1. Compress a file by compress, gzip, zip commands and decompress it again.
State the differences between compress and gzip commands.

```
nour@nour-virtual-machine:~$ touch f1 f2 f3
nour@nour-virtual-machine:~$ ls
 ahmed    f20            myteam         users.sorted.txt    علم
 ai       f3             nnn            users.sort.txt      فيديو
 ali      file10         now            word                قوالب
 dir1     filename1      oldpasswd      wow                مستندك
 docs     filename1.txt  passwd         www                موسيقى
 f1       ,filename2     passwd_copy    التنزيلك
 f111     filename2.txt  samir          نطح المكتب'
 f2       mmm            snap           صور
nour@nour-virtual-machine:~$ tar -cvf file.tar f1
f1
nour@nour-virtual-machine:~$ ls
 ahmed    f20            mmm            snap            صور
 ai       f3             myteam         users.sorted.txt    علم
 ali      file10         nnn            users.sort.txt      فيديو
 dir1     filename1      now            word                قوالب
 docs     filename1.txt  oldpasswd      wow                مستندك
 f1       ,filename2     passwd         www                موسيقى
 f111     filename2.txt  passwd_copy    التنزيلك
 f2       file.tar       samir          نطح المكتب'
nour@nour-virtual-machine:~$
```

```
nour@nour-virtual-machine:~$ compress file.tar
nour@nour-virtual-machine:~$ ls -lh
total 108K
d--------- 2 nour nour 4.0K 00:44 19 أكتـ   ahmed
drwxrwxr-x 2 nour nour 4.0K 15:19 22 أكتـ   ai
drw--wx--x 2 nour nour 4.0K 00:32 19 أكتـ   ali
drwxrwxr-x 4 nour nour 4.0K 22:40 17 أكتـ   dir1
drwxrwxr-x 2 nour nour 4.0K 20:29 17 أكتـ   docs
-rw-rw-r-- 1 nour nour    0 15:32 23 أكتـ   f1
d--------- 2 nour nour 4.0K 00:48 19 أكتـ   f111
-rw-rw-r-- 1 nour nour    0 15:32 23 أكتـ   f2
--------- 1 nour nour    0 00:49 19 أكتـ   f20
-rw-rw-r-- 1 nour nour    0 15:32 23 أكتـ   f3
--------- 1 nour nour    0 00:48 19 أكتـ   file10
-rw-rw-r-- 1 nour nour    0 15:19 22 أكتـ   filename1
-rw-rw-r-- 1 nour nour   33 15:20 22 أكتـ   filename1.txt
-rw-rw-r-- 1 nour nour    0 15:19 22 أكتـ   ,filename2
-rw-rw-r-- 1 nour nour   34 15:21 22 أكتـ   filename2.txt
-rw-rw-r-- 1 nour nour  226 15:33 23 أكتـ   file.tar.Z
drwxrwxr-x 2 nour nour 4.0K 15:26 22 أكتـ   mmm
dr--rwxr-x 2 nour nour 4.0K 00:06 19 أكتـ   myteam
```

```
nour@nour-virtual-machine:~$ uncompress file.tar.Z
nour@nour-virtual-machine:~$ ls -lh
total 116K
d--------- 2 nour nour 4.0K 00:44 19 أكَ   ahmed
drwxrwxr-x 2 nour nour 4.0K 15:19 22 أكَ   ai
drw--wx--x 2 nour nour 4.0K 00:32 19 أكَ   ali
drwxrwxr-x 4 nour nour 4.0K 22:40 17 أكَ   dir1
drwxrwxr-x 2 nour nour 4.0K 20:29 17 أكَ   docs
-rw-rw-r-- 1 nour nour    0 15:32 23 أكَ   f1
d--------- 2 nour nour 4.0K 00:48 19 أكَ   f111
-rw-rw-r-- 1 nour nour    0 15:32 23 أكَ   f2
---------- 1 nour nour    0 00:49 19 أكَ   f20
-rw-rw-r-- 1 nour nour    0 15:32 23 أكَ   f3
---------- 1 nour nour    0 00:48 19 أكَ   file10
-rw-rw-r-- 1 nour nour    0 15:19 22 أكَ   filename1
-rw-rw-r-- 1 nour nour   33 15:20 22 أكَ   filename1.txt
-rw-rw-r-- 1 nour nour    0 15:19 22 أكَ   ,filename2
-rw-rw-r-- 1 nour nour   34 15:21 22 أكَ   filename2.txt
-rw-rw-r-- 1 nour nour  10K 15:33 23 أكَ   file.tar
drwxrwxr-x 2 nour nour 4.0K 15:26 22 أكَ   mmm
dr--rwxr-x 2 nour nour 4.0K 00:06 19 أكَ   myteam
```

```
nour@nour-virtual-machine:~$ gzip file.tar
nour@nour-virtual-machine:~$ ls -lh
total 108K
d--------- 2 nour nour 4.0K 00:44 19 أكت   ahmed
drwxrwxr-x 2 nour nour 4.0K 15:19 22 أكت   ai
drw--wx--x 2 nour nour 4.0K 00:32 19 أكت   ali
drwxrwxr-x 4 nour nour 4.0K 22:40 17 أكت   dir1
drwxrwxr-x 2 nour nour 4.0K 20:29 17 أكت   docs
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت   f1
d--------- 2 nour nour 4.0K 00:48 19 أكت   f111
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت   f2
--------- 1 nour nour     0 00:49 19 أكت   f20
