



Operating Systems Writeup

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1 Practical 1 - Commands

Taking a selection of Windows CLI commands from those given below, use the online help to examine the various options and arguments, and try them out.

You're required carefully to write two A4 pages (Times 12 point or equivalent size) detailing your experiments with different options for between six and ten different commands. To get the online help for a command, type command /?

e.g.

dir /?

prompt

mkdir

color

title

tree

type

ver

print

xcopy

Type help at the windows command line prompt to see some more instructions

- Prompt - The prompt command is used to customize the text that appears before the cursor in the command prompt.

```
1 prompt MyPrompt$G
```

This changes the prompt to MyPrompt>. The \$G represents the > symbol.

- Mkdir - The mkdir command is used to create a new directory.

```
1 mkdir MyDirectory
```

This creates a new directory called MyDirectory. To create a folder inside another folder:

```
1 mkdir MyDirectory\MySubDirectory
```

- Color - The color command is used to change the color of the text and background in the command prompt.

```
1 color 0A
```

This sets a black background (0) with green text (A). To reset to default:

```
1 color
```

To see all the available colors:

```
1 color /?
```

- Title - The title command is used to change the title of the command prompt window.

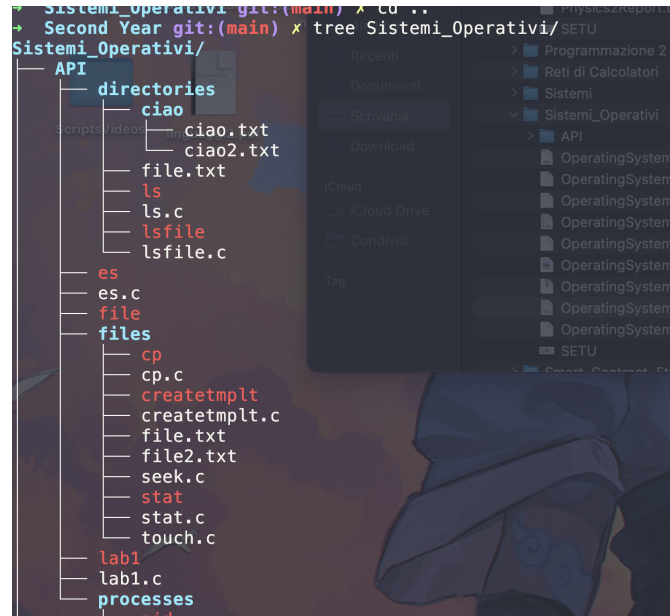
```
1 title MyTitle
```

This changes the title of the command prompt window to MyTitle.

- Tree - The tree command is used to display a graphical representation of the directory structure.

```
1 tree
```

And it will output something like this:



Displays a simple tree structure of folders in the current directory. To include all files in the display:

```
1 tree /f
```

The /F option lists all files along with the folder structure.

- Type - The type command is used to display the contents of a text file.

```
1 type MyFile.txt
```

This displays the contents of the file MyFile.txt. Useful for quickly viewing small text files without opening them.

- Ver - The ver command is used to display the version of the operating system.

```
1 ver
```

This displays the version of the operating system.

What's the purpose of the first line - @ECHO OFF? Remove it and see the effect

```
1 @ECHO OFF
2 ECHO Please insert a USB memory stick
3 PAUSE
4 COPY *.txt I:\
5 ECHO BACKUP COMPLETE
```

- @ECHO OFF → Hides command execution lines for cleaner output.

- ECHO → Displays messages on the screen.
- PAUSE → Waits for the user to press a key before continuing.
- COPY *.txt I: → Copies all .txt files from the current folder to the USB drive (assuming it's drive I:).
- ECHO BACKUP COMPLETE → Displays a completion message.

The first line, @ECHO OFF, is used to prevent the command prompt from displaying each command as it executes.

```

1 C:\Users\YourName\Desktop> ECHO Please insert a USB memory stick
2 Please insert a USB memory stick
3
4 C:\Users\YourName\Desktop> PAUSE
5 Press any key to continue . . .
6
7 C:\Users\YourName\Desktop> COPY *.txt I:\
8 3 file(s) copied.
9
10 C:\Users\YourName\Desktop> ECHO BACKUP COMPLETE
11 BACKUP COMPLETE

