocket_status"
```

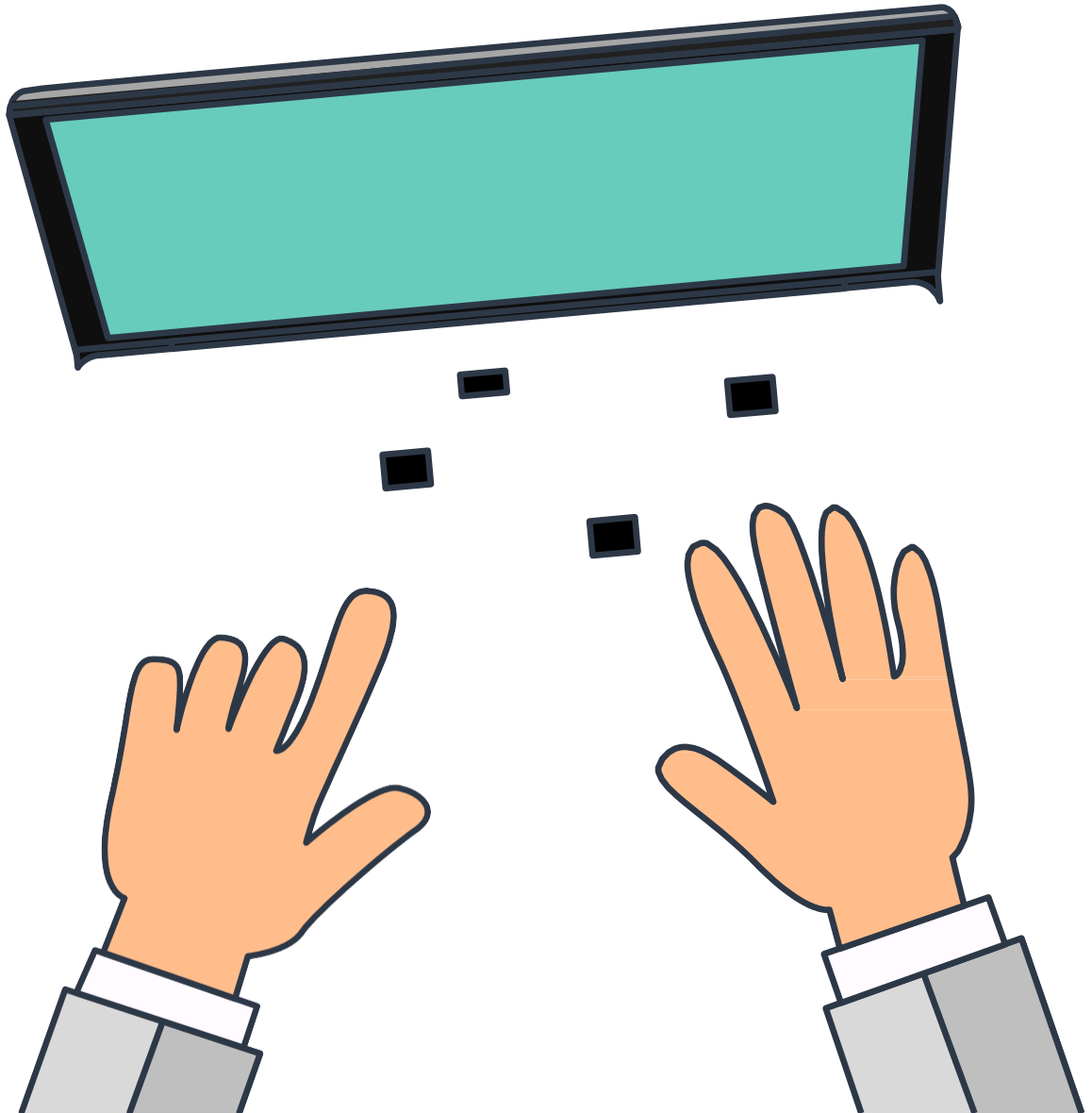
create-and-launch-

```
read -p "Enter mission name:" mission_name

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket-status $mission_name

rocket_status=$(rocket-status $mission_name)
echo "Status of launch: $rocket_status"
```

create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket-status $mission_name

rocket_status=$(rocket-status $mission_name)
echo "Status of launch: $rocket_status"
```

HANDS-ON LABS



Arithmetic Operations

Shell Scripting

expr

```
$ A=6
$ B=3
```

```
$ expr 6 + 3
9
```

```
$ expr $A + $B
9
```

```
$ expr 6 - 3
3
```

```
$ expr $A - $B
3
```

```
$ expr 6 / 3
2
```

```
$ expr $A / $B
2
```

```
$ expr 6 \* 3
18
```

```
$ expr $A \* $B
18
```

double parentheses

```
$ A=6
$ B=3
```

```
$ expr $A  +  $B
9
```

```
$ expr $A  -  $B
3
```

```
$ expr $A  /  $B
2
```

```
$ expr $A \*  $B
18
```

```
$ echo $(( A + B ))
9
```

```
$ echo $(( A-B ))
3
```

```
$ echo $((A/B))
2
```

```
$ echo $(( A * B ))
18
```

double parentheses

```
$ echo $(( A + B ))
9
```

```
$ echo $(( A-B ))
3
```

```
$ echo $((A/B))
2
```

```
$ echo $(( A * B ))
18
```

```
$ echo $(( ++A ))
7
```

```
$ echo $(( --A ))
6
```

```
$ echo $(( A++ ))
6
```

```
$ echo $(( A-- ))
7
```

bc

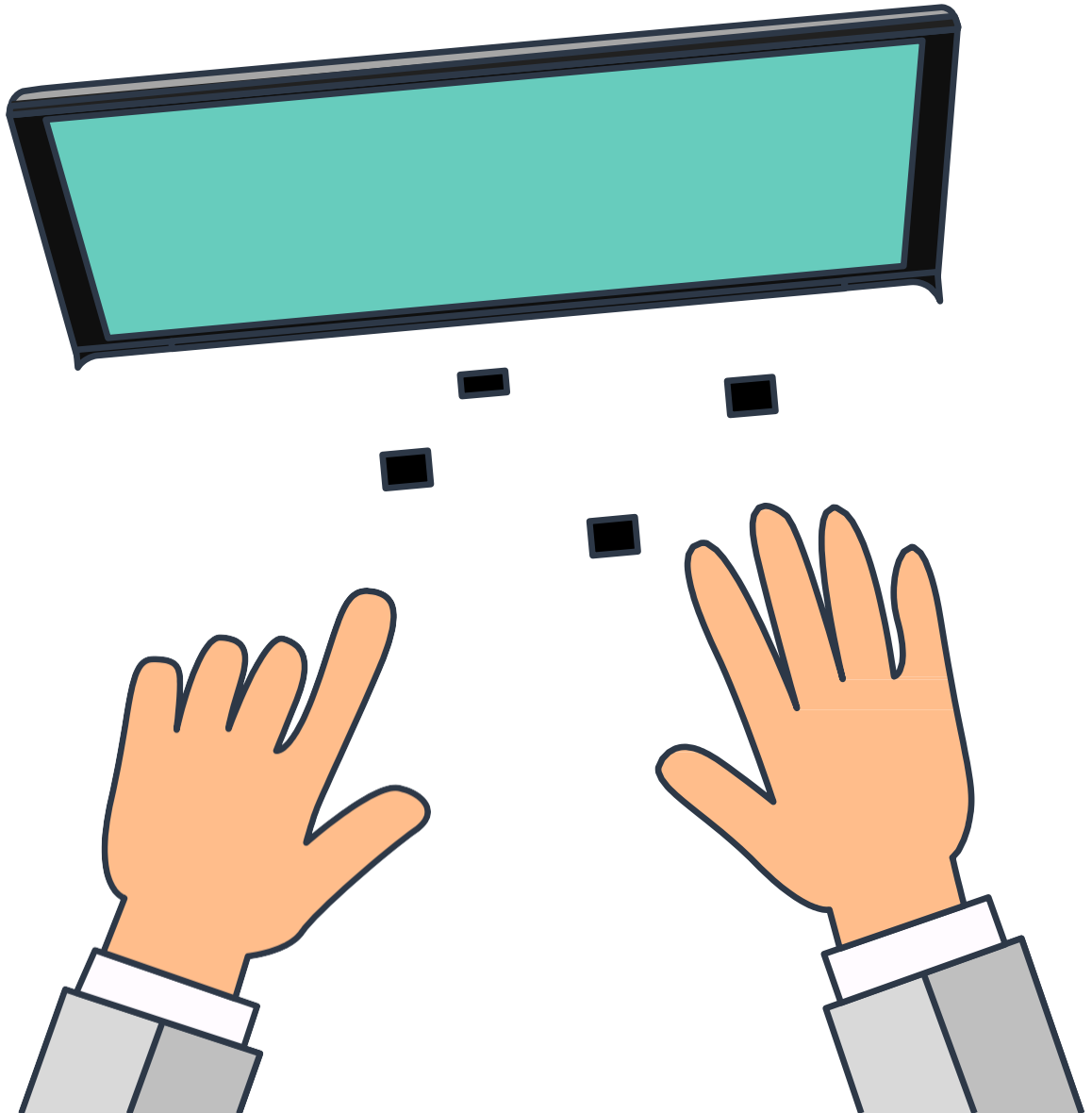
```
$ A=10
$ B=3
```

```
$ expr $A  /  $B
3
```

```
$ echo $((A/B))
3
```

```
$ echo $A / $B | bc -l
3.333333
```

