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

```
hoda@hoda-virtual-machine:~$ compress -v f1
f1:  -- replaced with f1.Z Compression: 8.47%
hoda@hoda-virtual-machine:~$ uncompress -v f1
f1.Z:  8.5% -- replaced with f1
hoda@hoda-virtual-machine:~$
```

```
hoda@hoda-virtual-machine:~$ gzip -v f1
f1:  15.3% -- replaced with f1.gz
hoda@hoda-virtual-machine:~$ gunzip -v f1
f1.gz:  15.3% -- replaced with f1
hoda@hoda-virtual-machine:~$
```

```
hoda@hoda-virtual-machine:~$ zip file.zip f1
adding: f1 (deflated 15%)
hoda@hoda-virtual-machine:~$ unzip file.zip
Archive:  file.zip
replace f1? [y]es, [n]o, [A]ll, [N]one, [r]ename: A
inflating: f1
hoda@hoda-virtual-machine:~$
```

(Gzip) is generally faster than (compress). This is because (gzip) uses algorithm which is more efficient and faster than algorithm used by (compress). Additionally, (gzip) is designed to be relatively fast while still providing good compression ratios.

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

```
hoda@hoda-virtual-machine:~$ zcat f1
```

3. Backup /etc directory using tar utility.

```
hoda@hoda-virtual-machine:~$ tar cvf march.tar /etc
tar: Removing leading '/' from member names
/etc/
/etc/newt/
/etc/newt/palette.original
/etc/newt/palette.ubuntu
/etc/newt/palette
/etc/mtab
/etc/cron.hourly/
/etc/cron.hourly/.placeholder
/etc/wpa_supplicant/
/etc/wpa_supplicant/ifupdown.sh
/etc/wpa_supplicant/functions.sh
/etc/wpa_supplicant/action_wpa.sh
```

```
hoda@hoda-virtual-machine:~$ tar xvf myarch.tar
etc/
etc/newt/
etc/newt/palette.original
etc/newt/palette.ubuntu
etc/newt/palette
etc/mtab
etc/cron.hourly/
etc/cron.hourly/.placeholder
etc/wpa_supplicant/
etc/wpa_supplicant/ifupdown.sh
etc/wpa_supplicant/functions.sh
etc/wpa_supplicant/action_wpa.sh
etc/environment.d/
etc/environment.d/90atk-adaptor.conf
etc/environment.d/90qt-a11y.conf
etc/timezone
etc/zfs/
etc/zfs/zed.d/
```

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

```
hoda@hoda-virtual-machine:~$ find ~ -type f -mtime -2
/home/hoda/f1.Z
/home/hoda/etc/ld.so.cache
/home/hoda/.cache/update-manager-core/meta-release-lts
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23FileSystem.db-wal
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Pictures.db-shm
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Pictures.db
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Software.db
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Video.db-shm
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Software.db-wal
/home/hoda/.cache/tracker3/files/.meta.isrunning
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2Fv3%2Ftracker%23Documents.db
/home/hoda/.cache/tracker3/files/http%3A%2F%2Ftracker.api.gnome.org%2Fontology%2
```

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

```
hoda@hoda-virtual-machine:/etc$ find /etc -type f -user root
/etc/newt/palette.original
/etc/newt/palette.ubuntu
/etc/cron.hourly/.placeholder
/etc/wpa_supplicant/ifupdown.sh
/etc/wpa_supplicant/functions.sh
/etc/wpa_supplicant/action_wpa.sh
/etc/environment.d/90atk-adaptor.conf
/etc/environment.d/90qt-a11y.conf
/etc/timezone
/etc/zfs/zed.d/zed-functions.sh
/etc/zfs/zed.d/zed.rc
/etc/zfs/zfs-functions
/etc/kernel/postrm.d/zz-update-grub
/etc/kernel/postrm.d/initramfs-tools
/etc/kernel/preinst.d/intel-microcode
/etc/kernel/postinst.d/zz-update-grub
/etc/kernel/postinst.d/initramfs-tools
/etc/kernel/postinst.d/xx-update-initrd-links
/etc/kernel/postinst.d/unattended-upgrades
/etc/kernel/postinst.d/zz-shim
/etc/ethertypes
/etc/fonts/conf.avail/35-archic-uming-aliases.conf
```

6. Find all directories in your home directory.

```
hoda@hoda-virtual-machine:~$ find ~ -type d
/home/hoda
/home/hoda/vdir
/home/hoda/Pictures
/home/hoda/etc
/home/hoda/etc/dconf
/home/hoda/etc/dconf/db
/home/hoda/etc/dconf/db/ibus.d
/home/hoda/etc/dconf/profile
/home/hoda/etc/ifplugd
/home/hoda/etc/ifplugd/action.d
/home/hoda/etc/zfs
/home/hoda/etc/zfs/zed.d
/home/hoda/etc/ubuntu-advantage
/home/hoda/etc/xdg
/home/hoda/etc/xdg/Xwayland-session.d
/home/hoda/etc/xdg/systemd
/home/hoda/etc/xdg/menus
/home/hoda/etc/xdg/autostart
```


