

### 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) %
```



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 -li ~/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 '-li' 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
16777232 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 Adlm
drwxr-xr-x  5 yashwanthnalla  staff  160B  1 Mar  2025 Applications
drwxr-xr-x@  6 yashwanthnalla  staff  192B  4 Dec  2024 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
drwx-----  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.