HANDS-ON LABS

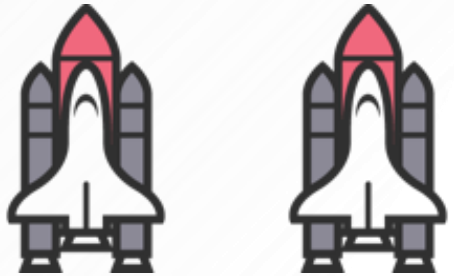


Conditional Logic

Shell Scripting

```
$ rocket-status lunar-mission
launching    success    failed
```

```
$ rocket-debug lunar-mission
overheating
```



create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name

if rocket-status is failed, then run this
rocket-debug $mission_name
```

Conditional Logic

```
$ rocket-status lunar-mission
launching    success    failed
```

```
$ rocket-debug lunar-mission
overheating
```

create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

    if rocket-status is failed, then run this
if [ $rocket_status = "failed"   ]
then
      rocket-debug $mission_name
fi
```

Conditional Logic

```
$ rocket-status lunar-mission
launching    |    success    |    failed
```

```
$ rocket-debug lunar-mission
overheating
```

create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

if [ $rocket_status = "failed"   ]
then
    rocket-debug $mission_name
fi
```

Else If

```
$ rocket-status lunar-mission
launching    |    success    |    failed
```

```
$ rocket-debug lunar-mission
overheating
```

create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

if [ $rocket_status = "failed"   ]
then
      rocket-debug $mission_name

elif [ $rocket_status = "success" ]
then
       echo "This is successful"
fi
```

Else

```
$ rocket-status lunar-mission
launching      success      failed
```

```
$ rocket-debug lunar-mission
overheating
```

mkdir $mission_name

```
rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

if [ $rocket_status = "failed"   ]
then
      rocket-debug $mission_name

elif [ $rocket_status = "success" ]
then
      echo "This is successful"

else

      echo "The state is not failed or succes

fi
```

Conditional Operators

[STRING1 = STRING2]

Example	Description
["abc" = "abc"]	If string1 is exactly equal to string2 (true)
["abc" != "abc"]	If string1 is not equal to string 2 (false)
[5 -eq 5]	If number1 is equal to number2 (true)
[5 -ne 5]	If number1 is not equal to number2 (false)
[6 -gt 5]	If number1 is greater than number2 (true)
[5 -lt 6]	If number1 is less than number2 (true)

Conditional Operators

```
[[ STRING1 = STRING2  ]]
```

Example	Description
`[[ "abcd" = *bc*  ]]`	If abcd contains bc (true)

`[[ "abc" = ab[cd] ]]`
or
`[[ "abd" = ab[cd] ]]`
	If 3rd character of abc is c or d (true)

`[[ "abe" = "ab[cd]" ]]`	If 3rd character of abc is c or d (false)
`[[ "abc" > "bcd" ]]`	If “abc” comes after “bcd” when sorted in alphabetical (lexographical) order (false)
`[[ "abc" < "bcd" ]]`	If “abc” comes before “bcd” when sorted in alphabetical (lexographical) order (true)

Only in BASH

Conditional Operators

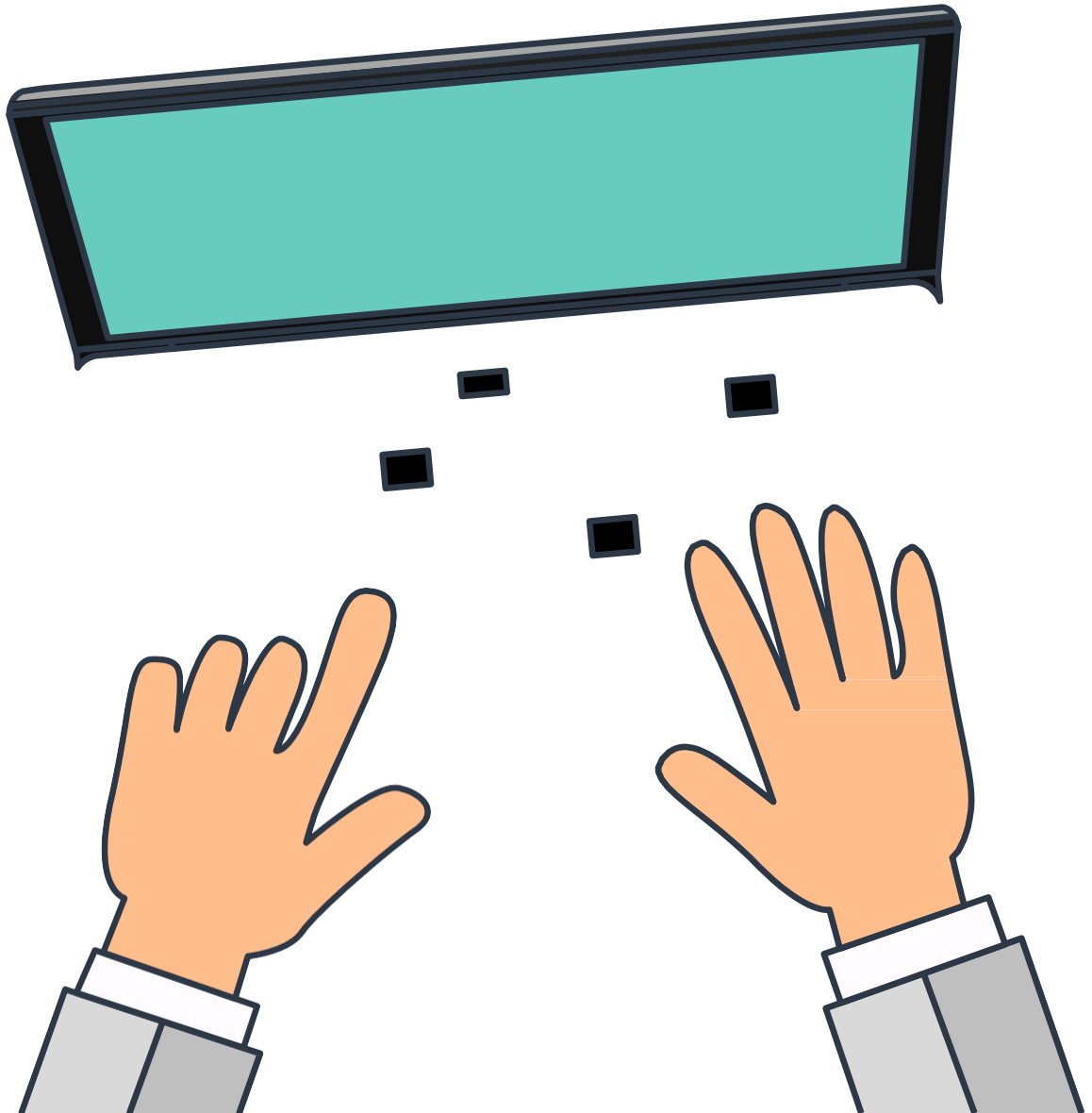
```
[ COND1   ] && [   COND2   ]

[[    COND1 && COND2      ]]

[ COND1   ] || [   COND2   ]

[[    COND1 || COND2      ]]
```

Example	Description
`[[ A -gt 4 && A -lt 10 ]]`	If A is greater than 4 and less than 10
`[[ A -gt 4 || A -lt 10 ]]`	If A is greater than 4 or less than 10

Conditional Operators

Example	Description
[-e FILE]	if file exists
[-d FILE]	if file exists and is a directory
[-s FILE]	If file exists and has size greater than 0
[-x FILE]	If the file is executable
[-w FILE]	If the file is writeable

