

1) File Creation:

```
yashwanthnalla@192 GA-Module(1-4) % echo "This is sample data for inode testing." > ~/sample_data.txt  
yashwanthnalla@192 GA-Module(1-4) %
```



sample_data.txt

This is sample data for inode testing.

This command creates a file named sample_data.txt in the home directory and writes sample text into it.

2) Hard Link Creation:

```
yashwanthnalla@192 GA-Module(1-4) % ln ~/sample_data.txt ~/sample_hard.txt  
yashwanthnalla@192 GA-Module(1-4) %
```

I used the 'ln' command without any switches to create a hard link. This creates a new directory entry (sample_hard.txt) that points to the exact same inode (physical data location) as the original file.

3) Symbolic (Soft) Link creation:

```
yashwanthnalla@192 GA-Module(1-4) % ln -s ~/sample_data.txt ~/sample_soft.txt  
yashwanthnalla@192 GA-Module(1-4) %
```

I used 'ln' with the '-s' switch to create a symbolic link. Unlike the hard link, this file acts as a pointer or "shortcut" that references the path of the original file rather than the data blocks directly.

4) Inode Verification:

```
yashwanthnalla@192 GA-Module(1-4) % ls -i ~/sample_data.txt ~/sample_hard.txt ~/sample_soft.txt  
132505806 /Users/yashwanthnalla/sample_data.txt 132510259 /Users/yashwanthnalla/sample_soft.txt  
132505806 /Users/yashwanthnalla/sample_hard.txt  
yashwanthnalla@192 GA-Module(1-4) %
```

The '-i' option in the 'ls' command displays the inode number (index node) for each file listed, allowing me to compare the unique identifiers used by the filesystem to manage these files.

5) Inode Analysis:

Sample_data.txt and sample_hard.txt share the same inode because hard links reference the same inode.

sample_soft.txt has a different inode because symbolic links store only the file path, not the actual data.

6) File Metadata Inspection:

```
yashwanthnalla@192 GA-Module(1-4) % stat ~/sample_data.txt
1677232 132505806 -rw-r--r-- 2 yashwanthnalla staff 0 39 "Jan 2 11:55:35 2026" "Jan 2 11:53:31 2026" "Jan 2 11:55:33 2026" "Jan 2 11:53:31
2026" 4096 8 0 /Users/yashwanthnalla/sample_data.txt
yashwanthnalla@192 GA-Module(1-4) %
```

The 'stat' command displays detailed metadata such as permissions, ownership, size, and timestamps of the file.

7) Disk Usage Check:

```
yashwanthnalla@192 GA-Module(1-4) % du -sh ~
du: /Users/yashwanthnalla/Music/Music: Operation not permitted
```

115G [/Users/yashwanthnalla](#)

```
yashwanthnalla@192 GA-Module(1-4) %
```

This command shows the total disk usage of the home directory.

