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I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

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1.1 Aims and Objectives

Aims:

1. **Hands-On Proficiency:** Develop practical proficiency in utilizing essential UNIX utilities for directory creation, navigation, file manipulation, and text processing.
2. **Directory Structure Mastery:** Enable participants to create and navigate a hierarchical directory structure using relative pathnames, understanding the significance of the **mkdir** command options.
3. **File Operations:** Familiarize participants with creating, copying, moving, and deleting files within the UNIX environment, employing various commands such as **cp**, **mv**, and **rm**.
4. **Text File Creation and Manipulation:** Provide experience in creating and manipulating text files using tools like **cat** or **cal**, emphasizing file content modification and duplication.
5. **Text Printing and Formatting:** Introduce participants to the **echo** and **printf** commands for displaying formatted text, including special characters and mathematical expressions.
6. **File Permission Understanding:** Educate participants on file permissions in UNIX, covering the concepts of read, write, and execute permissions for users, groups, and others.
7. **Directory Permission Handling:** Explore directory permissions, emphasizing the impact on file operations within directories and the necessity of appropriate access rights.

Objectives:

1. **Directory Structure Creation:** Participants will be able to create a specified directory structure using **mkdir** with and without the **-p** option, showcasing an understanding of relative pathnames.
2. **Efficient Directory Navigation:** Participants will practice changing directories using relative pathnames, including transitions between parent and child directories using **.** and **..**.
3. **File Operations Proficiency:** Participants will demonstrate competence in creating, copying, moving, and deleting files within the directory structure.
4. **Text File Management:** Participants will create a text file, duplicate it across directories with different names, and move it between directories to showcase file manipulation skills.
5. **Text Printing and Formatting:** Participants will use **echo** and **printf** commands to accurately display specified text strings with special characters and mathematical expressions.
6. **File Permission Handling:** Participants will display, modify, and experiment with file permissions for a given file, understanding the impact on read and write operations.
7. **Directory Permission Exploration:** Participants will navigate directory permissions, observing the effects on file operations and resolving access-related issues through permission adjustments.

1.2 Required Tools and Concepts

Required Tools:

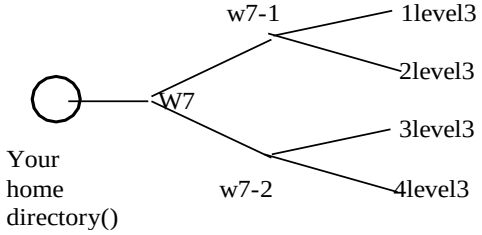
1. **Terminal/Shell:** Participants should have access to a UNIX/Linux terminal or shell environment.
2. **UNIX Utilities:** Familiarity with basic UNIX utilities, including **mkdir**, **cp**, **mv**, **rm**, **cat**, **echo**, **printf**, and **ls**.
3. **Access to Shell Commands:** Participants should have access to shell commands like **chmod** for modifying permissions.

Concepts:

1. **Directory Structure:** Understanding the hierarchical structure of directories and the use of pathnames.
2. **Relative Pathnames:** Knowledge of specifying file or directory locations relative to the current location.
3. **File Operations:** Creating, copying, moving, and deleting files using relevant commands.
4. **Text File Manipulation:** Creating and editing text files using tools like **cat** or **cal**.
5. **Text Printing and Formatting:** Displaying text using **echo** and **printf** commands, including special characters and formatting.
6. **File Permissions:** Understanding read, write, and execute permissions for users, groups, and others (**chmod**).
7. **Directory Permissions:** Understanding the impact of permissions on file operations within directories.
8. **Troubleshooting Permissions:** Identifying and resolving permission-related issues.

1. Practice in using UNIX utilities:

1) Create the directory structure presented in the figure below. Use **mkdir** command and relative pathnames from your home directory. Try both: no option and **–p** option, for the command.