HANDS-ON LABS



Loops - For

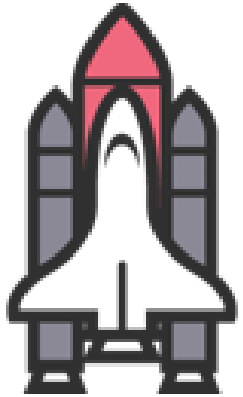
Shell Scripting



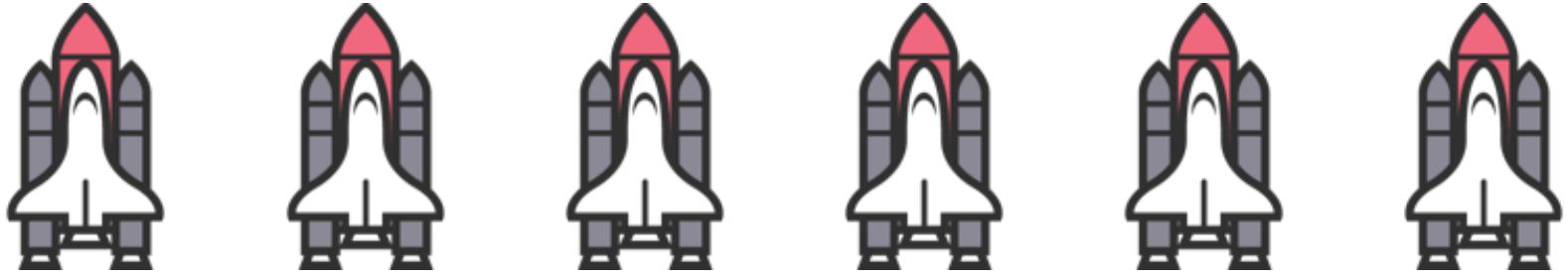





```
$ create-and-launch-rocket lunar-mission
```

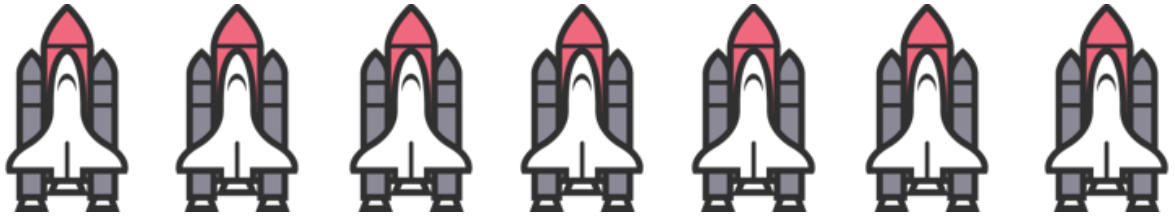


```
$ create-and-launch-rocket lunar-mission
$ create-and-launch-rocket jupiter-mission
$ create-and-launch-rocket saturn-mission
$ create-and-launch-rocket satellite-mission
$ create-and-launch-rocket lunar-mission-2
$ create-and-launch-rocket mars-mission
$ create-and-launch-rocket earth-mission
```






```
$ create-and-launch-rocket lunar-mission
$ create-and-launch-rocket jupiter-mission
$ create-and-launch-rocket saturn-mission
$ create-and-launch-rocket satellite-mission
$ create-and-launch-rocket lunar-mission-2
$ create-and-launch-rocket mars-mission
$ create-and-launch-rocket earth-mission
```



launch-rockets.sh

```
create-and-launch-rocket lunar-mission
create-and-launch-rocket jupiter-mission
create-and-launch-rocket saturn-mission
create-and-launch-rocket satellite-missio
create-and-launch-rocket lunar-mission-2
create-and-launch-rocket mars-mission
create-and-launch-rocket earth-mission
```



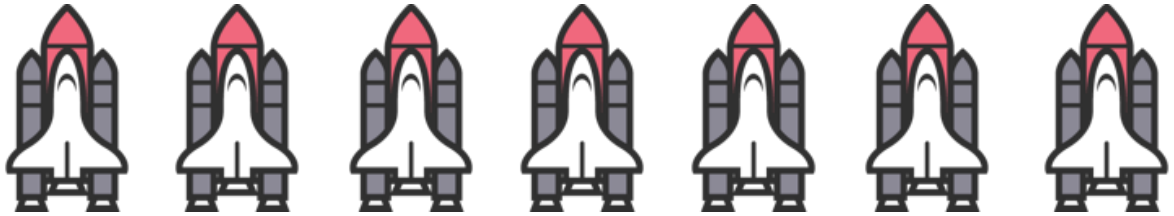

launch-rockets.sh

For each mission

create and

launch rocket

```
for mission in  lunar-mission jupiter-missio
do
  create-and-launch-rocket
done
```



launch-rockets.sh

```
for mission in lunar-mission jupiter-mission saturn-mission satellite-mission lunar-mission-2
do
  create-and-launch-rocket $mission
done
```

mission-names.txt

```
lunar-mission
jupiter-mission
saturn-mission
satellite-mission
lunar-mission-2
mars-mission
apollo-mission
spitzer-mission
viking-mission
pheonix-mission
chandrayan-mission
gaganyan-mission
aditya-mission
nisar-mission
mangalyaan-mission
columbia-mission
challenger-mission
atlantis-mission
endeavour-mission
mercury-mission
gemini-mission
```

launch-rockets.sh

```
for mission in $(cat mission-names.txt)
do
  create-and-launch-rocket $mission
done
```

```
for mission in $(cat mission-names.txt)
do
  create-and-launch-rocket  $mission
done
```

```
for mission in 1 2 3 4 5 6
do
 create-and-launch-rocket mission-$mission
done
```

```
mission-1
mission-2
mission-3
mission-4
mission-5
mission-6
```

```
for mission in  {0..100}
do
 create-and-launch-rocket mission-$mission
done
```

```
mission-1
mission-2
mission-3
mission-4
mission-100
```

```
for mission in $(cat mission-names.txt)
do
 create-and-launch-rocket  $mission
done
```

```
for (( mission = 0 ; mission <= 100; mission++ ))
do
 create-and-launch-rocket mission-$mission
done
```

```
for mission in 1 2 3 4 5 6
do
 create-and-launch-rocket mission-$mission
done
```

```
for mission in {0..100}
do
 create-and-launch-rocket mission-$mission
done
```

Use a For Loop when you have to:

- Execute a command or a set of commands many times
- Iterate through files
- Iterate through lines within a file
- Iterate through the output of a command