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت   f3
--------- 1 nour nour     0 00:48 19 أكت   file10
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت   filename1
-rw-rw-r-- 1 nour nour   33 15:20 22 أكت   filename1.txt
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت   ,filename2
-rw-rw-r-- 1 nour nour   34 15:21 22 أكت   filename2.txt
-rw-rw-r-- 1 nour nour  115 15:33 23 أكت   file.tar.gz
drwxrwxr-x 2 nour nour 4.0K 15:26 22 أكت   mmm
dr--rwxr-x 2 nour nour 4.0K 00:06 19 أكت   myteam
drwxrwxr-x 2 nour nour 4.0K 15:23 22 أكت   nnn
-rw-rw-r-- 1 nour nour    0 21:45 17 أكت   now
nour@nour-virtual-machine:~$ gunzip file.tar.gz
nour@nour-virtual-machine:~$ ls -lh
total 116K
d--------- 2 nour nour 4.0K 00:44 19 أكت   ahmed
drwxrwxr-x 2 nour nour 4.0K 15:19 22 أكت   ai
drw--wx--x 2 nour nour 4.0K 00:32 19 أكت   ali
drwxrwxr-x 4 nour nour 4.0K 22:40 17 أكت   dir1
drwxrwxr-x 2 nour nour 4.0K 20:29 17 أكت   docs
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت   f1
d--------- 2 nour nour 4.0K 00:48 19 أكت   f111
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت   f2
--------- 1 nour nour     0 00:49 19 أكت   f20
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت   f3
--------- 1 nour nour     0 00:48 19 أكت   file10
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت   filename1
-rw-rw-r-- 1 nour nour   33 15:20 22 أكت   filename1.txt
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت   ,filename2
-rw-rw-r-- 1 nour nour   34 15:21 22 أكت   filename2.txt
-rw- -r-- 1 nour nour  10K 15:33 23 أكت   file.tar
drwxrwxr-x 2 nour nour 4.0K 15:26 22 أكت   mmm
dr--rwxr-x 2 nour nour 4.0K 00:06 19 أكت   myteam
drwxrwxr-x 2 nour nour 4.0K 15:23 22 أكت   nnn
-rw-rw-r-- 1 nour nour    0 21:45 17 أكت   now
-rw--wx--x 1 nour nour 2.9K 21:23 17 أكت   oldpasswd
```
Help

```
nour@nour-virtual-machine:~$ zip file1.zip file.tar
  adding: file.tar (deflated 99%)
nour@nour-virtual-machine:~$ ls -lh
total 128K
d--------- 2 nour nour 4.0K 00:44 19 أكت  ahmed
drwxrwxr-x 2 nour nour 4.0K 15:19 22 أكت  ai
drw--wx--x 2 nour nour 4.0K 00:32 19 أكت  ali
drwxrwxr-x 4 nour nour 4.0K 22:40 17 أكت  dir1
drwxrwxr-x 2 nour nour 4.0K 20:29 17 أكت  docs
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت  f1
d--------- 2 nour nour 4.0K 00:48 19 أكت  f111
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت  f2
--------- 1 nour nour    0 00:49 19 أكت  f20
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت  f3
--------- 1 nour nour    0 00:48 19 أكت  file10
-rw-rw-r-- 1 nour nour  254 16:00 23 أكت  file1.zip
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت  filename1
-rw-rw-r-- 1 nour nour   33 15:20 22 أكت  filename1.txt
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت  ,filename2
-rw-rw-r-- 1 nour nour   34 15:21 22 أكت  filename2.txt
-rw-rw-r-- 1 nour nour  10K 15:33 23 أكت  file.tar
-rw-rw-r-- 1 nour nour  254 16:00 23 أكت  file.zip
-rw-rw-r-- 1 nour nour    0 15:58 23 أكت  i
```

```
nour@nour-virtual-machine:~$ unzip file.zip
Archive:  file.zip
replace file.tar? [y]es, [n]o, [A]ll, [N]one, [r]ename: y
  inflating: file.tar
nour@nour-virtual-machine:~$ ls -lh
total 128K
d--------- 2 nour nour 4.0K 00:44 19 أكت    ahmed
drwxrwxr-x 2 nour nour 4.0K 15:19 22 أكت    ai
drw--wx--x 2 nour nour 4.0K 00:32 19 أكت    ali
drwxrwxr-x 4 nour nour 4.0K 22:40 17 أكت    dir1
drwxrwxr-x 2 nour nour 4.0K 20:29 17 أكت    docs
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت    f1
d--------- 2 nour nour 4.0K 00:48 19 أكت    f111
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت    f2
---------- 1 nour nour    0 00:49 19 أكت    f20
-rw-rw-r-- 1 nour nour    0 15:32 23 أكت    f3
---------- 1 nour nour    0 00:48 19 أكت    file10
-rw-rw-r-- 1 nour nour  254 16:00 23 أكت    file1.zip
-rw-rw-r-- 1 nour nour    0 15:19 22 أكت    filename1
```

