1-Using shell expansion characters only, We need to create parent directory mfs. mfs contains 3 directories admin1,admin2,admin3. Each admin directory contains 5 directies (day1,day2,day3,day4,day5). Each day contains 5 labs files (lab1,lab2,lab3,lab4,lab5).txt

```
\label{lem:mkdir-pmfs/admin} $$mkdir -p mfs/admin{1...3}/day{1...5}$$ touch mfs/admin{1...3}/day{1...5}/lab{1...5}$$ cd
```

ls -IR

```
total 0
drwxr-xr-x 1_mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 mfs
                                                                                                                                                                                       rwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
rwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
rwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
                                                                                                                                                                                       /mfs/admin2/day1:
  irwxr-xr-x 1 mahmoud kamal mahmoud kamal 512 Jan 31 16:54 admi
                                                                                                                                                                                       rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
 drwxr-xr-x 1 mahmoud kamal mahmoud kamal 512 Jan 31 16:54 admi
drwxr-xr-x 1 mahmoud kamal mahmoud kamal 512 Jan 31 16:54 admi
                                                                                                                                                                                      rw-r--r- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab2
rw-r--r- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab2
rw-r--r- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab4
rw-r--r- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab4
  /mfs/admin1:
 irwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day1
irwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day2
irwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day3
                                                                                                                                                                                   ./mfs/admin2/day2:
total 0
                                                                                                                                                                                      total 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
 rwxr-xr-x 1 mahmoud kamal mahmoud kamal 512 Jan 31 16:54 day4
drwxr-xr-x 1 mahmoud kamal mahmoud kamal 512 Jan 31 16:54 day5
  /mfs/admin1/dav1:
 /mfs/admin2/day3:
                                                                                                                                                                                     total 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
  /mfs/admin1/day2:
  otal 0
 cotal 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
                                                                                                                                                                                       /mfs/admin2/day4:
                                                                                                                                                                                      total 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
  /mfs/admin1/day3:
  otal 0
 rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
                                                                                                                                                                                       /mfs/admin2/day5:
                                                                                                                                                                                      ./mrs/adminiz/days:
total 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
  rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab5
 ./mfs/admin1/dav4:
 total 0

rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1

rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2

rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3

rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
                                                                                                                                                                                      ./mfs/admin3:
total 0
                                                                                                                                                                                     total 0
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day
  rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab5
 ./mfs/admin1/day5:
  rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
                                                                                                                                                                                       /mfs/admin3/day1:
 rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
                                                                                                                                                                                     total 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
 ./mfs/admin2:
 tutai 0
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day1
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day2
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day3
                                                                                                                                                                                       /mfs/admin3/day2:
                                                                                                                                                                                        rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
```

```
otal 0
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day2
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 daý3
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day4
drwxr-xr-x 1 mahmoud_kamal mahmoud_kamal 512 Jan 31 16:54 day5
./mfs/admin3/day1:
total 0
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
./mfs/admin3/dav2:
total 0
rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
./mfs/admin3/day3:
total 0
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab4
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
./mfs/admin3/day4:
total 0
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab3
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab4
-rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
/mfs/admin3/day5:
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab1
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab2
-rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab3
-rw-r--r-- 1 mahmoud kamal mahmoud kamal 0 Jan 31 16:54 lab4
rw-r--r-- 1 mahmoud_kamal mahmoud_kamal 0 Jan 31 16:54 lab5
                         -MBJF1N6:~$ ls -lR
 ahmoud kamal
```

2-Chanege shell prompt to permanent:

LoginNAME@HOSTNAME-MM-DD-Current Directory\$

PS1="\[\e]0;\u@\h:

Or PS1=" $e[0;36m\u@h-D{\%m-\%d}-\w$ e[m"]$

[nano ¬/.bashrc and change PS1 to change it forever]

```
mahmoud_kamal@DESKTOP-MBJF1N6:~$ PS1="'
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$
```

3-Any user has W on a directory can remove any file under this directory even if he/she has no write perm on this file and not owner ?? What is the solution.

```
Create new user:

sudo useradd -c "MK" -m -s /bin/bash mk

sudo su - mk

mkdir Directory

touch Directory/file

$ chmod 1777 Directory/ or $ chmod +t Directory/
```

[If you set the sticky bit to a directory, other users cannot delete or rename the files (or subdirectories) within that directory.

When the sticky bit is set on a directory, only the owner and the root user can delete / rename the files or directories within that directory.]

```
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$ls -lR /home/mk
/home/mk:
total 0
drwxrwxrwt 1 mk mk 512 Jan 31 17:34 Directory
/home/mk/Directory:
total 0
-rw-rw-r-- 1 mk mk 0 Jan 31 17:34 file
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$rm /home/mk/Directory/file
rm: remove write-protected regular empty file '/home/mk/Directory/file'? y
rm: cannot remove '/home/mk/Directory/file': Operation not permitted
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$
```

4-How normal user change is password while has has no W on /etc/shadow? How? how to do it?

```
mahmoud_kamal@DESKTOP-MBJF1N6-01-31:~$ls -alh $(which passwd)
-rwsr-xr-x 1 root root 67K Jul 15 2021 /usr/bin/passwd
```

The 's' in the 4th position indicates that the setuid flag is set. This allows any user to run the executable as the files owner (root) without having to actually be root (and with no need to use sudo either)