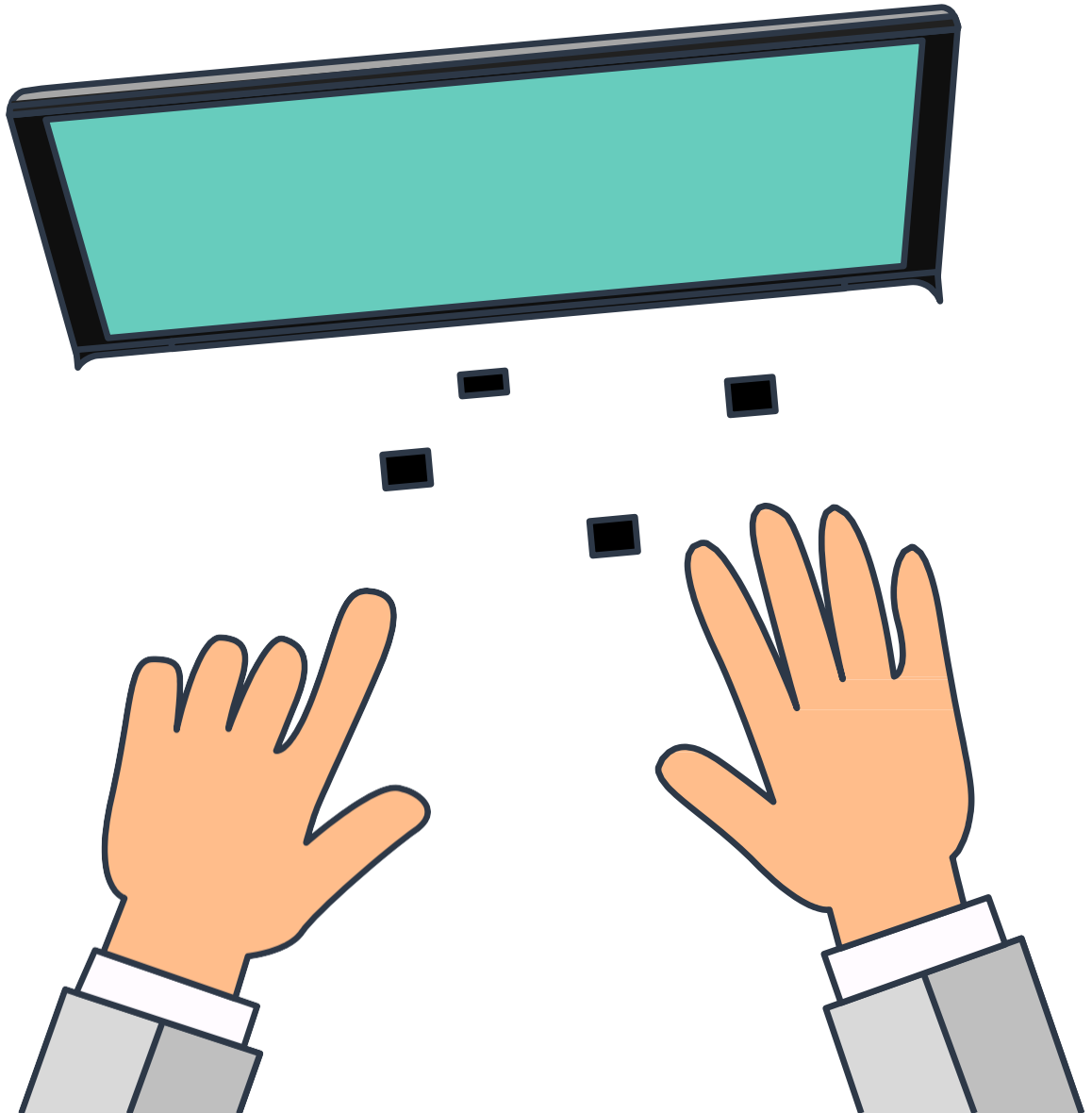
Real life use cases:

```
for file in $(ls)
do
 echo Line count of $file is $(cat $file | wc -l)
done
```

```
for server in $(cat servers.txt)
do
 ssh $server "uptime"
done
```

```
for package in $(cat install-packages.txt)
do
 sudo apt-get -y install $package
done
```

HANDS-ON LABS



Loops - While

Shell Scripting

```
$ rocket-status lunar-mission
success
```

create-and-launch-

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name


if [ $rocket_status = "failed"   ]
then
      rocket-debug $mission_name
fi
```

```
mission_name=$1
```

```
$ rocket-status lunar-mission
launching
```

create-and-launch-

```
mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name
if [$rocket_status = "launching"]
then
     sleep 2
     rocket_status=rocket-status $mission_nam
fi
if [ $rocket_status = "failed"   ]
then
      rocket-debug $mission_name
fi
```

mission_name=$1

```
$ rocket-status lunar-mission
launching
```

create-and-launch-

```
mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name
if [$rocket_status = "launching"]
then
     sleep 2
     rocket_status=rocket-status $mission_nam
     if [$rocket_status = "launching"]
     then
          sleep 2
     fi
fi
```

```
mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name

if [$rocket_status = "launching"]
then
     sleep 2
     rocket_status=rocket-status $mission_name
     if [$rocket_status = "launching"]
     then
          sleep 2
          rocket_status=rocket-status $mission_name
          if [$rocket_status = "launching"]
          then
               sleep 2
          fi
     fi
fi
```

```
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=rocket-status $mission_name

while [ $rocket_status = "launching"   ]
do

  sleep 2
  rocket_status=rocket-status $mission_name

done
```

mission_name=$1

create-and-launch-

```
mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name
while [ $rocket_status = "launching"   ]
do
  sleep 2
  rocket_status=rocket-status $mission_name
done
if [ $rocket_status = "failed"   ]
then
    rocket-debug $mission_name
fi
```

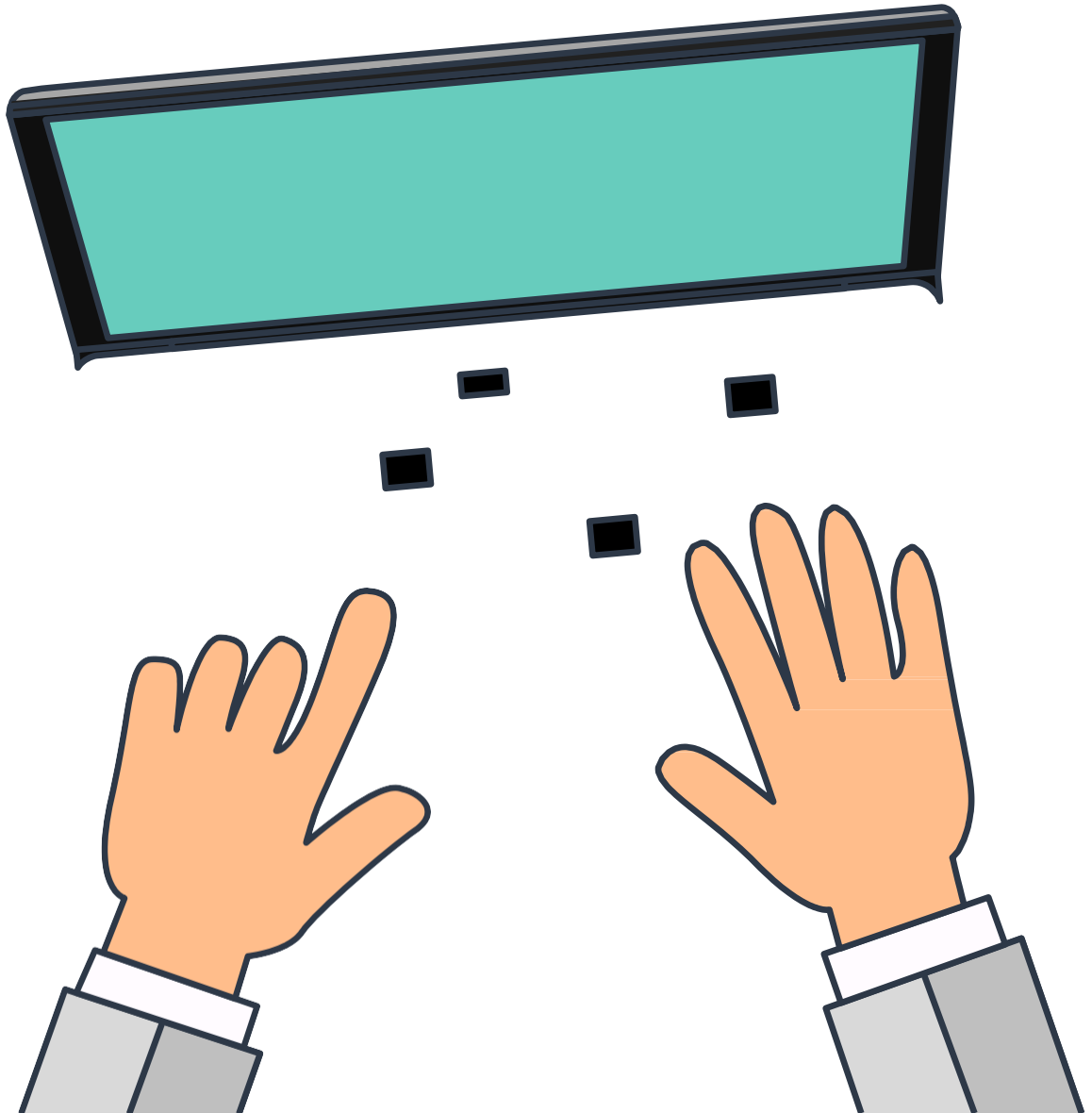
Use a While Loop when you have to:

- Execute a command or a set of commands multiple times but you are not sure how many times.
- Execute a command or a set of commands until a specific condition occurs
- Create infinite loops
- Menu driven programs

Real life use cases:

```
while true
Do
     echo "1. Shutdown"
     echo "2. Restart"
     echo "3. Exit Menu"
     read -p "Enter your choice: " choice

     if [ $choice  -eq 1 ]
     then
        shutdown now
     elif [ $choice  -eq 2 ]
     then
        shutdown -r now
     elif [ $choice  -eq 3 ]
     then
        break
     else
        continue
     fi


done
```

HANDS-ON LABS



Case Statements

Shell Scripting

```
while
true
do
   echo "1. Shutdown"
   echo "2. Restart"
   echo "3. Exit Menu"
   read -p "Enter your choice: " choice

   if [ $choice  -eq 1 ]
   then
      shutdown now
   elif [ $choice  -eq 2 ]
   then
      shutdown -r now
   elif [ $choice  -eq 3 ]
   then
      break
   else
      continue
   fi
done
```