Ans,

Figure 1 Creating Directory Structure

2. Change to the **1level3** directory by one step using a relative pathname.

Ans,

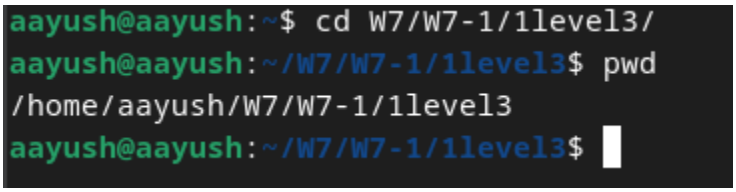


Figure 2 Changing to 1level3 using relative path

3. Practice in changing directories in your directory structure by one command using relative pathnames, e.g., from **1level3** to **2level3**, from **2level3** to **4level3**, from **4level3** to **W7**, etc. Use names of parent and child directories (‘**.**’ and ‘**..**’) as well.

Ans.

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ cd ../2lvel3/
aayush@aayush:~/W7/W7-1/2lvel3$ pwd
/home/aayush/W7/W7-1/2lvel3
aayush@aayush:~/W7/W7-1/2lvel3$ cd ../../W7-2/3level3/
aayush@aayush:~/W7/W7-2/3level3$ pwd
/home/aayush/W7/W7-2/3level3
aayush@aayush:~/W7/W7-2/3level3$ cd ../../W7-1/2lvel3/
aayush@aayush:~/W7/W7-1/2lvel3$ pwd
/home/aayush/W7/W7-1/2lvel3
aayush@aayush:~/W7/W7-1/2lvel3$ cd ../../W7-2/4level3/
aayush@aayush:~/W7/W7-2/4level3$ pwd
/home/aayush/W7/W7-2/4level3
aayush@aayush:~/W7/W7-2/4level3$
```

Figure 3 changing into different directories using relative pathnames

4. Change to **1level3** and create a text file by any tool (e.g., by **cat** or **cal** like last tutorial).

Ans,

```
aayush@aayush:~/W7$ cd W7-1/1level3/
aayush@aayush:~/W7/W7-1/1level3$ cat > week7.txt
Aayush Limbu
```

Figure 4 changing to 1level3 directory and creating a file

5. Copy this text file from **1level3** to **1level3** (with the name **file1**), **2level3**, and to **3level3** changing its name. Show that there are these files in corresponding directories.

Ans,

```
aayush@aayush:~/W7/W7-1/1level3$ cp week7.txt file1.txt
aayush@aayush:~/W7/W7-1/1level3$ cp week7.txt ../2lvel3/file2.txt
aayush@aayush:~/W7/W7-1/1level3$ cp week7.txt ../../W7-2/3level3/file3.txt
```

Figure 5 copying previously made txt file into different directories while changing file names.

```
aayush@aayush:~/W7/W7-1/1level3$ tree ~/W7
/home/aayush/W7
├── W7-1
│   ├── 1level3
│   │   ├── file1.txt
│   │   └── week7.txt
│   └── 2lvel3
│       └── file2.txt
└── W7-2
    ├── 3level3
    │   └── file3.txt
    └── 4level3
```

Figure 6 Verifying if copied file exists or not.

6. Move this file to **4level3**. Show that there is this file in **4level3** and there is not in **1level3**.

Ans,

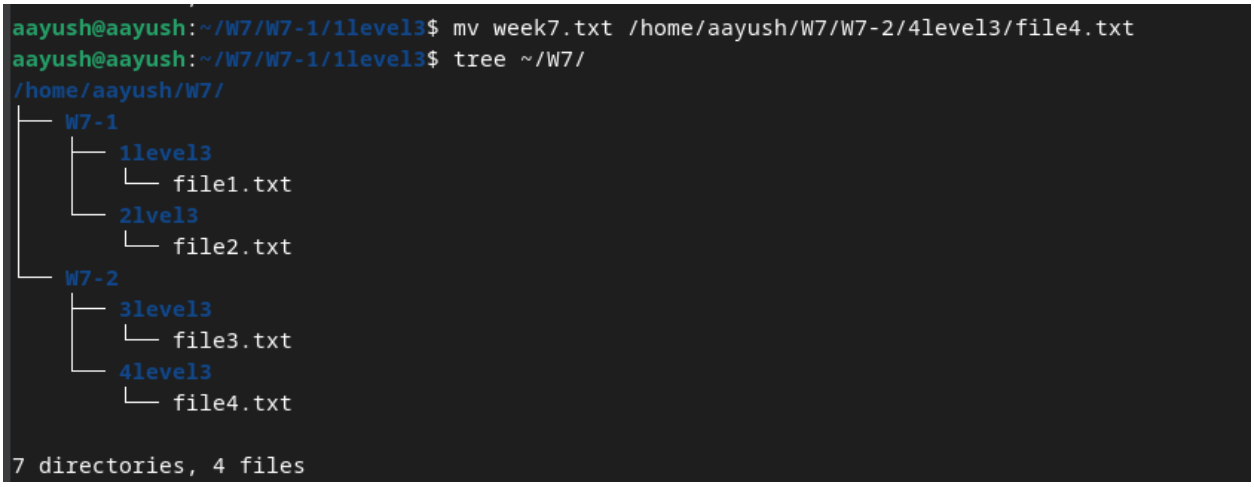


Figure 7 Moving a file while changing its name and verifying the process.

7. Print the following texts each in one **echo** or **printf** command:

- Hello! I can do it
- 5 > (20: 8) < (30 * 2)
- Line 1 Line 2
- a-b, A-B, –, +, <, >, #, $, %, &.

Ans

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ echo "
> Hello! I can do it
> 5 > (20: 8) < (30 * 2)
> Line1 Line2
> a-b, A-B, -, +, <, >, #, $, %, &.
> "

Hello! I can do it
5 > (20: 8) < (30 * 2)
Line1 Line2
a-b, A-B, -, +, <, >, #, $, %, &.

aayush@aayush:~/W7/W7-1/1level3$
```