2. What is the command used to view the content of a compressed file.

```
nour@nour-virtual-machine:~$ unzip -l file.zip
Archive:  file.zip
  Length      Date    Time    Name
---------  ---------- -----    ----
    10240  2023-10-23 15:33    file.tar
---------                      -------
    10240                      1 file
nour@nour-virtual-machine:~$
```

3. Backup /etc directory using tar utility.

```
nour@nour-virtual-machine:~$ tar -cvf etc.tar / tar | more
tar: Removing leading `/' from member names
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-switcheroo-contro
l.service-qWa5bg: Cannot open: Permission denied
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-systemd-logind.se
rvice-xr8eJ0: Cannot open: Permission denied
tar: Removing leading `/' from hard link targets
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-colord.service-R0
PF5I: Cannot open: Permission denied
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-bluetooth.service
-wTNang: Cannot open: Permission denied
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-systemd-oomd.serv
ice-sy2p71: Cannot open: Permission denied
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-ModemManager.serv
ice-gSaxQB: Cannot open: Permission denied
tar: /
/var/
/var/tmp/
/var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-systemd-timesyncd.serv
ice-R6HFF9: Cannot open: Permission denied
tar: /var/tmp/systemd-private-3abda4dada7343eead351d91bc8da1af-power-profiles-da
emon.service-WeqiZW: Cannot open: Permission denied
```

4. Starting from your home directory, find all files that were modified in the last two day.

```
nour@nour-virtual-machine:~$ find . -mtime -3 > text.txt
find: './ahmed': Permission denied
find: './f111': Permission denied
nour@nour-virtual-machine:~$ cat text.txt |more
.
./مستندك
./filename1.txt
./.swn
./.bashrc
./etc.tar
./.config
./.config/pulse/871f261511354d8b828cf21b04657de0-default-sink
./.config/pulse/871f261511354d8b828cf21b04657de0-default-source
./.config/dconf
./.config/dconf/user
./.config/gedit
./.config/gedit/accels
./.config/user-dirs.locale
./.config/user-dirs.dirs
./.config/ibus/bus
./.config/ibus/bus/871f261511354d8b828cf21b04657de0-unix-wayland-0
./.config/ibus/bus/871f261511354d8b828cf21b04657de0-unix-0
```