```
echo "1. Shutdown"
echo "2. Restart"
echo "3. Exit Menu"
read -p "Enter your choice: " choice

if [ $choice  -eq 1 ]
then
   shutdown now
elif [ $choice  -eq 2 ]
then
   shutdown -r now
elif [ $choice  -eq 3 ]
then
   break
else
   continue
fi
```

Case Statement

```
    echo "1. Shutdown"
    echo "2. Restart"
    echo "3. Exit Menu"
    read -p "Enter your choice: " choice
    if [ $choice  -eq 1 ]
    then
        shutdown now
    elif [ $choice  -eq 2 ]
    then
        shutdown -r now
    elif [ $choice  -eq 3 ]
    then
        break
    else
        continue
    fi
```

- *echo "1. Shutdown"*
- *echo "2. Restart"*
- *echo "3. Exit Menu"*
- *read –p "Enter your choice:" choice*
- *case $choice in*

```
    1) shutdown now ;;
    esac
```

Case Statement

```
   echo "1. Shutdown"
   echo "2. Restart"
   echo "3. Exit Menu"
   read -p "Enter your choice: " choice
   if [ $choice  -eq 1 ]
   then
      shutdown now
   elif [ $choice  -eq 2 ]
   then
      shutdown -r now
   elif [ $choice  -eq 3 ]
   then
      break
   else
      continue
   fi
```

- *echo "1. Shutdown"*
- *echo "2. Restart"*
- *echo "3. Exit Menu"*
- *read –p "Enter your choice:" choice*
- *case $choice in*
  - *1) shutdown now*
  - *;;*
  - *2) shutdown –r now*

```
esac
```

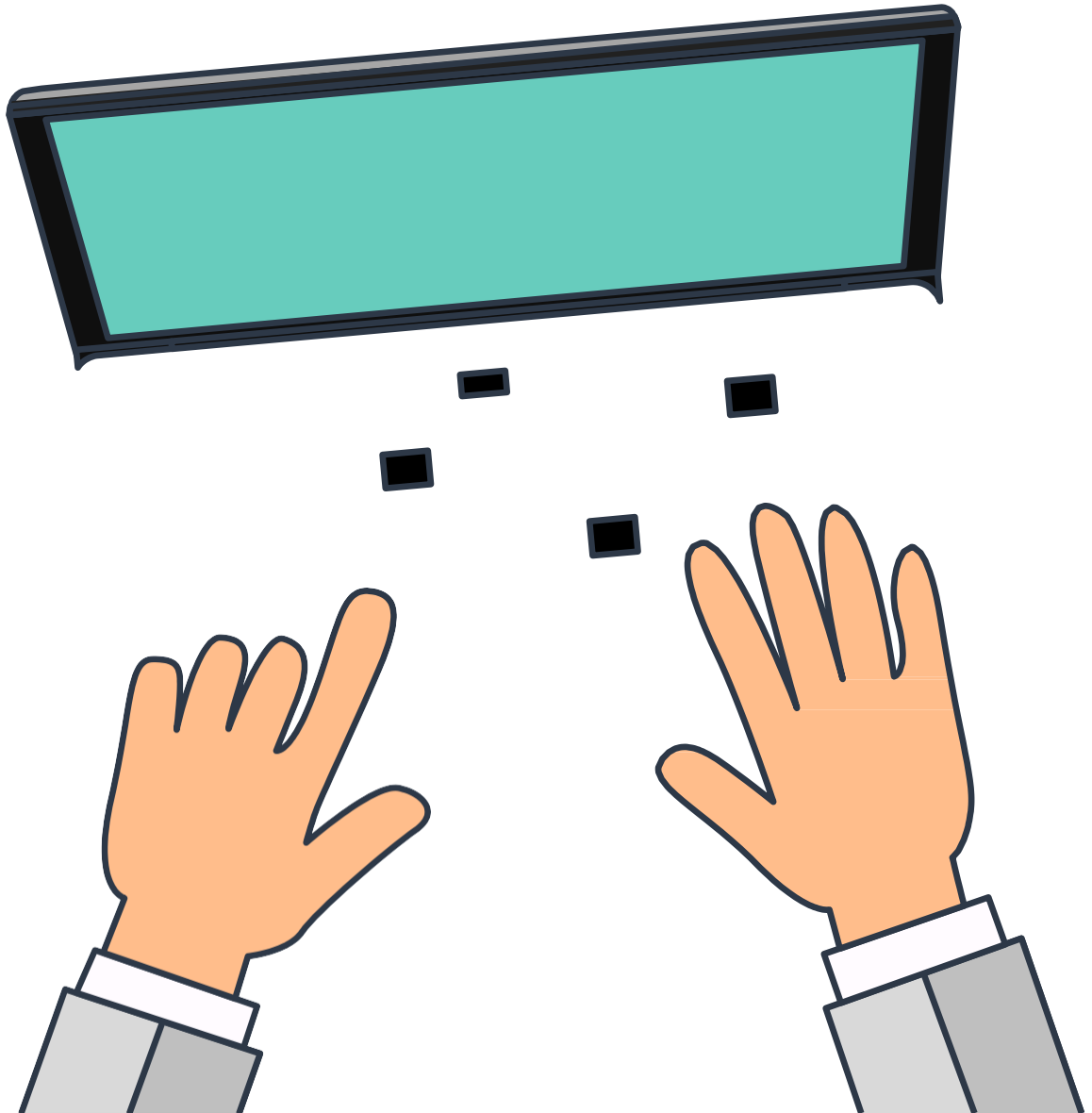
Case Statement

```
 echo "1. Shutdown"
 echo "2. Restart"
 echo "3. Exit Menu"
 read -p "Enter your choice: " choice

case $choice in

      1) shutdown now
         ;;
      2) shutdown -r now
         ;;
      3) break
         ;;
      *) continue
         ;;

esac
```

Case Statement

```
while true
do
  echo "1. Shutdown"
  echo "2. Restart"
  echo "3. Exit Menu"
  read -p "Enter your choice: " choice

 case $choice in

      1) shutdown now
         ;;
      2) shutdown -r now
         ;;
      3) break
         ;;
      *) continue
         ;;

 esac

done
```

HANDS-ON LABS



SHEBANG

Shell Scripting

SHEBANG

```
sh$ ls -l /bin/sh
    /bin/sh -> /bin/bash
```

launch-rockets.sh

```
#!/bin/bash
for mission in {0..10}
do
  create-and-launch-rocket $mission
done
```

Bourne Shell (**sh**)
Debian Almquist Shell (**dash**)

```
sh$ launch-rockets.sh
Launching mission {0..10}

sh$ bash launch-rockets.sh
Launching mission 0
Launching mission 1
Launching mission 2
Launching mission 3
.
.
Launching mission 9
Launching mission 10
```

Bourne again Shell (**bash**)

```
bash$ launch-rockets.sh
Launching mission 0
Launching mission 1
Launching mission 2
Launching mission 3
Launching mission 4
Launching mission 5
Launching mission 6
Launching mission 7
Launching mission 8
Launching mission 9
Launching mission 10
```

Best Practice

“Always start with a Shebang in your scripts”

Exit Codes

Shell Scripting

Exit Codes

```
$ ls
/home /root /tmp
```

```
$ echo $?
0
```


```
$ rocket-status
success
```

```
$ echo $?
0
```

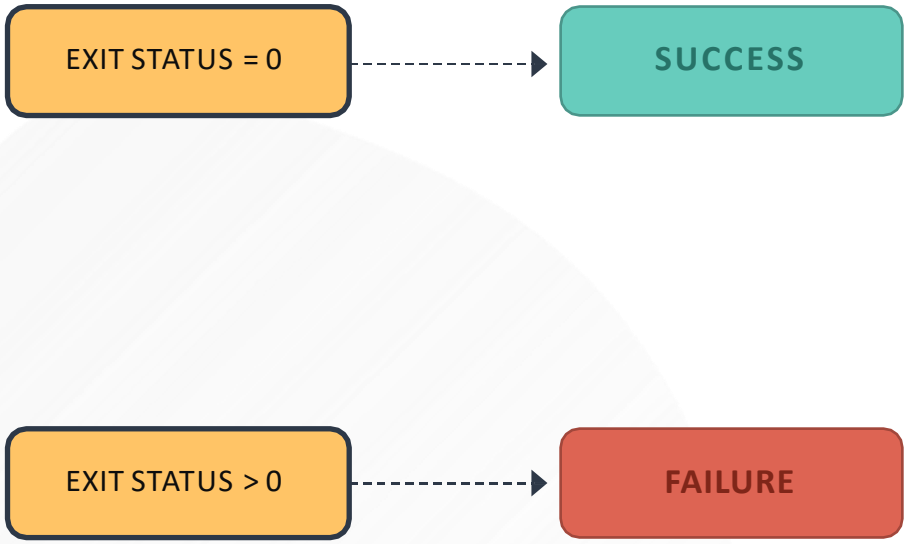
```
$ lss
Failed: command not found
```

