

- using `dd` command create empty file with size of 20MB (hint: count 40000, bs=512)

```
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ dd if=/dev/zero of=/tmp/disk.img bs=512 count=40000
40000+0 records in
40000+0 records out
20480000 bytes (20 MB, 20 MiB) copied, 0.136903 s, 150 MB/s
```

- attach the file as loop device using `losetup` command (hint: use `losetup -f` to allocate free device)

```
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ sudo losetup -f
/dev/loop17
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ sudo losetup /dev/loop17 /tmp/disk.img
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ sudo losetup -f
/dev/loop18
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ losetup -a
/dev/loop1: []: (/var/lib/snapd/snaps/bare_5.snap)
/dev/loop17: []: (/tmp/disk.img)
```

- using `fdisk` command, create new partition into the loop device (`fdisk /dev/loop<??>` where `<??>` is the device number)

```
/dev/loop18
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ sudo fdisk /dev/loop17

Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-39999, default 39

Created a new partition 1 of type 'Linux' and of size 18.5 MiB.

Command (m for help):
```

```
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$ losetup -l | grep 17
/dev/loop17      0      0      0  0 /tmp/disk.img          0      512
/dev/loop3       0      0      1  1 /var/lib/snapd/snaps/core20_1778.snap 0      512
/dev/loop10      0      0      1  1 /var/lib/snapd/snaps/snapd_17950.snap 0      512
mahmoud@mahmoud-Virtual-Machine:~/Desktop/Lab5$
```

Device	Boot	Start	End	Sectors	Size	Id	Type
/dev/loop17p1		2048	39999	37952	18.5M	83	Linux

- format the new partition using `mkfs.ext4` command

Syncing disks.

```
mahmoud@mahmoud-Virtual-Machine:~/Desktop$ sudo mkfs /dev/loop14p1
mke2fs 1.46.5 (30-Dec-2021)
Discarding device blocks: done
Creating filesystem with 1280 4k blocks and 1280 inodes

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done

mahmoud@mahmoud-Virtual-Machine:~/Desktop$
```

- mount the formatted partition into /mnt directory

```
mahmoud@mahmoud-Virtual-Machine:~/Desktop$ sudo mkfs.ext4 -c /dev/loop14p1
mke2fs 1.46.5 (30-Dec-2021)
/dev/loop14p1 contains a ext2 file system
    created on Wed Mar  1 15:26:41 2023
Proceed anyway? (y,N) y
```

- create some files inside the mounted /mnt directory

```
mahmoud@mahmoud-Virtual-Machine:~/Desktop$ sudo mount /dev/loop14p1 /mnt
mahmoud@mahmoud-Virtual-Machine:~/Desktop$ ls /mnt
lost+found
mahmoud@mahmoud-Virtual-Machine:~/Desktop$
touch: cannot touch 'file1': Permission denied
mahmoud@mahmoud-Virtual-Machine:/mnt$ sudo touch file1 file2
mahmoud@mahmoud-Virtual-Machine:/mnt$ ll
total 24
drwxr-xr-x  3 root root  4096 15:30 1 مار ./
drwxr-xr-x 20 root root  4096 12:59 1 مار ../
-rw-r--r--  1 root root    0 15:30 1 مار file1
-rw-r--r--  1 root root    0 15:30 1 مار file2
drwx-----  2 root root 16384 15:28 1 مار lost+found/
mahmoud@mahmoud-Virtual-Machine:/mnt$
```

- unmount /mnt directory using umount command

```
mahmoud@mahmoud-Virtual-Machine:/mnt$ sudo umount /mnt
umount: /mnt: target is busy.
mahmoud@mahmoud-Virtual-Machine:/mnt$ cd
mahmoud@mahmoud-Virtual-Machine:~$ sudo umount /mnt
mahmoud@mahmoud-Virtual-Machine:~$
```

- using `apt` command, search and install `gparted` program

```
mahmoud@mahmoud-Virtual-Machine:~$ sudo apt search gparted
Sorting... Done
Full Text Search... Done
gparted/jammy 1.3.1-1ubuntu1 amd64
  GNOME partition editor

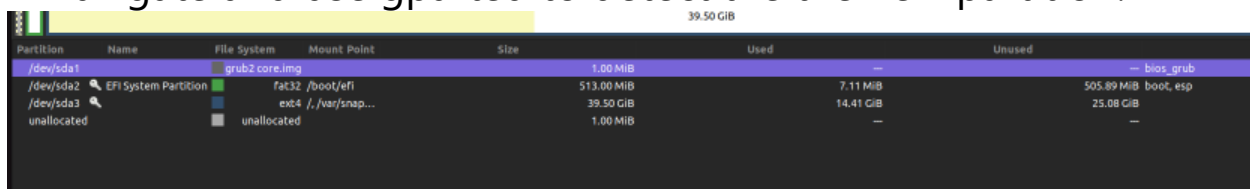
gparted-common/jammy,jammy 1.3.1-1ubuntu1 all
  GNOME partition editor -- common data

partitionmanager/jammy 21.12.3-0ubuntu1 amd64
  file, disk and partition management for KDE

mahmoud@mahmoud-Virtual-Machine:~$
```

```
mahmoud@mahmoud-Virtual-Machine:~$ sudo apt install gparted
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi i965-va-driver
  intel-media-va-driver libaacs0 libaom3 libass9 libavcodec58 libavformat58
  libavutil56 libbdplus0 libblas3 libbluray2 libbs2b0 libchromaprint1
```

- navigate and use gparted to detect the the new partition.



Partition	Name	File System	Mount Point	Size	Used	Unused
/dev/sda1		grub2 core.img		1.00 MiB	—	—
/dev/sda2	EFI System Partition	fat32	/boot/efi	513.00 MiB	7.11 MiB	505.89 MiB
/dev/sda3		ext4	/, /var/snap...	39.50 GiB	14.41 GiB	25.08 GiB
unallocated		unallocated		1.00 MiB	—	—