5. Starting from /etc, find files owned by root user.

```
nour@nour-virtual-machine:~$ find /etc -user root |more
/etc
/etc/pulse
/etc/pulse/client.conf.d
/etc/pulse/client.conf.d/01-enable-autospawn.conf
/etc/pulse/system.pa
/etc/pulse/daemon.conf
/etc/pulse/default.pa
/etc/pulse/client.conf
/etc/pulse/default.pa.d
/etc/bluetooth
/etc/bluetooth/main.conf
/etc/bluetooth/network.conf
/etc/bluetooth/input.conf
/etc/apg.conf
/etc/ca-certificates
/etc/ca-certificates/update.d
/etc/terminfo
/etc/terminfo/README
/etc/logcheck
/etc/logcheck/ignore.d.paranoid
/etc/logcheck/ignore.d.paranoid/cracklib-runtime
find: '/etc/polkit-1/localauthority': Permission denied
```

6. Find all directories in your home directory.

```
nour@nour-virtual-machine:~$ find ~ -type d
/home/nour
/home/nour/مستندك
/home/nour/.config
/home/nour/.config/pulse
/home/nour/.config/dconf
/home/nour/.config/gedit
/home/nour/.config/update-notifier
/home/nour/.config/evolution
/home/nour/.config/evolution/sources
/home/nour/.config/goa-1.0
/home/nour/.config/ibus
/home/nour/.config/ibus/bus
/home/nour/.config/enchant
/home/nour/.config/nautilus
/home/nour/.config/gtk-3.0
/home/nour/www
/home/nour/.thunderbird
/home/nour/.thunderbird/Crash Reports
/home/nour/.thunderbird/Crash Reports/events
/home/nour/.thunderbird/Pending Pings
```

7. Write a command to search for all files on the system that, its name is ".profile".

```
nour@nour-virtual-machine:~$ sudo find /   -type f -name ".profile"
/root/.profile
/home/baduser/.profile
/home/islam/.profile
/home/baduser2/.profile
/home/nour/.profile
/etc/skel/.profile
/snap/core20/2015/etc/skel/.profile
/snap/core20/2015/root/.profile
/snap/core20/1974/etc/skel/.profile
/snap/core20/1974/root/.profile
/snap/core22/858/etc/skel/.profile
/snap/core22/858/root/.profile
/snap/core22/864/etc/skel/.profile
/snap/core22/864/root/.profile
find: '/run/user/1000/doc': Permission denied
find: '/run/user/1000/gvfs': Permission denied
```

8. Identify the file types of the following: /etc/passwd, /dev/pts/0, /etc, /dev/sda

```
nour@nour-virtual-machine:~$ file /etc/passwd
/etc/passwd: ASCII text
nour@nour-virtual-machine:~$ file /dev/pts/0
/dev/pts/0: character special (136/0)
nour@nour-virtual-machine:~$ file /etc
/etc: directory
nour@nour-virtual-machine:~$ file/dev/sda
bash: file/dev/sda: No such file or directory
nour@nour-virtual-machine:~$
```