```
$ echo $?
127
```


```
$ rocket-status
failed
```

```
$ echo $?
1
```

mission_name=$1




```
$ create-and-launch-rocket
failed
```

```
$ echo $?
0
```

create-and-launch-

```
mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name
while [ $rocket_status == "launching"   ]
do
  sleep 2
  rocket_status=rocket-status $mission_name
done
if [ $rocket_status = "failed"   ]
then
      rocket-debug $mission_name
fi
```


```
$ create-and-launch-rocket
failed
```

```
$ echo $?
1
```

create-and-launch-

_name=

$1

```
mkdir $mission_name
rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name
rocket_status=rocket-status $mission_name
while [ $rocket_status == "launching"  ]
do
  sleep 2
  rocket_status=rocket-status $mission_name
done
if [ $rocket_status = "failed"  ]
then
      rocket-debug $mission_name
      exit 1
fi
```

Best Practice

“Always return appropriate exit codes in your script”

Functions

Shell Scripting

create-and-launch-rocket

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

while [ $rocket_status == "launching"  ]
do
  sleep 2
  rocket_status=$(rocket-status $mission_name)
done
if  [$rocket_status = "failed" ]
then
  rocket-debug $mission_name
  exit 1
fi
```

create-and-launch-rocket

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

while [ $rocket_status == "launching"  ]
do
  sleep 2
  rocket_status=$(rocket-status $mission_name)
done
if  [$rocket_status = "failed" ]
then
  rocket-debug $mission_name
  exit 1
fi

mission_name=mars-mission

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

while [ $rocket_status == "launching"  ]
do
```

create-and-launch-rocket

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name


rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

while [ $rocket_status == "launching"  ]
do
  sleep 2
  rocket_status=$(rocket-status $mission_name)
done
if  [$rocket_status = "failed" ]
then
  rocket-debug $mission_name
  exit 1
fi
```

```
mission_name=mars-mission

mkdir $mission_name

rocket-add $mission_name


rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
rocket-start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status $mission_name)

while [ $rocket_status == "launching"  ]
do
  sleep 2
  rocket_status=$(rocket-status $mission_name)
done
if  [$rocket_status = "failed" ]
then
  rocket-debug $mission_name
  exit 1
fi
```

```
mission_name=mars-mission

mkdir $mission_name

rocket-add $mission_name


rocket-start-power $mission_name
rocket-internal-power $mission_name
rocket-start-sequence $mission_name
```

create-and-launch-rocket

```
mission_name=$1

mkdir $mission_name

rocket-add $mission_name

rocket-start-power $mission_name
rocket-internal-power
$mission_name rocket-start-
sequence $mission_name rocket-
start-engine $mission_name
rocket-lift-off $mission_name

rocket_status=$(rocket-status

$mission_name) while [ $rocket_status ==

"launching"                              ]
do
  sleep 2
  rocket_status=$(rocket-status $mission_name)
done
if  [$rocket_status = "failed" ]
then
  rocket-debug $mission_name
  exit 1
fi
```

create-and-launch-rocket

```
function launch-rocket() {
  mission_name=$1

  mkdir $mission_name

  rocket-add $mission_name

  rocket-start-power $mission_name
  rocket-internal-power
  $mission_name rocket-start-
  sequence $mission_name rocket-
  start-engine $mission_name
  rocket-lift-off $mission_name

  rocket_status=$(rocket-status

  $mission_name) while [ $rocket_status ==

  "launching"                              ]
  do
    sleep 2
    rocket_status=$(rocket-status
  $mission_name) done
  if  [$rocket_status = "failed" ]
  then
    rocket-debug $mission_name
    exit 1
  fi
}
```

create-and-launch-rocket

```
function launch-rocket() {
    mission_name=$1

    mkdir $mission_name

    rocket-add $mission_name

    rocket-start-power $mission_name
    rocket-internal-power
    $mission_name rocket-start-
    sequence $mission_name rocket-
    start-engine $mission_name
    rocket-lift-off $mission_name

    rocket_status=$(rocket-status

    $mission_name) while [ $rocket_status ==

    "launching"                              ]
    do
      sleep 2
      rocket_status=$(rocket-status
    $mission_name) done
    if  [$rocket_status = "failed" ]
    then
      rocket-debug $mission_name
      exit 1
    fi
}
```

create-and-launch-rocket

Function Definition

```
function launch-rocket() {
  mission_name=$1

  mkdir $mission_name

  rocket-add $mission_name

  rocket-start-power $mission_name
  rocket-internal-power $mission_name
  rocket-start-sequence $mission_name
  rocket-start-engine $mission_name
  rocket-lift-off $mission_name

  rocket_status=$(rocket-status $mission_name)

  while [ $rocket_status == "launching"  ]
  do
    sleep 2
    rocket_status=$(rocket-status $mission_name)
  done
  if  [$rocket_status = "failed" ]
  then
    rocket-debug $mission_name
    exit 1
  fi
}
```

Main

```
launch-rocket lunar-mission

launch-rocket mars-mission

launch-rocket saturn-mission

launch-rocket mercury-mission
```

```
launch-rocket: command not found
```

create-and-launch-rocket

Main

```
launch-rocket lunar-mission
launch-rocket mars-mission
launch-rocket saturn-mission
launch-rocket mercury-mission
```

Function Definition

```
function launch-rocket() {
  mission_name=$1

  mkdir $mission_name

  rocket-add $mission_name


  rocket-start-power $mission_name
  rocket-internal-power $mission_name
  rocket-start-sequence $mission_name
  rocket-start-engine $mission_name
  rocket-lift-off $mission_name

  rocket_status=$(rocket-status $mission_name)

  while [ $rocket_status == "launching"  ]
  do
    sleep 2
    rocket_status=$(rocket-status $mission_name)
  done
  if  [$rocket_status = "failed" ]
  then
    rocket-debug $mission_name
    exit 1
  fi
}
```

create-and-launch-rocket

Function Definition

```
function launch-rocket() {
  mission_name=$1

  mkdir $mission_name

  rocket-add $mission_name

  rocket-start-power $mission_name
  rocket-internal-power $mission_name
  rocket-start-sequence $mission_name
  rocket-start-engine $mission_name
  rocket-lift-off $mission_name

  rocket_status=$(rocket-status $mission_name)

  while [ $rocket_status == "launching"  ]
  do
    sleep 2
    rocket_status=$(rocket-status $mission_name)
  done
  if  [$rocket_status = "failed" ]
  then
    rocket-debug $mission_name
    exit 1
  fi
}
```

Main

```
launch-rocket lunar-mission

launch-rocket mars-mission

launch-rocket saturn-mission

launch-rocket mercury-mission
```

create-and-launch-rocket

```
function launch-rocket() {
  mission_name=$1

  mkdir $mission_name

  rocket-add $mission_name

  rocket-start-power $mission_name
  rocket-internal-power $mission_name
  rocket-start-sequence $mission_name
  rocket-start-engine $mission_name
  rocket-lift-off $mission_name

  rocket_status=$(rocket-status $mission_name)

  while [ $rocket_status == "launching"  ]
  do
    sleep 2
    rocket_status=$(rocket-status $mission_name)
  done
  if  [$rocket_status = "failed" ]
  then
    rocket-debug $mission_name
    return 1
  fi
}

launch-rocket lunar-mission

launch-rocket mars-mission

launch-rocket saturn-mission

launch-rocket mercury-mission
```

create-and-launch-rocket

```
function launch-rocket() {
  mission_name=$1

  mkdir $mission_name

  rocket-add $mission_name

  rocket-start-power $mission_name
  rocket-internal-power $mission_name
  rocket-start-sequence $mission_name
  rocket-start-engine $mission_name
  rocket-lift-off $mission_name

  rocket_status=$(rocket-status $mission_name)

  while [ $rocket_status == "launching"  ]
  do
    sleep 2
    rocket_status=$(rocket-status $mission_name)
  done
  if  [$rocket_status = "failed" ]
  then
    rocket-debug $mission_name
    return 1
  fi
}

launch-rocket lunar-mission
LUNAR_STATUS_CODE=$?
launch-rocket mars-mission
MARS_STATUS_CODE=$?
launch-rocket saturn-mission
SATURN_STATUS_CODE=$?
```

When to use Functions?