```

2 Practical 2 - Powershell

2.1 Test the above using a directory that you created last week.

```

user@machine:~/data/os1$
Directory: /temp

```

UnixMode	User	Group	LastWriteTime	Size
drwxr-xr-x	root	root	2/12/2025 10:10	39
drwxr-xr-x	root	root	2/12/2025 10:10	50
drwxr-xr-x	root	root	2/12/2025 10:10	58
drwxr-xr-x	root	root	2/12/2025 10:10	42
drwxr-xr-x	root	root	2/12/2025 10:10	41
drwxr-xr-x	root	root	2/12/2025 10:10	23
-rwxr-xr-x	root	root	2/12/2025 10:18	502
-rwxr-xr-x	root	root	2/12/2025 10:18	81
-rwxr-xr-x	root	root	2/12/2025 10:18	123
-rw-r--r--	root	root	2/12/2025 10:18	566
-rwxr-xr-x	root	root	2/12/2025 10:18	221
-rwxr-xr-x	root	root	2/12/2025 10:18	199
-rw-r--r--	root	root	2/12/2025 10:18	0
-rwxr-xr-x	root	root	2/12/2025 10:18	1983
-rwxr-xr-x	root	root	2/12/2025 10:18	180
-rwxr-xr-x	root	root	2/12/2025 10:18	140
-rw-r--r--	root	root	2/12/2025 10:18	620
-rwxr-xr-x	root	root	2/12/2025 10:18	186
-rwxr-xr-x	root	root	2/12/2025 10:18	213
-rwxr-xr-x	root	root	2/12/2025 10:18	45
-rwxr-xr-x	root	root	2/12/2025 10:18	69
-rwxr-xr-x	root	root	2/12/2025 10:18	17
-rwxr-xr-x	root	root	2/12/2025 10:18	2079
-rwxr-xr-x	root	root	2/12/2025 10:18	2043
-rwxr-xr-x	root	root	2/12/2025 10:18	1126
-rwxr-xr-x	root	root	2/12/2025 10:18	320
-rwxr-xr-x	root	root	2/12/2025 10:18	1019
-rwxr-xr-x	root	root	2/12/2025 10:18	231
-rwxr-xr-x	root	root	2/12/2025 10:18	277

Using the directory was created last week, we can use the Get-ChildItem command to list the contents of the directory. using the following list of commands:

```

$mylist = dir
$mylist
$mylist[0].Name
$mylist[0].length
$mylist[0].Mode
$mylist[0].LastWriteTime

```

Exercise of bash scripting in Powershell:

- Simply record what happens when you run this script.
- Find out how to run scripts if they're in a directory other than the working directory.
- Study the following script and see if you can figure out what it'll do. Now type it into a file called game.ps1 (You can use copy/paste in places to reduce the labour.) Run it and see if your predictions are true.

```

#####
#####
##
## The three pathetic knock-knock jokes program!
## Date: 26/09/17
## For: BSc (Hons) Computer Forensics and Security
##
#####
#####

#####
## initialisation section
#####
$userReply = ""
#####
## first question
#####
Clear-Host

while($userReply -ne "Who is there?"){
    $userReply = read-host "Knock Knock!"
}
Clear-Host
while($userReply -ne "Orange who?"){
    $userReply = read-host "Orange"
}
Clear-Host
Write-Output "Orange you glad you created this PowerShell script?"
Start-Sleep -Seconds 5
#####
## Second Question
#####
Clear-Host

```

```

while($UserReply -ne "Who is there?"){
    $UserReply = read-host "Knock Knock!"
}
Clear-Host
while($UserReply -ne "Orange who?"){
    $UserReply = read-host "Orange"
}
Clear-Host
Write-Output "Oranges are oranges but this is PowerShellscripting!"
Start-Sleep -Seconds 5
#####
## Third Question
#####
Clear-Host
while($UserReply -ne "Who is there?"){
    $UserReply = read-host "Knock Knock!"
}
Clear-Host
while($UserReply -ne "Banana who?"){
    $UserReply = read-host "Banana"
}
Clear-Host
Write-Output "Orange you glad I didn't say orange?"
Start-Sleep -Seconds 5
#####
## Farewell Message
#####
Clear-Host
Write-Output "Goodbye!nn"

```

When you run game.ps1, here's the interactive sequence you'll experience:

1. The script will prompt you with "Knock Knock!"
2. You'll need to respond with "Who is there?"
3. The script will then prompt you with "Orange"
4. Until you respond with "Orange who?"
5. The script will then output "Orange you glad you created this PowerShell script?"
6. The second and third questions follow a similar pattern.
7. The script will then output "Goodbye!"

To do:

1. Create another file called beverage.txt identical to drink.txt. (Hint: Use what you learned in practical 1 to do this.)
2. Issue this command again
 Get-ChildItem — select-string coffee
 and see what happens.