Figure 8 Printing multiple lines into the terminal using the echo command.

8. Give the **ls** command (without options and with **a**, **d**, **g**, **l**, **R** options) in home directory, **w7**, **w7-1**, and **1level3** directories. Explain for yourself the results received.

Ans,

1. **ls**: Lists files and directories in the current directory.
2. **ls -a**: Lists all files, including hidden files (those whose names start with a dot **.**).
3. **ls -d**: Lists only the directories (not their contents) in the current directory.
4. **ls -g**: Lists files and directories with additional information, excluding owner names.
5. **ls -i**: Lists files and directories with their inode numbers (unique identifiers).
6. **ls -R**: Lists files and directories recursively, including those in subdirectories.

Home directory:

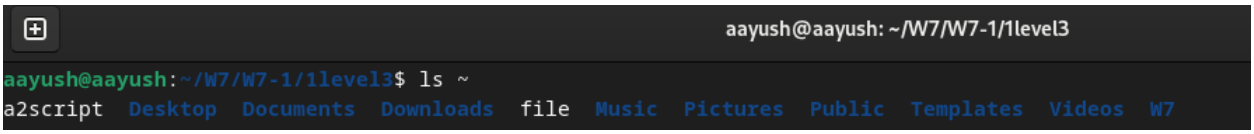


Figure 9 ls the home directory.