- Break up large script that performs many different tasks:
  - Installing packages
  - Adding users
  - Configuring firewalls
  - Perform Mathematical calculations

```
function add(){
  echo $(( $1 + $2 ))
}


add 3 5
```

```
function add(){
  echo $(( $1 + $2 ))
}


sum=$( add 3 5 )
```

```bash
function add(){
  echo $(( $1 + $2 ))
}

sum=$( add 3 5 )
```

```bash
function add(){
  return $(( $1 + $2 ))
}

add 3 5

sum=$?
```

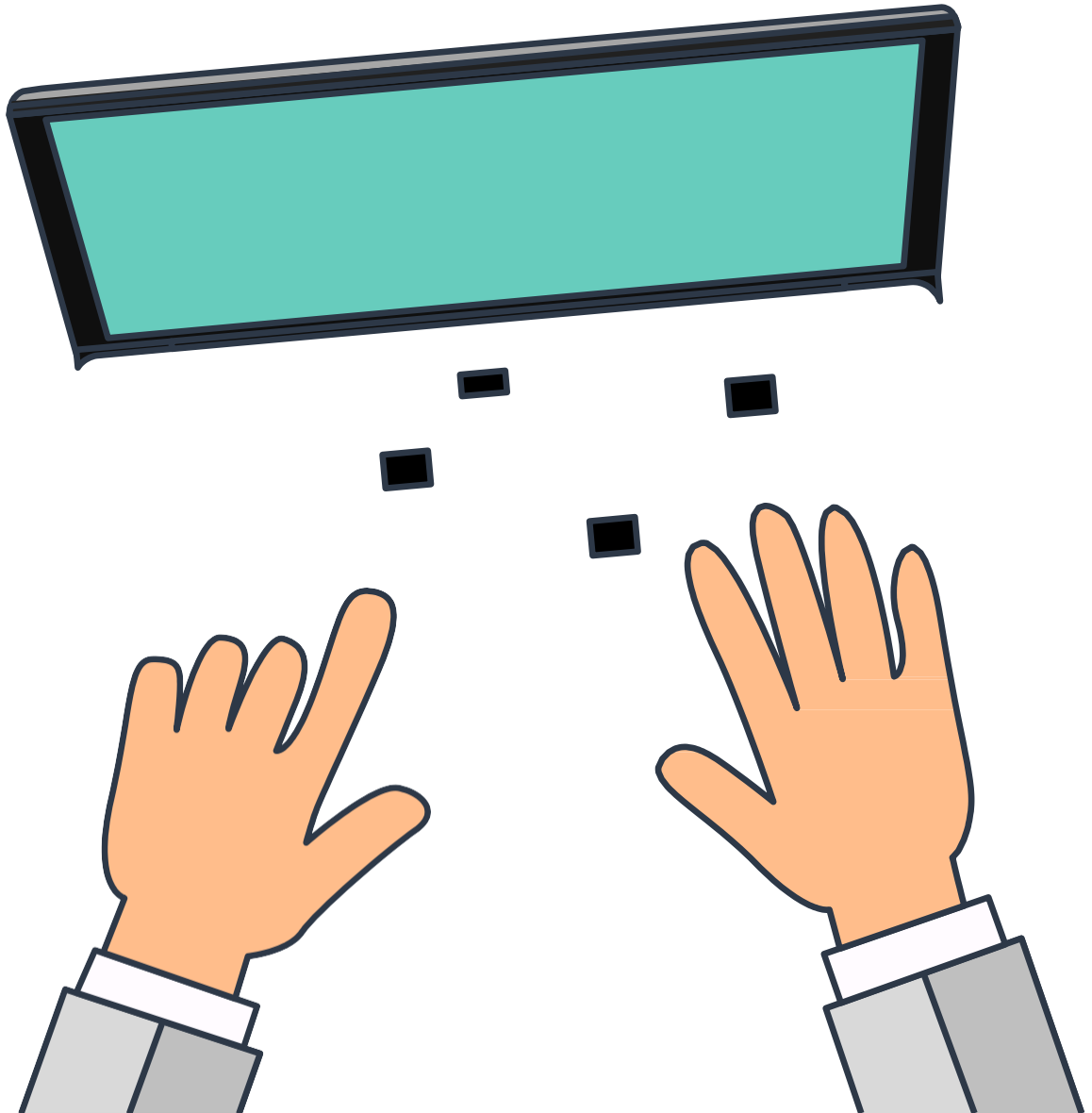
Best Practice

“Always develop scripts in a modular re-usable way using functions”

“Avoid duplicate code”

“Use arguments/parameters to pass in variables”

HANDS-ON LABS



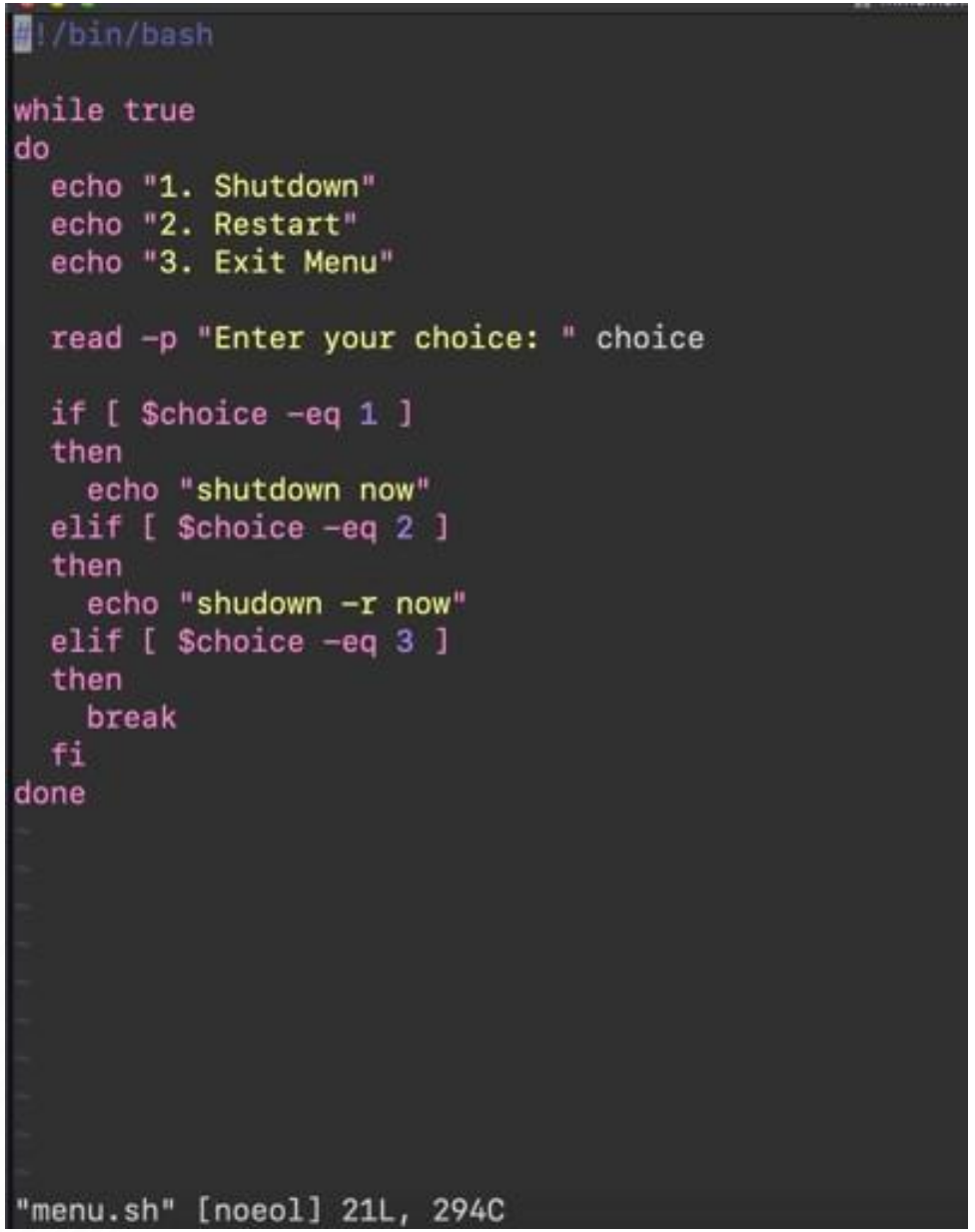
Project

Shell Scripting

ShellCheck/IDEs

Shell Scripting

VIM Editor


#!/bin/bash
while true
do
echo "1. Shutdown"
echo "2. Restart"
echo "3. Exit Menu"
read -p "Enter your choice: " choice
if [$choice -eq 1]
then
echo "shutdown now"
elif [$choice -eq 2]
then
echo "shudown -r now"
elif [$choice -eq 3]
then
break
fi
done
"menu.sh" [noeol] 21L, 294C