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

```
hoda@hoda-virtual-machine:~$ find / -name profile -type f
find: '/home/islam': Permission denied
find: '/home/lost+found': Permission denied
/home/hoda/etc/profile
find: '/home/hoda/.local/share/nano': Permission denied
find: '/home/hoda/pdir': Permission denied
find: '/home/hoda/dirv': Permission denied
find: '/home/hoda/sdir': Permission denied
find: '/home/hossam': Permission denied
find: '/home/baduser': Permission denied
find: '/etc/ssl/private': Permission denied
find: '/etc/polkit-1/localauthority': Permission denied
/etc/profile
find: '/etc/sss': Permission denied
find: '/etc/cups/ssl': Permission denied
find: '/proc/tty/driver': Permission denied
find: '/proc/1/task/1/fd': Permission denied
find: '/proc/1/task/1/fdinfo': Permission denied
```

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

```
hoda@hoda-virtual-machine:~$ file etc/passwd /dev/pts/0 /dev/sda
etc/passwd: ASCII text
/dev/pts/0: character special (136/0)
/dev/sda: block special (8/0)
hoda@hoda-virtual-machine:~$
```

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

```
hoda@hoda-virtual-machine:~$ ls -li /
13 bin          2 home          11 lost+found  390916 root        12 swapfile
 2 boot         14 lib           521217 media      1 run           1 sys
19 cdrom        15 lib32         521218 mnt          18 sbin          390918 tmp
 1 dev          16 lib64         390915 opt          130308 snap       130309 usr
390913 etc         17 libx32        1 proc          521220 srv         260610 var
hoda@hoda-virtual-machine:~$
```

```
hoda@hoda-virtual-machine:~$ ls -li /etc
390924 acpi              391100 machine-id
391054 adduser.conf    391101 magic
390925 alsa              391102 magic.mime
390926 alternatives      391089 mailcap
391055 anacrontab       391104 mailcap.order
391056 apg.conf         391105 manpath.config
390927 apm              391106 mime.types
390928 apparmor         391107 mke2fs.conf
390929 apparmor.d       390919 ModemManager
390930 appport           390992 modprobe.d
391057 appstream.conf  391108 modules
```

```
hoda@hoda-virtual-machine:~$ ls -li /etc/hosts
391081 /etc/hosts
hoda@hoda-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.

```
hoda@hoda-virtual-machine:~$ cp /etc/passwd ~/passwd-copy
hoda@hoda-virtual-machine:~$ diff /etc/passwd ~/passwd-copy
hoda@hoda-virtual-machine:~$ cmp /etc/passwd ~/passwd-copy
hoda@hoda-virtual-machine:~$ vi ~/passwd-copy
hoda@hoda-virtual-machine:~$ vi ~/passwd-copy
hoda@hoda-virtual-machine:~$ diff /etc/passwd ~/passwd-copy
47a48,53
>
> I
> B
> C
> C
> halloLKJB
hoda@hoda-virtual-machine:~$ cmp /etc/passwd ~/passwd-copy
/etc/passwd /home/hoda/passwd-copy differ: byte 2839, line 48
hoda@hoda-virtual-machine:~$
```

11.

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

```
hoda@hoda-virtual-machine:~$ sudo ln -s /etc/passwd /boot/passwd-link
```

```
hoda@hoda-virtual-machine:~$ cd /boot/
hoda@hoda-virtual-machine:/boot$ ls -li
total 150372
 14 -rw-r--r-- 1 root root    275465 16:22 13 يول config-6.2.0-26-generic
 12 drwxr-xr-x 5 root root     4096 06:53 11 ديس grub
 15 lrwxrwxrwx 1 root root         27 06:52 11 ديس initrd.img -> initrd.img-6.2.0-26-generic
 25 -rw-r--r-- 1 root root 131380607 06:52 11 ديس initrd.img-6.2.0-26-generic
 16 lrwxrwxrwx 1 root root         27 06:42 11 ديس initrd.img.old -> initrd.img-6.2.0-26-generic
 11 drwx----- 2 root root     16384 06:41 11 ديس lost+found
 17 -rw-r--r-- 1 root root    182800 2022 6 فيبر memtest86+.bin
 18 -rw-r--r-- 1 root root    184476 2022 6 فيبر memtest86+.elf
 19 -rw-r--r-- 1 root root    184980 2022 6 فيبر memtest86+ multiboot.bin
319 lrwxrwxrwx 1 root root         11 11:25 26 ديس passwd-link -> /etc/passwd
 13 -rw----- 1 root root    7963097 16:22 13 يول System.map-6.2.0-26-generic
 20 lrwxrwxrwx 1 root root         24 06:52 11 ديس vmlinuz -> vmlinuz-6.2.0-26-generic
 24 -rw-r--r-- 1 root root 13770312 02:05 8 أغسطس vmlinuz-6.2.0-26-generic
hoda@hoda-virtual-machine:/boot$ cd
hoda@hoda-virtual-machine:~$
```

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

Can't create a hard link to a directory (/etc/passwd) because it is a file, not a directory. Hard links are only allowed for files, not directories.