3. Create a file called fruit.txt with the list apple, orange, banana in it.
4. Issue this command again
`Get-ChildItem — select-string coffee`
 and see what happens.

```
PS C:\Users\User1\green> Copy-Item drink.txt beverage.txt
PS C:\Users\User1\green> Get-ChildItem *.txt
Directory: C:\Users\User1\green

Mode                LastWriteTime         Length Name
----                -
-a----             2/10/2025   10:15 AM           123 drink.txt
-a----             2/10/2025   10:15 AM           123 beverage.txt
PS C:\Users\User1\green> Get-ChildItem | Select-String coffee
drink.txt:1:coffee.
beverage.txt:1:coffee.
PS C:\Users\User1\green> Set-Content fruit.txt -Value "apple`r`norange`r`nbanana"
PS C:\Users\User1\green> Get-Content fruit.txt
apple
orange
banana
PS C:\Users\User1\green> Get-ChildItem | Select-String coffee
drink.txt:1:coffee.
beverage.txt:1:coffee.
```

Find out and explain how to get help about any cmdlet.

- Find out and explain what F7 does in PowerShell.
- What is the purposes of (a) the `-whatif` switch and (b) the `-confirm`
- Write a note to explain how you can use tab to complete a command as soon as it's unambiguous.

In PowerShell, you can obtain help for any cmdlet by typing `Get-Help` followed by the name of the cmdlet.

`Get-Help Get-Process`

This will display detailed information about the `Get-Process` cmdlet, including a description, syntax, parameters, examples, and more. When you press F7 in a PowerShell console, it brings up a graphical popup window displaying your command history from the current session. You can use the arrow keys to navigate through the list of previously executed commands. This is a handy feature to quickly recall and reuse commands without retyping them.

The `-WhatIf` switch is used to simulate the execution of a command. It shows you what would happen if the command ran but does not make any actual changes. Use `-WhatIf` with potentially destructive or impactful commands to verify what actions would be performed.

`Remove-Item C:\Temp* -WhatIf`

The -Confirm switch forces the command to prompt for your confirmation before executing each action. This extra safety measure helps prevent accidental changes.

```
Remove-Item C:\Temp\* -Confirm
```

PowerShell supports intelligent tab completion. As you start typing a command, cmdlet name, parameter, or even file path, you can press the Tab key to auto-complete the text. If the text you've entered uniquely identifies a command or parameter, pressing Tab will automatically complete it. If **multiple completions are possible repeatedly pressing Tab cycles through the available options until you reach the one you want.**

3 Practical 3 - Powershell Part 2

```
$name = Read-Host "Please type your name"
Write-Host "Hello" $name
```

Simply record what happens when you run this script. What difference does it make if you leave out the text "Please type your name" from the first line of the script? What happens:

1. Powershell prompts you with: "Please type your name:"
2. You enter a name (e.g., John).
3. Powershell outputs: "Hello John"
4. If you don't put the text "Please type your name" in the Read-Host command, Powershell will prompt you with a blank line instead of the text.

Find out how to run scripts if they're in a directory other than the working directory. By default, PowerShell restricts script execution for security reasons. You may need to change the execution policy before running scripts: If your script is stored in C:\Scripts\myscript.ps1 and your working directory is elsewhere, you can run it using:

```
C:\Scripts\myscript.ps1
```

or explicitly call PowerShell:

```
powershell -ExecutionPolicy Bypass -File C:\Scripts\myscript.ps1
```

```
$inputString = read-host
$value = $inputString -as [Double]
write-host "You entered: $value"
```

(a) Find out how to do the same thing that the code above does except that it'll only accept integers (such as 67). (b) Once you're found the answer, find out what happens if you type a real number (such as 67.4 or 67.8)

- a. To only accept integers, you can use [Int] instead of [Double]:

```
$value = $inputString -as [Int]
```

- b. If you type a real number, PowerShell will round the number down to the nearest integer.

do

```
    write-host -nonewline "Enter a numeric value: "
    $inputString = read-host
    $value = $inputString -as [Double]
    $ok = $value -ne $NULL
    if ( -not $ok ) { write-host "You must enter a numeric value" }
}
until ( $ok )
write-host "You entered: $value"
```

Alter the above program (in brown) to require the user to enter specifically integer values between 1 and 4 inclusive.

