

1) I created a new directory Lab4 under which the file Heart.csv is stored.

- To create symbolic link we use **ln -s**. whereas to create hardlink we simply use **ln**.
- If we use the same name for the links it gives a message saying FILE ALREADY EXISTS, therefore not letting us create another file of same name.
- To prove the links were created correctly, we use **ls -l** command. It shows that the size of the hard link and soft link are different to each other, whereas hardlink file is of the same size as the original file.

```
ibab@IBAB-RA-Comp203:~$ cd Lab4
ibab@IBAB-RA-Comp203:~/Lab4$ ln heart.csv heart_hlink
ln: failed to access 'heart.csv': No such file or directory
ibab@IBAB-RA-Comp203:~/Lab4$ ln Heart heart_hlink
ln: failed to access 'Heart': No such file or directory
ibab@IBAB-RA-Comp203:~/Lab4$ ln Heart.csv heart_hlink
ibab@IBAB-RA-Comp203:~/Lab4$ ln -s Heart.csv heart_slink
ibab@IBAB-RA-Comp203:~/Lab4$ ls -l
total 40
-rw-rw-r-- 2 ibab ibab 19925 Jul 31 14:06 Heart.csv
-rw-rw-r-- 2 ibab ibab 19925 Jul 31 14:06 heart_hlink
lrwxrwxrwx 1 ibab ibab    9 Jul 31 14:21 heart_slink -> Heart.csv
ibab@IBAB-RA-Comp203:~/Lab4$
```

```
ibab@IBAB-RA-Comp203:~/Lab4$ ls -l
total 40
-rw-rw-r-- 2 ibab ibab 19925 Jul 31 14:06 Heart.csv
-rw-rw-r-- 2 ibab ibab 19925 Jul 31 14:06 heart_hlink
lrwxrwxrwx 1 ibab ibab    9 Jul 31 14:21 heart_slink -> Heart.csv
ibab@IBAB-RA-Comp203:~/Lab4$ ln -s Heart.csv heart_hlink
ln: failed to create symbolic link 'heart_hlink': File exists
ibab@IBAB-RA-Comp203:~/Lab4$
```

2) To check the filetype of the file Heart.csv, we use the command **file <filename>**, which shows the filetype as ASCII text or in UTF.

```
ibab@IBAB-RA-Comp203:~/Lab4$ file Heart.csv
Heart.csv: CSV ASCII text
ibab@IBAB-RA-Comp203:~/Lab4$
```

3)

- **more** command reads the entire file before displaying the contents. It reads the file and prints it in an understandable manner.
- **less** command prints the entire file in a detailed manner. It prints all the contents of the file with better utility.