9. List the inode numbers of /, /etc, /etc/hosts.

```
nour@nour-virtual-machine:~$ ls -i /
     13 bin          15 lib32           1 proc           1 sys
1966081 boot         16 lib64     1310721 root      524289 tmp
1703938 cdrom        17 libx32          1 run       655361 usr
      1 dev          11 lost+found     18 sbin      786433 var
1572865 etc     1835009 media     2228225 snap
 262145 home    1703937 mnt        393217 srv
     14 lib     2359297 opt             12 swapfile
```
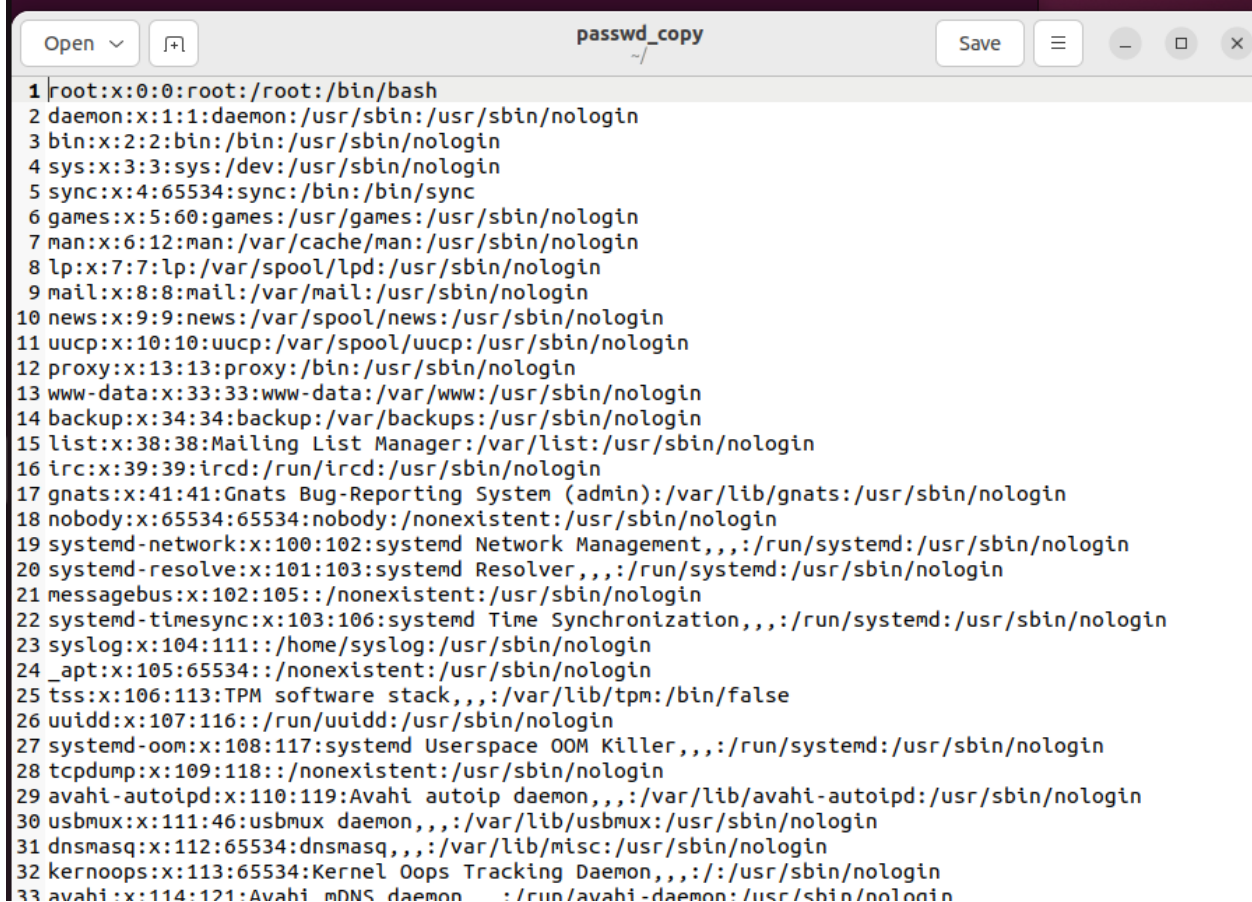
```
nour@nour-virtual-machine:~$ ls -i /etc
1572872 acpi                    1573047 lsb-release
1573002 adduser.conf            1573048 machine-id
1572873 alsa                    1573049 magic
1572874 alternatives            1573050 magic.mime
1573003 anacrontab              1573037 mailcap
1573004 apg.conf                1573052 mailcap.order
1572875 apm                     1573053 manpath.config
1572876 apparmor                1573054 mime.types
1572877 apparmor.d              1573055 mke2fs.conf
1572878 apport                  1572867 ModemManager
1573005 appstream.conf          1572940 modprobe.d
1572879 apt                     1573056 modules
1572880 avahi                   1572941 modules-load.d
1573006 bash.bashrc             1573057 mtab
1573007 bash_completion         1573058 nanorc
1572881 bash_completion.d       1573059 netconfig
1573008 bindresvport.blacklist  1572942 netplan
1572882 binfmt.d                1572943 network
1572883 bluetooth               1572944 networkd-dispatcher
1573009 brlapi.key              1572868 NetworkManager
1572884 brltty                  1573060 networks
1573010 brltty.conf             1572945 newt
1572885 ca-certificates         1573061 nftables.conf
```

```
nour@nour-virtual-machine:~$ ls -i /etc/hosts
1573029 /etc/hosts
nour@nour-virtual-machine:~$
```