do

```
{
    write-host -nonewline "Enter an integer value (1-4): "
    $inputString = read-host
    $value = $inputString -as [Int]
    $ok = ($value -ne $NULL) -and ($value -ge 1) -and ($value -le 4)

    if ( -not $ok ) { write-host "Invalid input. Please enter a whole number between 1 and 4." }
}
until ( $ok )

write-host "You entered: $value"
```

```
-----
$i = 1
while ($i -le 20)
{
    if (($i -ne 13) -and ($i -ne 17))
    {
        Write-Host $i
    }
    $i = $i + 1
}
```

- What does the above script do?
- We don't need the brackets round (i -ne 13) and (i -ne 17) in the code above. Why do we not need them? (Hint: The answer is the same as for Java). Do you think that it's a good idea to put them in even if they aren't necessary? Explain your answer.
- - Initialize i = 1
 - Loop while i <= 20
 - Condition Check: If i is not 13 and i is not 17, print i
 - Otherwise, skip printing.

- Increment *i* by 1 each loop iteration.
- Repeat until *i* exceeds 20.
- In PowerShell (like in Java), comparison operators are evaluated first. Is it a good idea to include them anyway? Using parentheses is optional but can be a good habit for clarity, especially in more complex conditions.

```
for($i = 1; $i -le 8; $i = $i + 1)
{
Write-Host $i
}
```

We can replace *i = i + 1* with something shorter, in the above two scripts. What do you think it is? Try it and see. It's *\$i++*.

```
do
{
    Write-Host $i;
    $i = $i + 1;
} until ($i -eq 10);
```

Oops, I've put semicolons at the end of each of the lines, in the do...until loop above. I suppose it's because of my experience in writing programs in other languages that sometimes I put semicolons at the end of a line of PowerShell script, even when they're entirely unnecessary in PowerShell. Does PowerShell forgive me for doing this? Find out, and write your conclusion. The script runs normally without errors. The semicolons do not break execution since PowerShell treats them as harmless separators.

```
$temperature = 1
switch($temperature)
{
    { $_ -lt 0 } { "Below Freezing"; break }
    0 { "Exactly Freezing"; break }
    { $_ -le 10 } { "Cold"; break }
    { $_ -le 20 } { "Warm"; break }
    default { "Hot" }
}
```

Alter this program to deal with grade categories (for example >70 is a distinction mark etc) in an examination and also allow the user to enter a grade.

```
$grade = Read-Host "Enter your exam grade"

switch ($grade -as [int])
{
    { $_ -ge 70 } { "Distinction"; break }
    { $_ -ge 60 } { "Merit"; break }
    { $_ -ge 50 } { "Pass"; break }
    { $_ -ge 40 } { "Borderline Fail"; break }
    default { "Fail" }
}
```

```

$listing = dir
$showLong = $listing.Length
$i = 0;
while($i -lt $showLong)
{
Write-Host $listing[$i].Name
$i++
}

```

1. Explain what the above example does. Modify it to show fields other than the Name field.
 2. Draw up a chart to show equivalent syntaxes for different control structures/data structures among Java, Unix script, and PowerShell. You'll have to revisit this question when you've learned some Unix/Linux.
 3. Compare the ways in which scripts are enabled to run in (a) Unix/Linux and (b) PowerShell. Again this is a question for review when you've done some Unix/Linux.

1. Retrieves a list of files and directories in the current directory (dir is an alias for Get-ChildItem).
2. Iterates through the list and prints the name of each item.
3. Prints the Name property of each file/directory (\$listing[\$i].Name).
4. Increments \$i by 1 in each iteration.

To show additional fields like Size, LastWriteTime, and Mode, modify the script as follows:

```

$listing = dir
$showLong = $listing.Length
$i = 0
while($i -lt $showLong)
{
    Write-Host "$($listing[$i].Mode) $($listing[$i].Length)
    $($listing[$i].LastWriteTime) $($listing[$i].Name)"
    $i++
}

```

Concept	PowerShell	Java	Bash
Variable Assignment	<code>\$x = 5</code>	<code>int x = 5;</code>	<code>x=5</code>
If	<code>if (\$x -gt 10) { ... }</code>	<code>if (x > 10) { ... }</code>	<code>if [\$x -gt 10]; then ... fi</code>
For	<code>for (\$i=0; \$i -lt 10; \$i++)</code>	<code>for (int i=0; i<10; i++)</code>	<code>for i in {0..9}; do ... done</code>
While	<code>while (\$x -lt 10)</code>	<code>while (x < 10)</code>	<code>while [\$x -lt 10]; do ... done</code>
Switch	<code>switch (\$var) { ... }</code>	<code>switch (var) { case 1: ... }</code>	<code>case \$var in ... esac</code>
Array	<code>\$arr = @(1,2,3)</code>	<code>int[] arr = {1,2,3}</code>	<code>arr=(1 2 3)</code>
Function	<code>function MyFunc { ... }</code>	<code>int myFunc(int x) { ... }</code>	<code>my_func() { ... }</code>