- The number of pages can simply be determined by the number of times we press the spacebar which in this case is 7 times.

```

ibab@IBAB-RA-Comp203:~/Lab4$ more Heart.csv
", "Age", "Sex", "ChestPain", "RestBP", "Chol", "Fbs", "RestECG", "MaxHR", "ExAng", "Oldpeak", "Slope", "Ca", "Thal", "AHD"
"1", 63, 1, "typical", 145, 233, 1, 2, 150, 0, 2.3, 3, 0, "fixed", "No"
"2", 67, 1, "asymptomatic", 160, 286, 0, 2, 108, 1, 1.5, 2, 3, "normal", "Yes"
"3", 67, 1, "asymptomatic", 120, 229, 0, 2, 129, 1, 2.6, 2, 2, "reversible", "Yes"
"4", 37, 1, "nonanginal", 130, 250, 0, 0, 187, 0, 3.5, 3, 0, "normal", "No"
"5", 41, 0, "nontypical", 130, 204, 0, 2, 172, 0, 1.4, 1, 0, "normal", "No"
"6", 56, 1, "nontypical", 120, 236, 0, 0, 178, 0, 0.8, 1, 0, "normal", "No"
"7", 62, 0, "asymptomatic", 140, 268, 0, 2, 160, 0, 3.6, 3, 2, "normal", "Yes"
"8", 57, 0, "asymptomatic", 120, 354, 0, 0, 163, 1, 0.6, 1, 0, "normal", "No"
"9", 63, 1, "asymptomatic", 130, 254, 0, 2, 147, 0, 1.4, 2, 1, "reversible", "Yes"
"10", 53, 1, "asymptomatic", 140, 203, 1, 2, 155, 1, 3.1, 3, 0, "reversible", "Yes"
"11", 57, 1, "asymptomatic", 140, 192, 0, 0, 148, 0, 0.4, 2, 0, "fixed", "No"
"12", 56, 0, "nontypical", 140, 294, 0, 2, 153, 0, 1.3, 2, 0, "normal", "No"
"13", 56, 1, "nonanginal", 130, 256, 1, 2, 142, 1, 0.6, 2, 1, "fixed", "Yes"
"14", 44, 1, "nontypical", 120, 263, 0, 0, 173, 0, 0, 1, 0, "reversible", "No"
"15", 52, 1, "nonanginal", 172, 199, 1, 0, 162, 0, 0.5, 1, 0, "reversible", "No"
"16", 57, 1, "nonanginal", 150, 168, 0, 0, 174, 0, 1.6, 1, 0, "normal", "No"
"17", 48, 1, "nontypical", 110, 229, 0, 0, 168, 0, 1, 3, 0, "reversible", "Yes"
"18", 54, 1, "asymptomatic", 140, 239, 0, 0, 160, 0, 1.2, 1, 0, "normal", "No"
"19", 48, 0, "nonanginal", 130, 275, 0, 0, 139, 0, 0.2, 1, 0, "normal", "No"
"20", 49, 1, "nontypical", 130, 266, 0, 0, 171, 0, 0.6, 1, 0, "normal", "No"
"21", 64, 1, "typical", 110, 211, 0, 2, 144, 1, 1.8, 2, 0, "normal", "No"
"22", 58, 0, "typical", 150, 283, 1, 2, 162, 0, 1, 1, 0, "normal", "No"

