1. Using dd command create empty file with size of 20MB (hint: count 40000, bs=512)

```
mostafa@mostafa-VirtualBox:~$ dd if=/dev/zero of=/tmp/disk.img bs=512 count=4000
0
40000+0 records in
40000+0 records out
20480000 bytes (20 MB, 20 MiB) copied, 1.10693 s, 18.5 MB/s
mostafa@mostafa-VirtualBox:~$
```

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

```
mostafa@mostafa-VirtualBox:~$ sudo losetup -f
[sudo] password for mostafa:
/dev/loop0
mostafa@mostafa-VirtualBox:~$ sudo losetup /dev/loop18 /tmp/disk.img
mostafa@mostafa-VirtualBox:~$
```

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

```
mostafa@mostafa-VirtualBox:~$ sudo fdisk /dev/loop18

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.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x28333810.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-39999, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-39999, default 39999):

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

Command (m for help):
```

4. format the new partition using mkfs.ext4 command

```
mostafa@mostafa-VirtualBox:~$ sudo mkfs.ext4 /tmp/disk.img
mke2fs 1.46.5 (30-Dec-2021)
Found a dos partition table in /tmp/disk.img
Proceed anyway? (y,N) y
Discarding device blocks: done
Creating filesystem with 5000 4k blocks and 5008 inodes

Allocating group tables: done
Writing inode tables: done
Creating journal (1024 blocks): done
Writing superblocks and filesystem accounting information: done
```

5. mount the formatted partition into /mnt directory

```
mostafa@mostafa-VirtualBox:~$ sudo mount /dev/loop18 /mnt
mostafa@mostafa-VirtualBox:~$ ls /mnt
lost+found
mostafa@mostafa-VirtualBox:~$
```

6. create some files inside the mounted /mnt directory

```
mostafa@mostafa-VirtualBox:~$ sudo touch /mnt/first.txt
mostafa@mostafa-VirtualBox:~$ sudo touch /mnt/second.txt
mostafa@mostafa-VirtualBox:~$ ls /mnt
first.txt  lost+found  second.txt
mostafa@mostafa-VirtualBox:~$
```

7. unmount /mnt directory using umount command

```
mostafa@mostafa-VirtualBox:~$ sudo umount /mnt
mostafa@mostafa-VirtualBox:~$
```

8. using `apt` command, search and install `gparted` program

```
mostafa@mostafa-VirtualBox:~$ sudo apt install gparted
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  gparted-common
Suggested packages:
  gpart reiser4progs udftools
The following NEW packages will be installed:
  gparted gparted-common
0 upgraded, 2 newly installed, 0 to remove and 241 not upgraded.
Need to get 490 kB of archives.
After this operation, 2,128 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

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