Figure 10 ls command with -d option in home directory

Figure 11 ls command with -a option in home directory

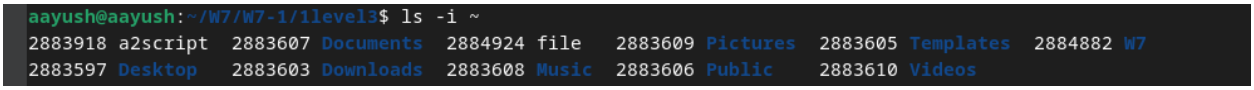


Figure 12 ls command with -a option in home directory

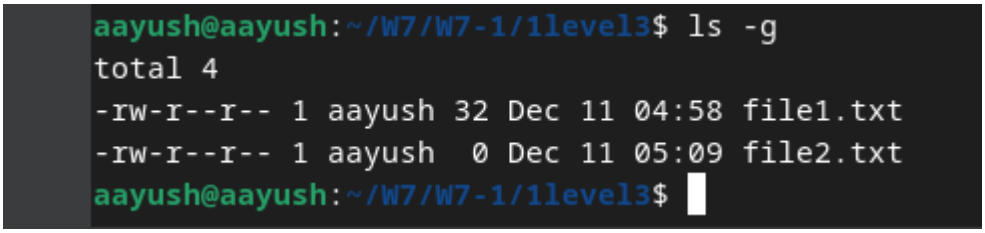


Figure 13 ls command with -g option in home directory.

```
aayush@aayush:~/W7/W7-1/1level3$ ls -R ~
/home/aayush:
a2script  Desktop  Documents  Downloads  file  Music  Pictures  Public  Templates  Videos  W7

/home/aayush/Desktop:

/home/aayush/Documents:

/home/aayush/Downloads:
google-chrome-stable_current_amd64.deb  Workshop7_90156.docx

/home/aayush/Music:

/home/aayush/Pictures:

/home/aayush/Public:

/home/aayush/Templates:

/home/aayush/Videos:

/home/aayush/W7:
W7-1

/home/aayush/W7/W7-1:
1level3  2lvel3

/home/aayush/W7/W7-1/1level3:
file1.txt  file2.txt

/home/aayush/W7/W7-1/2lvel3:
file2.txt
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 14 ls command with -R option in home directory

W7 directory:

```
aayush@aayush:~/W7/W7-1/1level3$ ls ~/W7/
W7-1
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 15 ls command in W7 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -a ~/W7/
.  ..  W7-1
```

Figure 16 ls with option -a command in W7 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -d ~/W7/
/home/aayush/W7/
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 17 ls with -d option in W7 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -g ~/W7/
total 4
drwxr-xr-x 4 aayush 4096 Dec  7 21:19 W7-1
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 18 ls with -d option in W7 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -i ~/W7/
2884902 W7-1
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 19 ls with -i option in W7 directory

```
aayush@aayush:~/W7/W7-1/1level3$ ls -R ~/W7/
/home/aayush/W7/:
W7-1

/home/aayush/W7/W7-1:
1level3  2lvel3

/home/aayush/W7/W7-1/1level3:
file1.txt  file2.txt

/home/aayush/W7/W7-1/2lvel3:
file2.txt
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 20 ls with -R option in W7 directory

W7-1 directory:

```
aayush@aayush:~/W7/W7-1/1level3$ ls ~/W7/W7-1/
1level3  2lvel3
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 21 ls with no option in W7-1 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -a ~/W7/W7-1/
.  ..  1level3  2lvel3
```

Figure 22 ls with -a option in W7-1 directory

```
aayush@aayush:~/W7/W7-1/1level3$ ls -d ~/W7/W7-1/
/home/aayush/W7/W7-1/
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 23 ls with -d option in W7-1 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -g ~/W7/W7-1/
total 8
drwxr-xr-x 2 aayush 4096 Dec 11 05:09 1level3
drwxr-xr-x 2 aayush 4096 Dec 11 04:27 2lvel3
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 24 ls with -g option in W7-1 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -i ~/W7/W7-1/
2884903 1level3  2884904 2lvel3
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 25 ls with -i option in W7-1 directory

```
aayush@aayush:~/W7/W7-1/1level3$ ls -R ~/W7/W7-1/
/home/aayush/W7/W7-1/:
1level3  2lvel3

/home/aayush/W7/W7-1/1level3:
file1.txt  file2.txt

/home/aayush/W7/W7-1/2lvel3:
file2.txt
```

Figure 26 ls with -R option in W7-1 directory

1level3 directory:

```
aayush@aayush: ~/W7/W7-1/1level3
aayush@aayush:~/W7/W7-1/1level3$ ls ~/W7/W7-1/1level3/
file1.txt  file2.txt
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 27 **ls without any option in 1level3 directory**

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -a ~/W7/W7-1/1level3/
.  ..  file1.txt  file2.txt
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 28 **ls with -a option in 1level3 directory**

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -d ~/W7/W7-1/1level3/
/home/aayush/W7/W7-1/1level3/
```

Figure 29 **ls with -d option in 1level3 directory**

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -g ~/W7/W7-1/1level3/
total 4
-rw-r--r-- 1 aayush 32 Dec 11 04:58 file1.txt
-rw-r--r-- 1 aayush  0 Dec 11 05:09 file2.txt
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 30 **ls with -i option in 1level3 directory**

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -i ~/W7/W7-1/1level3/
2884911 file1.txt  2884906 file2.txt
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 31 ls with -i option in 1level3 directory

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ ls -R ~/W7/W7-1/1level3/
/home/aayush/W7/W7-1/1level3/:
file1.txt  file2.txt
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$
```

Figure 32 ls with -R option in 1level3 directory

9. Change to the **W7** directory. Remove the directory files **w7-2**, **3level-3**, **4level3** and all ordinary files in them. Use the option **–i** of the **rm** and **rmdir** commands. Show that there are not these ordinary and directory files in your file structure.