```

```

", "Age", "Sex", "ChestPain", "RestBP", "Chol", "Fbs", "RestECG", "MaxHR", "ExAng", "Oldpeak", "Slope", "Ca", "Thal", "AHD"
"1", 63, 1, "typical", 145, 233, 1, 2, 150, 0, 2.3, 3, 0, "fixed", "No"
"2", 67, 1, "asymptomatic", 160, 286, 0, 2, 108, 1, 1.5, 2, 3, "normal", "Yes"
"3", 67, 1, "asymptomatic", 120, 229, 0, 2, 129, 1, 2.6, 2, 2, "reversible", "Yes"
"4", 37, 1, "nonanginal", 130, 250, 0, 0, 187, 0, 3.5, 3, 0, "normal", "No"
"5", 41, 0, "nontypical", 130, 204, 0, 2, 172, 0, 1.4, 1, 0, "normal", "No"
"6", 56, 1, "nontypical", 120, 236, 0, 0, 178, 0, 0.8, 1, 0, "normal", "No"
"7", 62, 0, "asymptomatic", 140, 268, 0, 2, 160, 0, 3.6, 3, 2, "normal", "Yes"
"8", 57, 0, "asymptomatic", 120, 354, 0, 0, 163, 1, 0.6, 1, 0, "normal", "No"
"9", 63, 1, "asymptomatic", 130, 254, 0, 2, 147, 0, 1.4, 2, 1, "reversible", "Yes"
"10", 53, 1, "asymptomatic", 140, 203, 1, 2, 155, 1, 3.1, 3, 0, "reversible", "Yes"
"11", 57, 1, "asymptomatic", 140, 192, 0, 0, 148, 0, 0.4, 2, 0, "fixed", "No"
"12", 56, 0, "nontypical", 140, 294, 0, 2, 153, 0, 1.3, 2, 0, "normal", "No"
"13", 56, 1, "nonanginal", 130, 256, 1, 2, 142, 1, 0.6, 2, 1, "fixed", "Yes"
"14", 44, 1, "nontypical", 120, 263, 0, 0, 173, 0, 0, 1, 0, "reversible", "No"
"15", 52, 1, "nonanginal", 172, 199, 1, 0, 162, 0, 0.5, 1, 0, "reversible", "No"
"16", 57, 1, "nonanginal", 150, 168, 0, 0, 174, 0, 1.6, 1, 0, "normal", "No"
"17", 48, 1, "nontypical", 110, 229, 0, 0, 168, 0, 1, 3, 0, "reversible", "Yes"
"18", 54, 1, "asymptomatic", 140, 239, 0, 0, 160, 0, 1.2, 1, 0, "normal", "No"
"19", 48, 0, "nonanginal", 130, 275, 0, 0, 139, 0, 0.2, 1, 0, "normal", "No"
"20", 49, 1, "nontypical", 130, 266, 0, 0, 171, 0, 0.6, 1, 0, "normal", "No"
"21", 64, 1, "typical", 110, 211, 0, 2, 144, 1, 1.8, 2, 0, "normal", "No"
"22", 58, 0, "typical", 150, 283, 1, 2, 162, 0, 1, 1, 0, "normal", "No"
"23", 58, 1, "nontypical", 120, 284, 0, 2, 160, 0, 1.8, 2, 0, "normal", "Yes"
"24", 58, 1, "nonanginal", 132, 224, 0, 2, 173, 0, 3.2, 1, 2, "reversible", "Yes"
"25", 60, 1, "asymptomatic", 130, 206, 0, 2, 132, 1, 2.4, 2, 2, "reversible", "Yes"
"26", 50, 0, "nonanginal", 120, 219, 0, 0, 158, 0, 1.6, 2, 0, "normal", "No"
"27", 58, 0, "nonanginal", 120, 340, 0, 0, 172, 0, 0, 1, 0, "normal", "No"
"28", 66, 0, "typical", 150, 226, 0, 0, 114, 0, 2.6, 3, 0, "normal", "No"
"29", 43, 1, "asymptomatic", 150, 247, 0, 0, 171, 0, 1.5, 1, 0, "normal", "No"
"30", 40, 1, "asymptomatic", 110, 167, 0, 2, 114, 1, 2, 2, 0, "reversible", "Yes"
"31", 69, 0, "typical", 140, 239, 0, 0, 151, 0, 1.8, 1, 2, "normal", "No"
"32", 60, 1, "asymptomatic", 117, 230, 1, 0, 160, 1, 1.4, 1, 2, "reversible", "Yes"
"33", 64, 1, "nonanginal", 140, 335, 0, 0, 158, 0, 0, 1, 0, "normal", "Yes"
"34", 59, 1, "asymptomatic", 135, 234, 0, 0, 161, 0, 0.5, 2, 0, "reversible", "No"
"35", 44, 1, "nonanginal", 130, 233, 0, 0, 179, 1, 0.4, 1, 0, "normal", "No"

