A) Hard links and i-nodes:

Go to a subfolder you have used earlier.

:~$ cd Desktop/playground

Create a file with some content.

:~/Desktop/playground$ nano test.txt
first line in test file
Ctrl^o
Ctrl^x

Create then a hard link to this file by using ln command.

:~/Desktop/playground$ ln test test_hard

Check that linked files are actually same files.

:~/Desktop/playground$ ls -li
total 8
917751 -rw-r--r-- 2 ik0v ik0v 25 Oct 9 13:00 test_hard
917751 -rw-r--r-- 2 ik0v ik0v 25 Oct 9 13:00 test.txt

inode number is same, so this to files are same file.

Go to another folder and create a link from there. Does it work?

:~/Desktop/playground$ cd ..
:~/Desktop$ ln playground/test.txt test_hard

Make sure these file are one file by: a) listing out content, editing file.

:~/Desktop$ nano test_hard.txt
opens same file, adding more info:

second line in test file
Ctrl^x

:~/Desktop$ less playground/test.txt
both lines comes here – it works fine.

b) Using ls command with option -i.

:~/Desktop$ ls -i
917751 test_hard   - That hard link has same inode number.

Create a hard link to a folder (instead of file as earlier). Did it work? Check manual.

:~/Desktop$ ln playground playground_hard
ln: playground/: hard link not allowed for directory

It doesn't work, hard links can't be used on folders.

Try to create a hard link in your home directory for a file from /tmp folder.

:/tmp/$ ln brosjyre.pdf ~/brosjyre_hard
Found a pdf file in that subfolder. Probably it was placed there earlier by me. Got no errors.

:~$ ls -l
total 252
-rw-r--r-- 2 ik0v ik0v 100K Oct 25 13:27 brosjyre_hard

:~$ file brosjyre_hard
brosjyre_hard: PDF document, version 1.3 - it works fine.

B) Symbolic links:

Check if you find symbolic links in some of system folders (hint: try /usr/bin).

:/usr/bin$ find -type l

Look for l at the start of line when using ls -l. Why do you think symbolic links are here?

Many of those links have general name, and they point to a specific version of program. It makes it much easier to update a program.

Create a file rosenborg.txt in one of subfolders. Add some content to that.

:~/Desktop/playground$ nano rosenborg.txt

first line
second line
third line
Ctrl^x

Create then a symbolic link named trunga.txt to a file rosenborg.txt and a hard link rbk.txt to same file. Did it went well?

:~/Desktop/playground$ ln -s rosenborg.txt trunga.txt
:~/Desktop/playground$ ln rosenborg.txt rbk.txt

It went well.

How can u distinguish symbolic links and hard links?

```
:~/Desktop/playground$ ls -il
total 8
917811 -rw-r--r-- 2 ik0v ik0v 38 Oct  25 14:28 rbk.txt
917811 -rw-r--r-- 2 ik0v ik0v 38 Oct  25 14:28 rosenborg.txt
917751 -rw-r--r-- 3 ik0v ik0v 49 Oct  25 13:07 test_hard
917751 -rw-r--r-- 3 ik0v ik0v 49 Oct  25 13:07 test.txt
917708 lrwxrwxrwx 1 ik0v ik0v 13 Oct  25 14:24 trunga.txt -> rosenborg.txt
```

The last one in list is a symbolic link and can be found by -> symbols and turquoise color.
First l letter after inode number also indicates symbolic link.

b) Create a link called rborg.txt for rosenborg.txt from another folder. Did it went well?

:~/Desktop$ ln -s playground/rosenborg.txt rborg.txt - It works fine.

c) Try to create a symbolic link to a folder.

:~/Desktop$ ln -s playground playground_link

d) What is the difference between symbolic and hard links? Pros and cons?

Main drawback with hard link is that they don't work on folders and other partitions.
Original file still exists as long at least one hard link points to it. Original file is a hard link itself, when file is created it gets one hard link automatically.

Symbolic links were introduced later to improve drawbacks from hard links.
They work mainly as shortcuts in Windows.
Original file exists when such a link is deleted. Any changes added to symbolic link affects original file's content. When original file is deleted, then symbolic link becomes a broken link and does nothing.

e) Try to delete a file links are pointing to. What consequences will be? Delete link instead. What happens now?

:~/Desktop/playground$ rm rosenborg.txt
It went well, symbolic links still exists, but they point to nothing now.

:~/Desktop/playground$ rm trunga.txt
:~/Desktop$ rm rborg.txt

Links are deleted, as well as original file.

f) Delete now hard links. What happens now?

:~/Desktop/playground$ less rbk.txt
Hard link has same content as original file rosenborg.txt. It works as independent file.

:~/Desktop/playground$ rm rbk.txt
Hard link is deleted as well now.

C) Finding links with find-commands.

Use find command to find links in your home directory, then on whole system.
Try also to list out info about each file with ls -il command.

:~$ find -type l

:~$ cd /
:/$ find -type l

:~$ find -type l -exec ls -l {} \;
  * it took about 1 min on my pc

:~$ find -type l | wc -l

46590 – link files on my pc