Ans,

rm -i: This command helps you delete files. If we add **-i**, it's like the computer is double-checking with us before it erases anything. So, if we use the **rm -I -r W7-2/**, it'll ask, "Are you sure you want to delete **W7-2** directory? Yes or no?"

rmdir -i: This one is for removing empty folders (directories). The **-i** part means it will ask us each time before deleting a folder. For example, if you type **rmdir -i W7-2**, it will ask, "Do you really want to remove the **W7-2** folder? Yes or no?"

These **-i** things just make sure that we don't accidentally delete stuff without really meaning to. It's like the computer is being a good friend and asking, "Are you absolutely sure about this?"

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ cd ~/W7/
aayush@aayush:~/W7$ rm -r -i W7-2/
rm: descend into directory 'W7-2/'? y
rm: descend into directory 'W7-2/3level3'? y
rm: remove regular file 'W7-2/3level3/file3.txt'? y
rm: remove directory 'W7-2/3level3'? y
rm: descend into directory 'W7-2/4level3'? y
rm: remove regular file 'W7-2/4level3/file4.txt'? y
rm: remove directory 'W7-2/4level3'? y
rm: remove directory 'W7-2/'? y
aayush@aayush:~/W7$ tree
.
└── W7-1
    ├── 1level3
    │   └── file1.txt
    └── 2lvel3
        └── file2.txt

4 directories, 2 files
aayush@aayush:~/W7$
```

Figure 33 using rm -i command and verifying

10. Change to **w7-1**.

Display access permissions for the file **file1** in **1level3**.

Remove all access permissions for this file.

Display access permissions for this file.

Try to read this file using any utility (e.g., **cat**).

Try to write into this file using any utility (e.g., **cat** with the sign **>>** – *append*).

Add read and write access permissions for yourself for this file.

Display access permissions for this file.

Try to read this file using any utility.

Try to write into this file using any utility.

Ans

```
aayush@aayush:~/W7/W7-1/1level3$
aayush@aayush:~/W7/W7-1/1level3$ cd ~/W7/W7-1/
aayush@aayush:~/W7/W7-1$ pwd
/home/aayush/W7/W7-1
aayush@aayush:~/W7/W7-1$
```

Figure 34 changing to W7-1 directory.

```
aayush@aayush:~/W7/W7-1$ ls -l 1level3/file1.txt
-rw-r--r-- 1 aayush aayush 13 Dec 11 04:27 1level3/file1.txt
aayush@aayush:~/W7/W7-1$ chmod -rwx 1level3/file1.txt
aayush@aayush:~/W7/W7-1$ ls -l 1level3/file1.txt
---------- 1 aayush aayush 13 Dec 11 04:27 1level3/file1.txt
aayush@aayush:~/W7/W7-1$
```

Figure 35 Displaying access permissions for the file file1 in 1level3.

```
aayush@aayush:~/W7/W7-1$ chmod -rwx 1level3/file1.txt
aayush@aayush:~/W7/W7-1$ ls -l 1level3/file1.txt
---------- 1 aayush aayush 13 Dec 11 04:27 1level3/file1.txt
aayush@aayush:~/W7/W7-1$
```

Figure 36 Remove all access permissions for this file.

```
aayush@aayush:~/W7/W7-1$ ls -l 1level3/file1.txt
---------- 1 aayush aayush 13 Dec 11 04:27 1level3/file1.txt
aayush@aayush:~/W7/W7-1$
```

Figure 37 Displaying permissions again.

```
aayush@aayush:~/W7/W7-1$
aayush@aayush:~/W7/W7-1$ cat >> 1level3/file1.txt
bash: 1level3/file1.txt: Permission denied
```

Figure 38 Trying to read from the file.