10. Copy /etc/passwd to your home directory, use the commands diff and cmp, and Edit in the file you copied, and then use these commands again, and check the output.

```
nour@nour-virtual-machine:~$ cp /etc/passwd ~/passwd_copy
nour@nour-virtual-machine:~$ gedit passwd_copy
```

Open ⌄ | 🗗 | passwd_copy | Save | ≡ | — | ▢ | ✕
~/

```
 1 root:x:0:0:root:/root:/bin/bash
 2 daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
 3 bin:x:2:2:bin:/bin:/usr/sbin/nologin
 4 sys:x:3:3:sys:/dev:/usr/sbin/nologin
 5 sync:x:4:65534:sync:/bin:/bin/sync
 6 games:x:5:60:games:/usr/games:/usr/sbin/nologin
 7 man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
 8 lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
 9 mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
10 news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
11 uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
12 proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
13 www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
14 backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
15 list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
16 irc:x:39:39:ircd:/run/ircd:/usr/sbin/nologin
17 gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
18 nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
19 systemd-network:x:100:102:systemd Network Management,,,:/run/systemd:/usr/sbin/nologin
20 systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd:/usr/sbin/nologin
21 messagebus:x:102:105::/nonexistent:/usr/sbin/nologin
22 systemd-timesync:x:103:106:systemd Time Synchronization,,,:/run/systemd:/usr/sbin/nologin
23 syslog:x:104:111::/home/syslog:/usr/sbin/nologin
24 _apt:x:105:65534::/nonexistent:/usr/sbin/nologin
25 tss:x:106:113:TPM software stack,,,:/var/lib/tpm:/bin/false
26 uuidd:x:107:116::/run/uuidd:/usr/sbin/nologin
27 systemd-oom:x:108:117:systemd Userspace OOM Killer,,,:/run/systemd:/usr/sbin/nologin
28 tcpdump:x:109:118::/nonexistent:/usr/sbin/nologin
29 avahi-autoipd:x:110:119:Avahi autoip daemon,,,:/var/lib/avahi-autoipd:/usr/sbin/nologin
30 usbmux:x:111:46:usbmux daemon,,,:/var/lib/usbmux:/usr/sbin/nologin
31 dnsmasq:x:112:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
32 kernoops:x:113:65534:Kernel Oops Tracking Daemon,,,:/:/usr/sbin/nologin
33 avahi:x:114:121:Avahi mDNS daemon   :/run/avahi-daemon:/usr/sbin/nologin
```

Cmp ,diff

```
nour@nour-virtual-machine:~$ cp /etc/passwd ~/passwd_copy
nour@nour-virtual-machine:~$ gedit passwd_copy
nour@nour-virtual-machine:~$ diff  /etc/passwd ~/passwd_copy
nour@nour-virtual-machine:~$ gedit passwd_copy
nour@nour-virtual-machine:~$ cmp  /etc/passwd ~/passwd_copy
nour@nour-virtual-machine:~$ █
```

After manipulating

```
nour@nour-virtual-machine:~$ cmp  /etc/passwd ~/passwd_copy
/etc/passwd /home/nour/passwd_copy differ: byte 1, line 1
nour@nour-virtual-machine:~$ diff  /etc/passwd ~/passwd_copy
1c1
< root:x:0:0:root:/root:/bin/bash
---
> nour:123:0:0:nour :/root:/bin/sh
nour@nour-virtual-machine:~$
```

11. Create a symbolic link of /etc/passwd in /boot.

```
nour@nour-virtual-machine:~$ sudo ln -s /etc/passwd /boot/passwd_link
[sudo] password for nour:
nour@nour-virtual-machine:~$
```

12. Create a hard link of /etc/passwd in /boot. Could you? Why?

```
nour@nour-virtual-machine:~$ ln  /etc/passwd /boot
ln: failed to create hard link '/boot/passwd' => '/etc/passwd': Operation not pe
rmitted
nour@nour-virtual-machine:~$
```

They are two different partions