8) File Size Overview:

```
yashwanthnalla@192 GA-Module(1-4) % ls -lh ~
total 352
drwxr-x---  2 yashwanthnalla staff   64B  1 May 2024 Adm
drwxr-xr-x  5 yashwanthnalla staff 160B  1 Mar 2025 Applications
drwxr-xr-x@  6 yashwanthnalla staff 192B  4 Dec 12:40 BITS_Pilani
drwxr-xr-x 10 yashwanthnalla staff 320B 11 Jun 2025 Class
drwxr-xr-x 11 yashwanthnalla staff 352B 21 May 2025 Core
drwxr-xr-x  9 yashwanthnalla staff 288B 28 Dec 20:55 Core-DSA
drwxr-xr-x 14 yashwanthnalla staff 448B 22 Jul 15:16 CS_Examination
drwxr-xr-x@ 10 yashwanthnalla staff 320B 25 Jan 2024 de-anza-courses
drwx-----@ 66 yashwanthnalla staff 2.1K  2 Jan 12:07 Desktop
drwxr-xr-x 21 yashwanthnalla staff 672B  6 Dec 22:55 Development
drwx-----@ 20 yashwanthnalla staff 640B  8 Oct 01:11 Documents
drwx-----@ 421 yashwanthnalla staff 13K  1 Jan 23:20 Downloads
drwxr-xr-x  6 yashwanthnalla staff 192B 31 Dec 12:42 Durgamma
drwxr-xr-x@ 12 yashwanthnalla staff 384B 13 Feb 2024 file-R&B
drwx-----@ 113 yashwanthnalla staff 3.5K 22 Sep 17:31 Library
drwxr-xr-x@ 38 yashwanthnalla staff 1.2K 22 Dec 10:40 MBA
drwx----- 16 yashwanthnalla staff 512B 24 Mar 2025 Movies
drwx-----+ 7 yashwanthnalla staff 224B 13 Jun 2022 Music
drwxr-xr-x@ 15 yashwanthnalla staff 480B 21 Sep 14:49 my-folder
drwxr-xr-x@  4 yashwanthnalla staff 128B 24 Feb 2025 p4e
-rw-r--r--@  1 yashwanthnalla staff 93B 26 Sep 19:57 package-lock.json
drwxr-xr-x@  6 yashwanthnalla staff 192B 29 Feb 2024 Pictures
-rw-r--r--@  1 yashwanthnalla staff 144K 5 Jul 18:47 plot.pdf
-rw-r--r--@  1 yashwanthnalla staff 73B  4 Dec 14:35 practice.js
drwxr-xr-x@  4 yashwanthnalla staff 128B 2 Jan 11:43 project_documents
drwxr-xr-x+ 4 yashwanthnalla staff 128B 16 May 2021 Public
-rw-r--r--@  1 yashwanthnalla staff 11K  4 May 2022 Request_Id.docx
drwxr-xr-x@ 104 yashwanthnalla staff 3.3K 18 Oct 18:19 Sahithya
drwxr-xr-x@  7 yashwanthnalla staff 224B 26 Aug 18:31 Saikumar
-rw-r--r--@  2 yashwanthnalla staff 39B  2 Jan 11:53 sample_data.txt
-rw-r--r--@  2 yashwanthnalla staff 39B  2 Jan 11:53 sample_hard.txt
lrwxr-xr-x@  1 yashwanthnalla staff 37B  2 Jan 11:57 sample_soft.txt -> /Users/yashwanthnalla/sample_data.txt
drwxr-xr-x@ 11 yashwanthnalla staff 352B 16 Oct 14:21 Tour
drwxr-xr-x@  4 yashwanthnalla staff 128B 25 Nov 22:21 untitled folder
drwxr-xr-x@  7 yashwanthnalla staff 224B  8 Dec 22:08 Watch
drwxr-xr-x@  8 yashwanthnalla staff 256B 21 Jul 17:31 Yash
yashwanthnalla@192 GA-Module(1-4) %
```

I used 'ls' to list files with the '-l' (long format) and '-h' (human-readable) flags. This displays the size of every individual file in the home directory.

9) Link Deletion Test:

```
yashwanthnalla@192 GA-Module(1-4) % rm ~/sample_soft.txt && ls -l ~/sample_data.txt  
-rw-r--r--@ 2 yashwanthnalla staff 39 2 Jan 11:53 /Users/yashwanthnalla/sample_data.txt  
yashwanthnalla@192 GA-Module(1-4) %
```

I removed the soft link using rm. Listing the original file afterwards confirms that deleting a soft link only removes the pointer; the actual data and the original file (sample_data.txt) remain completely intact.

10) Disk Utility Demonstration:

```
yashwanthnalla@192 GA-Module(1-4) % df -h && du -sh ~/document  
Filesystem      Size   Used  Avail Capacity iused ifree %iused Mounted on  
/dev/disk3s1s1  460Gi  11Gi  208Gi   6%    453k  2.2G  0%   /  
devfs          201Ki  201Ki  0Bi   100%   696   0  100%  /dev  
/dev/disk3s6   460Gi  2.0Gi  208Gi   1%     2  2.2G  0%  /System/Volumes/VM  
/dev/disk3s2   460Gi  7.7Gi  208Gi   4%    1.3k  2.2G  0%  /System/Volumes/Preboot  
/dev/disk3s4   460Gi  4.6Mi  208Gi   1%     84  2.2G  0%  /System/Volumes/Update  
/dev/disk1s2   500Mi  6.0Mi  482Mi   2%     3  4.9M  0%  /System/Volumes/xarts  
/dev/disk1s1   500Mi  5.7Mi  482Mi   2%    30  4.9M  0%  /System/Volumes/iSCPreboot  
/dev/disk1s3   500Mi  1.5Mi  482Mi   1%    45  4.9M  0%  /System/Volumes/Hardware  
/dev/disk3s5   460Gi  230Gi  208Gi  53%   1.9M  2.2G  0%  /System/Volumes/Data  
map auto_home  0Bi    0Bi   0Bi   100%    0    0  -  /System/Volumes/Data/home  
  0B  /Users/yashwanthnalla/document  
yashwanthnalla@192 GA-Module(1-4) %
```

I chose ~/document as an example created in Q2

'df -h' displays the available disk space on the entire filesystem. 'du -sh' shows the space consumed by a specific directory tree.