```
aayush@aayush:~/W7/W7-1$ chmod +rw 1level3/file1.txt
aayush@aayush:~/W7/W7-1$ ls -l 1level3/file1.txt
-rw-r--r-- 1 aayush aayush 13 Dec 11 04:27 1level3/file1.txt
aayush@aayush:~/W7/W7-1$
```

Figure 39 Adding read and write permission again.

```
aayush@aayush:~/W7/W7-1$ cat 1level3/file1.txt
Aayush Limbu
aayush@aayush:~/W7/W7-1$
```

Figure 40 Rading from the file again.

```
aayush@aayush:~/W7/W7-1$ cat >> 1level3/file1.txt
Aayush Wanem Limbu
aayush@aayush:~/W7/W7-1$ cat 1level3/file1.txt
Aayush Limbu
Aayush Wanem Limbu
aayush@aayush:~/W7/W7-1$
```

Figure 41 Writing something to the file and reading again.

11. (Now,)

- Display access permissions for **1level3**.
- Remove all access permissions for the **1level3** directory.

- Display access permissions for **1level3**.
- Try to read a file from **1level3** using any utility.
- Try to put a file into **1level3** using any utility.
- Try to search in **1level3** using any command (e.g., the **ls** command).
- Add read, write, and execute access permissions for yourself for the **1level3** directory.
- Display access permissions for **1level3**.
- Try to read a file from **1level3** using any utility.
- Try to put a file into **1level3** using any utility.
- Try to search in **1level3** using any command (e.g., the **ls** command).

Ans

```
aayush@aayush:~/W7/W7-1$ ls -d -l 1level3/
drwxr-xr-x 2 aayush aayush 4096 Dec 11 04:37 1level3/
aayush@aayush:~/W7/W7-1$
```

Figure 42 Displaying access permissions for 1level3

```
aayush@aayush:~/W7/W7-1$ chmod -rwx 1level3/
aayush@aayush:~/W7/W7-1$ ls -d -l 1level3/
d--------- 2 aayush aayush 4096 Dec 11 04:37 1level3/
aayush@aayush:~/W7/W7-1$
```

Figure 43 removing all permission and showing permissions.

```
aayush@aayush:~/W7/W7-1$
aayush@aayush:~/W7/W7-1$ cat 1level3/file1.txt
cat: 1level3/file1.txt: Permission denied
aayush@aayush:~/W7/W7-1$ touch 1level3/file2.txt
touch: cannot touch '1level3/file2.txt': Permission denied
aayush@aayush:~/W7/W7-1$ ls 1level3/
ls: cannot open directory '1level3/': Permission denied
aayush@aayush:~/W7/W7-1$
```

Figure 44 Trying to read and write something into 1level3 directory

```
aayush@aayush:~/W7/W7-1$ ls 1level3/
ls: cannot open directory '1level3/': Permission denied
aayush@aayush:~/W7/W7-1$
```

Figure 45 listing contents inside of the 1level3 directory

```
aayush@aayush:~/W7/W7-1$
aayush@aayush:~/W7/W7-1$ chmod +rwx 1level3/
aayush@aayush:~/W7/W7-1$ ls -d -l 1level3/
drwxr-xr-x 2 aayush aayush 4096 Dec 11 04:37 1level3/
```

Figure 46 Adding read and write permission and showing permissions of 1level3 directory.

```
aayush@aayush:~/W7/W7-1$ cat 1level3/file1.txt
Aayush Limbu
Aayush Wanem Limbu
aayush@aayush:~/W7/W7-1$ touch 1level3/file2.txt
aayush@aayush:~/W7/W7-1$ ls 1level3/
file1.txt  file2.txt
aayush@aayush:~/W7/W7-1$
```

Figure 47 Reading from file inside of directory and creating a new file

1.3 Conclusion:

In my Networks and Operating Systems class (CT5052) this week, we had a hands-on session with UNIX tools. We started by creating folders using the **mkdir** command, trying it both with and without options. Then, we practiced moving around and doing things with files, like creating and copying them. The **ls** command helped us see what was where in our folders.

We also played with permissions, using commands like **chmod** to control who can do what with files and folders. One interesting part was using **rm** and **rmdir** with the **-i** option, which made the computer ask for confirmation before deleting things.