Figure 1: Syntax between PowerShell, Java e Bash

Feature	PowerShell	Unix/Linux
Default Script Execution	Disabled for security (Restricted mode)	Allowed but may require execution permissions.
Checking Execution Policy	<code>Get-ExecutionPolicy</code>	<code>ls -l script.sh</code>
Allowing Script Execution	<code>Set-ExecutionPolicy RemoteSigned</code>	<code>chmod +x script.sh</code>
Running a Script	<code>.\script.ps1</code>	<code>./script.sh</code>
Running from Another Directory	<code>C:\Scripts\script.ps1</code>	<code>/home/user/script.sh</code>
Running Without Changing Directory	<code>& "C:\Scripts\script.ps1"</code>	<code>bash /path/to/script.sh</code>

Table 1: Comparison between the execution in PowerShell e Unix/Linux

4 Practical 4 - Unix

As the first part of this exercise, create and run the above scripts shell scripts. Record your output using a screenshot. As an extension to the script above use the shell script in conjunction with the file redirection operator to redirect the output to a file called howmany; record your results using a screenshot.

```

COSADEVISTUDIARE.txt ScriptsVideos linguaggi2.pdf
Code SiteRecovery nu.sh
Curriculum IT.pdf UNIVR \begin{table} panopto-sync-master
IMGtoASCII in editor such UbuntuContainer sis-arm
LukeDemo UniNotes Checking Policy & \textt
LukeV2 Writing \hline vectorize
PortfolioSite githubrecovery \hline
→ Desktop chmod u+x nu.sh \hline
→ Desktop ./nu Running a Script & \texttt{\texttt{
zsh: no such file or directory: ./nu \hline
→ Desktop ./nu.sh Running from Another Directory & \
./nu.sh: line 1: we: command not found \hline
→ Desktop vim nu.sh Running Without Changing Directory
→ Desktop ./nu.sh \hline
20 \end{tabular}
→ Desktop ls \caption{Comparison between the execut
COSADEVISTUDIARE.txt ScriptsVideos linguaggi2.pdf
Code SiteRecovery nu.sh
Curriculum IT.pdf UNIVR \section{Prac
IMGtoASCII in editor such UbuntuContainer panopto-sync-master
LukeDemo UniNotes \textcolor{gray}{\bf{k}{
LukeV2 Writing As the first part of this exercise,
PortfolioSite githubrecovery a screenshot.
→ Desktop ./nu.sh > howmany As an extension to the script above
→ Desktop cat howmany the output to a file called howmany
21 572 }
→ Desktop

```

Write and execute the above shell script and record your result using screenshots. Also note what's the significance of the echo statement on a line without any succeeding text?

```

→ Desktop vim stats.sh
→ Desktop vim stats.sh
→ Desktop ./stats.sh
zsh: permission denied: ./stats.sh
→ Desktop chmod u+x stats.sh
→ Desktop ./stats.sh
The current time and date is:
Gio 13 Mar 2025 15:43:34 GMT
The number of files in my system are:
22
your current working directory is:
/Users/paoloimbriani/Desktop

```

The echo with no succeeding text is used to print a blank line. It's often used for formatting output or creating space between sections of a script. Put the above script into a file called InputOutput.sh and run it. Record your results using screenshots.

```
→ Desktop vim InputOutput.sh
→ Desktop chmod u+x InputOutput.sh
→ Desktop ./InputOutput.sh
./InputOutput.sh: line 1: ==: command not found
^C
→ Desktop ./InputOutput.sh
./InputOutput.sh: line 1: ==: command not found
3
3ble:
→ Desktop vim InputOutput.sh
→ Desktop vim InputOutput.sh
→ Desktop ./InputOutput.sh
10
10
→ Desktop
```

Write a shell script (student.sh) to ask the user to enter two fields. Their name and student ID. The script should append the data to a text file called student.txt.

```
#!/bin/bash
echo "Enter your name:"
read name
echo "Enter your student ID:"
read id
echo $name >> student.txt
echo $id >> student.txt
```

```
→ Desktop ./student.sh
Insert your name
Paolo

Insert your Student ID
20114452
→ Desktop cat student.txt
Paolo
20114452
→ Desktop
```