SHELLCHECK

```
$ apt-get install shellcheck
```

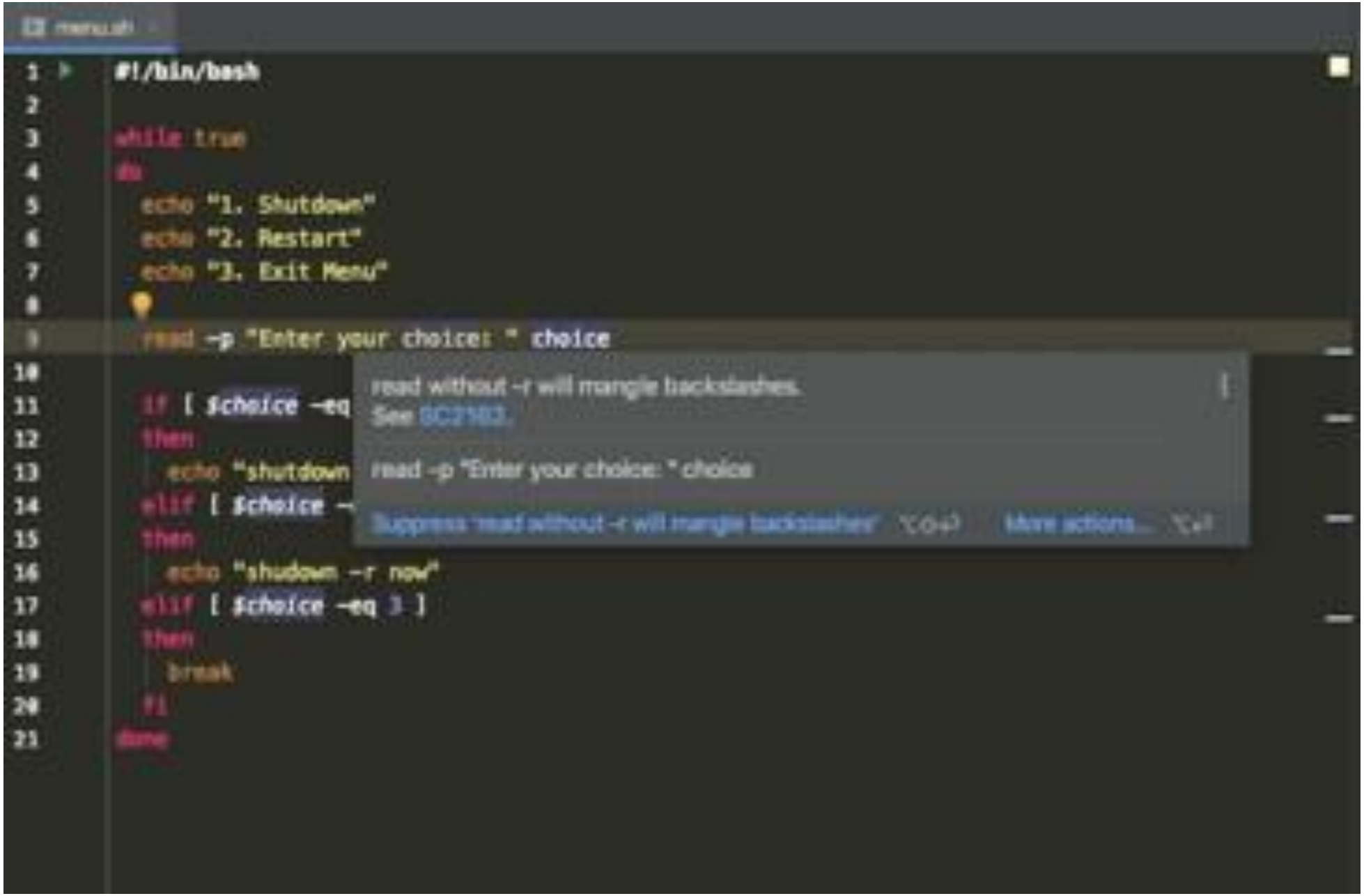
Or

```
$ yum install shellcheck
```

```
$ shellcheck menu.sh


In menu.sh line 9:
  read -p "Enter your choice: " choice
  ^--^ SC2162: read without -r will mangle backslashes.


In menu.sh line 11:
  if [ $choice -eq 1 ]
       ^-----^ SC2086: Double quote to prevent globbing and word splitting.

Did you mean:
  if [ "$choice" -eq 1 ]


In menu.sh line 14:
  elif [ $choice -eq 2 ]
         ^-----^ SC2086: Double quote to prevent globbing and word splittin

Did you mean:
  elif [ "$choice" -eq 2 ]
```

https://github.com/koalaman/shellcheck

https://www.jetbrains.com/pycharm/download


menu.sh
#!/bin/bash
while true
do
echo "1. Shutdown"
echo "2. Restart"
echo "3. Exit Menu"
read -p "Enter your choice: " choice
if [$choice -eq
then
echo "shutdown
elif [$choice -
then
echo "shudown -r now"
elif [$choice -eq 3]
then
break
fi
done
read without -r will mangle backslashes.
See SC2162.
read -p "Enter your choice: " choice
Suppress 'read without -r will mangle backslashes' ⌥⇧⌘F
More actions... ⌥⏎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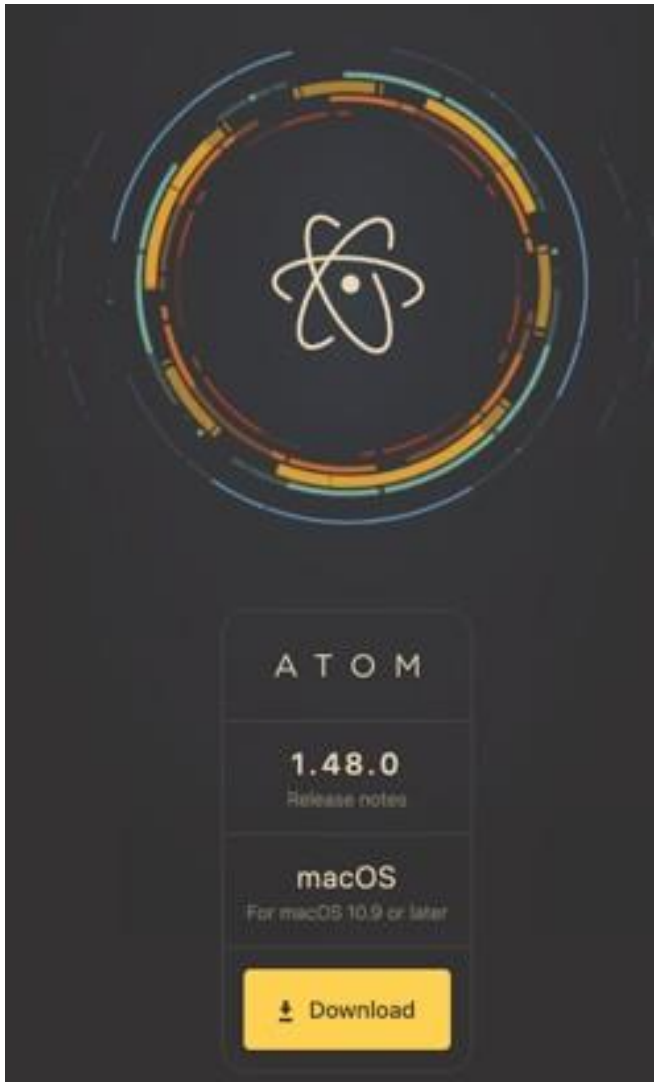
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styleguide

Shell Style Guide

Revision 2.02

Authored, revised and maintained by many Googlers.

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https://google.github.io/styleguide/shellguide.html