```

4) To get the first 35 lines of the given file we use **head** command and mention the number of lines we want to print with **-n**.

```
ibab@IBAB-RA-Comp203:~/Lab4$ head -n 35 Heart.csv
", "Age", "Sex", "ChestPain", "RestBP", "Chol", "Fbs", "RestECG", "MaxHR", "ExAng", "Oldpeak", "Slope", "Ca", "Thal", "AHD"
"1", 63, 1, "typical", 145, 233, 1, 2, 150, 0, 2, 3, 3, 0, "fixed", "No"
"2", 67, 1, "asymptomatic", 160, 286, 0, 2, 108, 1, 1, 5, 2, 3, "normal", "Yes"
"3", 67, 1, "asymptomatic", 120, 229, 0, 2, 129, 1, 2, 6, 2, 2, "reversible", "Yes"
"4", 37, 1, "nonanginal", 130, 250, 0, 0, 187, 0, 3, 5, 3, 0, "normal", "No"
"5", 41, 0, "nontypical", 130, 204, 0, 2, 172, 0, 1, 4, 1, 0, "normal", "No"
"6", 56, 1, "nontypical", 120, 236, 0, 0, 178, 0, 0, 8, 1, 0, "normal", "No"
"7", 62, 0, "asymptomatic", 140, 268, 0, 2, 160, 0, 3, 6, 3, 2, "normal", "Yes"
"8", 57, 0, "asymptomatic", 120, 354, 0, 0, 163, 1, 0, 6, 1, 0, "normal", "No"
"9", 63, 1, "asymptomatic", 130, 254, 0, 2, 147, 0, 1, 4, 2, 1, "reversible", "Yes"
"10", 53, 1, "asymptomatic", 140, 203, 1, 2, 155, 1, 3, 1, 3, 0, "reversible", "Yes"
"11", 57, 1, "asymptomatic", 140, 192, 0, 0, 148, 0, 0, 4, 2, 0, "fixed", "No"
"12", 56, 0, "nontypical", 140, 294, 0, 2, 153, 0, 1, 3, 2, 0, "normal", "No"
"13", 56, 1, "nonanginal", 130, 256, 1, 2, 142, 1, 0, 6, 2, 1, "fixed", "Yes"
"14", 44, 1, "nontypical", 120, 263, 0, 0, 173, 0, 0, 1, 0, "reversible", "No"
"15", 52, 1, "nonanginal", 172, 199, 1, 0, 162, 0, 0, 5, 1, 0, "reversible", "No"
"16", 57, 1, "nonanginal", 150, 168, 0, 0, 174, 0, 1, 6, 1, 0, "normal", "No"
"17", 48, 1, "nontypical", 110, 229, 0, 0, 168, 0, 1, 3, 0, "reversible", "Yes"
"18", 54, 1, "asymptomatic", 140, 239, 0, 0, 160, 0, 1, 2, 1, 0, "normal", "No"
"19", 48, 0, "nonanginal", 130, 275, 0, 0, 139, 0, 0, 2, 1, 0, "normal", "No"
"20", 49, 1, "nontypical", 130, 266, 0, 0, 171, 0, 0, 6, 1, 0, "normal", "No"
"21", 64, 1, "typical", 110, 211, 0, 2, 144, 1, 1, 8, 2, 0, "normal", "No"
"22", 58, 0, "typical", 150, 283, 1, 2, 162, 0, 1, 1, 0, "normal", "No"
"23", 58, 1, "nontypical", 120, 284, 0, 2, 160, 0, 1, 8, 2, 0, "normal", "Yes"
"24", 58, 1, "nonanginal", 132, 224, 0, 2, 173, 0, 3, 2, 1, 2, "reversible", "Yes"
"25", 60, 1, "asymptomatic", 130, 206, 0, 2, 132, 1, 2, 4, 2, 2, "reversible", "Yes"
"26", 50, 0, "nonanginal", 120, 219, 0, 0, 158, 0, 1, 6, 2, 0, "normal", "No"
"27", 58, 0, "nonanginal", 120, 340, 0, 0, 172, 0, 0, 1, 0, "normal", "No"
"28", 66, 0, "typical", 150, 226, 0, 0, 114, 0, 2, 6, 3, 0, "normal", "No"
"29", 43, 1, "asymptomatic", 150, 247, 0, 0, 171, 0, 1, 5, 1, 0, "normal", "No"
"30", 40, 1, "asymptomatic", 110, 167, 0, 2, 114, 1, 2, 2, 0, "reversible", "Yes"
"31", 69, 0, "typical", 140, 239, 0, 0, 151, 0, 1, 8, 1, 2, "normal", "No"
"32", 60, 1, "asymptomatic", 117, 230, 1, 0, 160, 1, 1, 4, 1, 2, "reversible", "Yes"
"33", 64, 1, "nonanginal", 140, 335, 0, 0, 158, 0, 0, 1, 0, "normal", "Yes"
"34", 59, 1, "asymptomatic", 135, 234, 0, 0, 161, 0, 0, 5, 2, 0, "reversible", "No"
ibab@IBAB-RA-Comp203:~/Lab4$
```

