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Website: <http://www.mpi-magdeburg.mpg.de/csc/teaching/20ws/sc1/>

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**Scientific Computing 1**  
**1st worksheet for online events**  
11/02/2020

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**Hint:** If you are not sure what a command does, or what the right parameters are, use `man`, `apropos` or `info` to get help.

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**Exercise 1:**

Log in to the virtual machine and make yourself familiar with the command line. Try the following actions and check the current results using `ls`:

- a.) Print the current directory.
- b.) Create a new directory with an arbitrary name and change into it.
- c.) Check if this was successful by printing the current directory again.
- d.) Create an empty file called `firstfile.txt` inside this directory.
- e.) Append the text "Hello World" to the previously created file.
- f.) Copy the file to the superordinate directory.
- g.) Remove the file from the current directory.
- h.) Change to the super-ordinate directory and rename the file to an arbitrary filename.
- i.) Print the renamed file to the screen.
- j.) Remove the previously created directory.

**Exercise 2:**

- a.) `find` and `locate` are two powerful tools to search for files. Search for a file called `GPL-2` beginning in the root of the file system employing both tools. If you found a file copy it to your home directory automatically, i.e. without copy and paste of the filenames.
- b.) Search for a directory named `common-licenses` beginning in the root of the file system. Check in the man page of `find` how it is possible to search only for directories.  
If you found a directory create a soft-link to it in your home directory and check the result using the `ls` with proper options.

### Exercise 3:

Access rights and permissions to files are managed using `chmod`, `chown` and `chgrp`. The current permissions and owner are displayed by `ls -l`. Try the following operations and comment what happens on your system. In the case of an error explain why this error occurs.

- a.) Allow only yourself to read and write a file.
- b.) Allow yourself to read and write a file and the group to only read it.
- c.) Set the group access rights to the same as the user has.
- d.) Change the group of a file to `adm`.
- e.) Check if it is possible to remove all permissions from a file and reassign them later.
- f.) Try to change the owner of a file to `root`. Why is this behavior useful?
- g.) Set the executable bit for all users and leave all other bits untouched. What changes in the `ls` output.

### Exercise 4:

- a.) Start a screen session and open a second terminal, in there. In one of them, start the Python 3 interpreter and figure out its process ID, using the other one. Terminate Python 3 using the `kill` command, from the same terminal.
- b.) Open `top` and try to:
  - 1.) sort the processes by the user name.
  - 2.) sort the processes by the command in descending order.
  - 3.) change the refresh time to 1s.

### Exercise 5:

- a.) Use `grep` to find the string "copyright" in some of the license files in `/usr/share/common-licenses/`. Which option must be added to `grep` such that also the line numbers of the matching lines are displayed?  
  
Search for a program which can count lines of a file using `apropos`. Use this program and `grep` to count how many lines contain the string "copyright" in the `/usr/share/common-licenses/` directory.
- b.) The `#` sign is used as comment identifier in many configuration files. Use `grep` to display all lines of a file which are not a comment. An example file which uses `#` for comments is `/etc/resolv.conf`<sup>1</sup>.
- c.) In MATLAB® the `tic` and `toc` commands can be used for time measurement. They produce a characteristic output like:

```
Elapsed time is XXXX seconds
```

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<sup>1</sup>This file specifies the DNS server address for the name resolution in network applications, such as browsers.

Write a `grep` command which searches for such lines in a file and displays the match together with five lines before and two lines after it.

### Exercise 6:

Write a regular expression which matches:

- a.) all strings ending with a dot.
- b.) all strings beginning with a # symbol.
- c.) a floating point number in the standard notation (e.g.: 19.456).
- d.) a floating point number in scientific notation (e.g.:  $3.123e + 4$ ).

### Exercise 7:

The `date` command displays the current time and the date. Use `awk` to filter the output and

- a.) display only the time.
- b.) display the time zone.
- c.) get the day, the month, and the year and rearrange them to the German format.