5) To get the last 15 lines of the data files, we use the command **tail -n**, the **-n** allowing us to enter the number of lines we want to be printed.

```
ibab@IBAB-RA-Comp203:~/Lab4$ tail -n 15 Heart.csv
"289", 56, 1, "nontypical", 130, 221, 0, 2, 163, 0, 0, 1, 0, "reversible", "No"
"290", 56, 1, "nontypical", 120, 240, 0, 0, 169, 0, 0, 3, 0, "normal", "No"
"291", 67, 1, "nonanginal", 152, 212, 0, 2, 150, 0, 0, 8, 2, 0, "reversible", "Yes"
"292", 55, 0, "nontypical", 132, 342, 0, 0, 166, 0, 1, 2, 1, 0, "normal", "No"
"293", 44, 1, "asymptomatic", 120, 169, 0, 0, 144, 1, 2, 8, 3, 0, "fixed", "Yes"
"294", 63, 1, "asymptomatic", 140, 187, 0, 2, 144, 1, 4, 1, 2, "reversible", "Yes"
"295", 63, 0, "asymptomatic", 124, 197, 0, 0, 136, 1, 0, 2, 0, "normal", "Yes"
"296", 41, 1, "nontypical", 120, 157, 0, 0, 182, 0, 0, 1, 0, "normal", "No"
"297", 59, 1, "asymptomatic", 164, 176, 1, 2, 90, 0, 1, 2, 2, "fixed", "Yes"
"298", 57, 0, "asymptomatic", 140, 241, 0, 0, 123, 1, 0, 2, 2, 0, "reversible", "Yes"
"299", 45, 1, "typical", 110, 264, 0, 0, 132, 0, 1, 2, 2, 0, "reversible", "Yes"
"300", 68, 1, "asymptomatic", 144, 193, 1, 0, 141, 0, 3, 4, 2, 2, "reversible", "Yes"
"301", 57, 1, "asymptomatic", 130, 131, 0, 0, 115, 1, 1, 2, 2, 1, "reversible", "Yes"
"302", 57, 0, "nontypical", 130, 236, 0, 2, 174, 0, 0, 2, 1, "normal", "Yes"
"303", 38, 1, "nonanginal", 138, 175, 0, 0, 173, 0, 0, 1, NA, "normal", "No"
ibab@IBAB-RA-Comp203:~/Lab4$
```


6) The **History** command gives us last few commands that were entered by the user.

```
ibab@IBAB-RA-Comp203:~/Lab4$ history
1035  ./pycharm.sh
1036  clear
1037  cd Vindhya/pycharm_Vindhya/pycharm-community-2024.2.1/bin
1038  ./pycharm.sh
1039  cd Vbn
1040  cd Vindhya/
1041  cd pycharm_Vindhya/
1042  ls
1043  cd ..
1044  cd pycharm
1045  ls
1046  cd pyt
1047  cd pythonProject/
```

The history command also gives the command code along with the command name. Here the second last command is tail -n of the code 2032.

```
2025  less Heart.csv
2026  clear
2027  head -n 35 Heart.csv
2028  clear
2029  ls -l
2030  ln -s Heart.csv heart_hlink
2031  clear
2032  tail -n 15 Heart.csv
2033  clear
2034  history
ibab@IBAB-RA-Comp203:~/Lab4$
```

To print the second last command we use both the process ID and the first letter of the command.

```
/home/ibab/Lab4
ibab@IBAB-RA-Comp203:~/Lab4$ !t 2032
tail -n 15 Heart.csv 2032
==> Heart.csv <==
"289",56,1,"nontypical",130,221,0,2,163,0,0,1,0,"reversible","No"
"290",56,1,"nontypical",120,240,0,0,169,0,0,3,0,"normal","No"
"291",67,1,"nonanginal",152,212,0,2,150,0,0.8,2,0,"reversible","Yes"
"292",55,0,"nontypical",132,342,0,0,166,0,1.2,1,0,"normal","No"
"293",44,1,"asymptomatic",120,169,0,0,144,1,2.8,3,0,"fixed","Yes"
"294",63,1,"asymptomatic",140,187,0,2,144,1,4,1,2,"reversible","Yes"
"295",63,0,"asymptomatic",124,197,0,0,136,1,0,2,0,"normal","Yes"
"296",41,1,"nontypical",120,157,0,0,182,0,0,1,0,"normal","No"
"297",59,1,"asymptomatic",164,176,1,2,90,0,1,2,2,"fixed","Yes"
"298",57,0,"asymptomatic",140,241,0,0,123,1,0.2,2,0,"reversible","Yes"
"299",45,1,"typical",110,264,0,0,132,0,1.2,2,0,"reversible","Yes"
```

7)

I. Here, we Sort the data according to the first column, and save the output in a new file called col1_sorted.out.

```
ibab@IBAB-RA-Comp203:~/Lab4$ head Heart.csv
", "Age", "Sex", "ChestPain", "RestBP", "Chol", "Fbs", "RestECG", "MaxHR", "ExAng", "Oldpeak", "Slope", "Ca", "Thal", "AHD"
"1", 63, 1, "typical", 145, 233, 1, 2, 150, 0, 2, 3, 3, 0, "fixed", "No"
"2", 67, 1, "asymptomatic", 160, 286, 0, 2, 108, 1, 1.5, 2, 3, "normal", "Yes"
"3", 67, 1, "asymptomatic", 120, 229, 0, 2, 129, 1, 2.6, 2, 2, "reversable", "Yes"
"4", 37, 1, "nonanginal", 130, 250, 0, 0, 187, 0, 3.5, 3, 0, "normal", "No"
"5", 41, 0, "nontypical", 130, 204, 0, 2, 172, 0, 1.4, 1, 0, "normal", "No"
"6", 56, 1, "nontypical", 120, 236, 0, 0, 178, 0, 0.8, 1, 0, "normal", "No"
"7", 62, 0, "asymptomatic", 140, 268, 0, 2, 160, 0, 3.6, 3, 2, "normal", "Yes"
"8", 57, 0, "asymptomatic", 120, 354, 0, 0, 163, 1, 0.6, 1, 0, "normal", "No"
"9", 63, 1, "asymptomatic", 130, 254, 0, 2, 147, 0, 1.4, 2, 1, "reversable", "Yes"
ibab@IBAB-RA-Comp203:~/Lab4$ sort -t ',' -k 1 -n Heart.csv > col1_sorted.out
ibab@IBAB-RA-Comp203:~/Lab4$ head col1_sorted.out
"100", 48, 1, "asymptomatic", 122, 222, 0, 2, 186, 0, 0, 1, 0, "normal", "No"
"101", 45, 1, "asymptomatic", 115, 260, 0, 2, 185, 0, 0, 1, 0, "normal", "No"
"102", 34, 1, "typical", 118, 182, 0, 2, 174, 0, 0, 1, 0, "normal", "No"
"103", 57, 0, "asymptomatic", 128, 303, 0, 2, 159, 0, 0, 1, 1, "normal", "No"
"104", 71, 0, "nonanginal", 110, 265, 1, 2, 130, 0, 0, 1, 1, "normal", "No"
"10", 53, 1, "asymptomatic", 140, 203, 1, 2, 155, 1, 3, 1, 3, 0, "reversable", "Yes"
"105", 49, 1, "nonanginal", 120, 188, 0, 0, 139, 0, 2, 2, 3, "reversable", "Yes"
"106", 54, 1, "nontypical", 108, 309, 0, 0, 156, 0, 0, 1, 0, "reversable", "No"
"107", 59, 1, "asymptomatic", 140, 177, 0, 0, 162, 1, 0, 1, 1, "reversable", "Yes"
"108", 57, 1, "nonanginal", 128, 229, 0, 2, 150, 0, 0, 4, 2, 1, "reversable", "Yes"
ibab@IBAB-RA-Comp203:~/Lab4$
```

ii. Here, we sort the data according to the 'Age' column and save the the output in a new file called age_sorted.out.

We use sort -c along with the filename to see if the new file was sorted or not.

```
ibab@IBAB-RA-Comp203:~/Lab4$ sort -t ',' -k 2 -n Heart.csv > age_sorted.out
ibab@IBAB-RA-Comp203:~/Lab4$ ls age_sorted.out
age_sorted.out
ibab@IBAB-RA-Comp203:~/Lab4$ sort -c
age_sorted.out
>
^C
ibab@IBAB-RA-Comp203:~/Lab4$ sort -c age_sorted.out
sort: age_sorted.out:2: disorder: "133", 29, 1, "nontypical", 130, 204, 0, 2, 202, 0, 0, 1, 0, "normal", "No"
ibab@IBAB-RA-Comp203:~/Lab4$
```

iii. Here, we sort in a reverse manner according to the 'RestBP' column, and save output in a new file called restbp_revsort.out. We check if the file is sorted using sort -c <filename>

```
ibab@IBAB-RA-Comp203:~/Lab4$ head Heart.csv
", "Age", "Sex", "ChestPain", "RestBP", "Chol", "Fbs", "RestECG", "MaxHR", "ExAng", "Oldpeak", "Slope", "Ca", "Thal", "AHD"
"1", 63, 1, "typical", 145, 233, 1, 2, 150, 0, 2, 3, 3, 0, "fixed", "No"
"2", 67, 1, "asymptomatic", 160, 286, 0, 2, 108, 1, 1.5, 2, 3, "normal", "Yes"
"3", 67, 1, "asymptomatic", 120, 229, 0, 2, 129, 1, 2.6, 2, 2, "reversable", "Yes"
"4", 37, 1, "nonanginal", 130, 250, 0, 0, 187, 0, 3.5, 3, 0, "normal", "No"
"5", 41, 0, "nontypical", 130, 204, 0, 2, 172, 0, 1.4, 1, 0, "normal", "No"
"6", 56, 1, "nontypical", 120, 236, 0, 0, 178, 0, 0.8, 1, 0, "normal", "No"
"7", 62, 0, "asymptomatic", 140, 268, 0, 2, 160, 0, 3.6, 3, 2, "normal", "Yes"
"8", 57, 0, "asymptomatic", 120, 354, 0, 0, 163, 1, 0.6, 1, 0, "normal", "No"
"9", 63, 1, "asymptomatic", 130, 254, 0, 2, 147, 0, 1.4, 2, 1, "reversable", "Yes"
ibab@IBAB-RA-Comp203:~/Lab4$ sort -t ',' -k 5 -nr Heart.csv > restbp_revsort.out
ibab@IBAB-RA-Comp203:~/Lab4$ sort -c restbp_revsort.out
sort: restbp_revsort.out:5: disorder: "173", 59, 0, "asymptomatic", 174, 249, 0, 0, 143, 1, 0, 2, 0, "normal", "Yes"
ibab@IBAB-RA-Comp203:~/Lab4$
```

iv. Here we use the man command to help us learn which commands we must place instead. We use keywords of GNU to print the given functions.

```
ibab@IBAB-RA-Comp203:~$ cd Lab4
ibab@IBAB-RA-Comp203:~/Lab4$ sort --field-separator=',' --key=1 --numeric-sort Heart.csv > col1_sorted_gnu.out
ibab@IBAB-RA-Comp203:~/Lab4$ sort -c col1_sorted_gnu.out
ibab@IBAB-RA-Comp203:~/Lab4$ sort --field-separator=',' --key=2 --numeric-sort -reverse Heart.csv > age_sorted_gnu.out
ibab@IBAB-RA-Comp203:~/Lab4$
```

v & vi.

```
ibab@IBAB-RA-Comp203:~/Lab4$ head Heart.csv
", "Age", "Sex", "ChestPain", "RestBP", "Chol", "Fbs", "RestECG", "MaxHR", "ExAng", "Oldpeak", "Slope", "Ca", "Thal", "AHD"
"1",63,1,"typical",145,233,1,2,150,0,2.3,3,0,"fixed","No"
"2",67,1,"asymptomatic",160,286,0,2,108,1,1.5,2,3,"normal","Yes"
"3",67,1,"asymptomatic",120,229,0,2,129,1,2.6,2,2,"reversible","Yes"
"4",37,1,"nonanginal",130,250,0,0,187,0,3.5,3,0,"normal","No"
"5",41,0,"nontypical",130,204,0,2,172,0,1.4,1,0,"normal","No"
"6",56,1,"nontypical",120,236,0,0,178,0,0.8,1,0,"normal","No"
"7",62,0,"asymptomatic",140,268,0,2,160,0,3.6,3,2,"normal","Yes"
"8",57,0,"asymptomatic",120,354,0,0,163,1,0.6,1,0,"normal","No"
"9",63,1,"asymptomatic",130,254,0,2,147,0,1.4,2,1,"reversible","Yes"
ibab@IBAB-RA-Comp203:~/Lab4$ sort -t ',' -k 2 -n -k 5 -n Heart.csv > age_restbp_sort.out
ibab@IBAB-RA-Comp203:~/Lab4$ sort -c age_restbp_sort.out
sort: age_restbp_sort.out:2: disorder: "133",29,1,"nontypical",130,204,0,2,202,0,0,1,0,"normal","No"
ibab@IBAB-RA-Comp203:~/Lab4$ sort -t ',' -k 3 -n -k 2 -n -k 4 -n Heart.csv > sex_age_chpain_sort.out
ibab@IBAB-RA-Comp203:~/Lab4$ sort -c sex_age_chpain_sort.out
sort: sex_age_chpain_sort.out:2: disorder: "226",34,0,"nontypical",118,210,0,0,192,0,0.7,1,0,"normal","No"
ibab@IBAB-RA-Comp203:~/Lab4$
```

We sort the data 1) according to age, and then according to RestBP.

2) according to sex, then according to age, then according to ChestPain.

To do this, we simply use the -k and -n command, which allows us to sort multiple things at once.