Week 5 –Assignment 3 - LINUX/UNIX COMMAND LINE BASICS

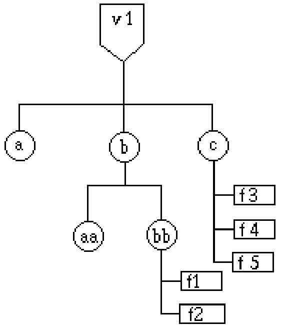
Get the initial skills of working with a Linux/UNIX command line via bash shell. The Linux/UNIX commands are used:

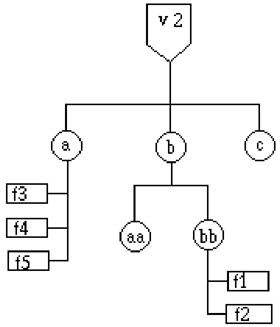
adduser, userdel, passwd, sudo, logout, poweroff, apt,man, apropos, help info, whatis, whereis, type
who, whoami, id, uname, date, clear, ps, df, banner, cal, bc, echo,pwd, cd, ls, mkdir, rmdir, rm, mv, ln, ln -s, du,
touch, cat, cp, mv, rm, more, tail, head, ls, ln, file, type, find.

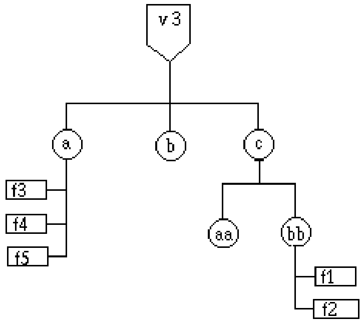
TASKS FOR WORK
(NOTE. Start Your **Ubuntu** Virtual Machine on your VirtualBox. You need only Linux Terminal to complete the lab tasks.
Before completing the tasks, make a SnapShot of your Virtual Linux, if there are problems, you can easily go back to working condition!)

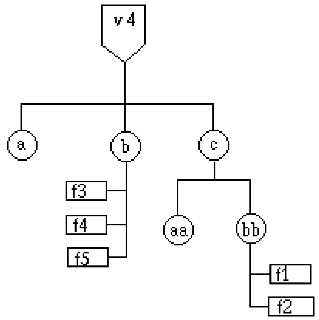
Generate You Variant Nr.
User account management basic. (make a Screenshot 1)
Use apt Package Manager on Ubuntu Command Line. (make a Screenshot 2)
Command line structure. (Read only)
Use the man, info, help. (Read only)
System commands. (Fill in a Table 1)
Directory commands. (Fill in a Table 2)
File commands. (Fill in a Table 3)
Create a bash-script **report-vN**. (make a Screenshot 3), (make a Screenshot 4)

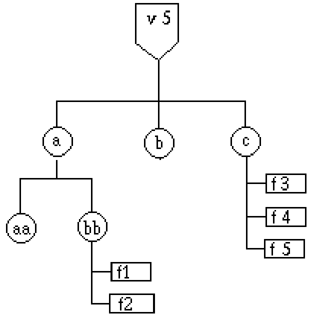
Structure Variants vN, where N –variant Number generated from Your Surname and Name:

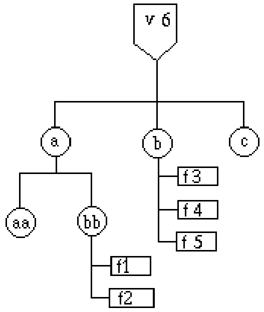


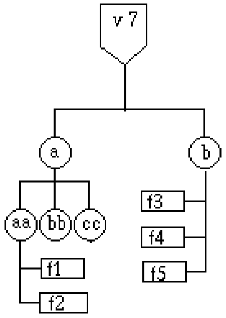


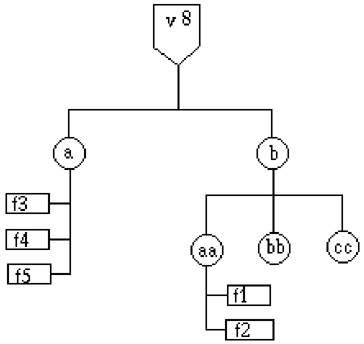


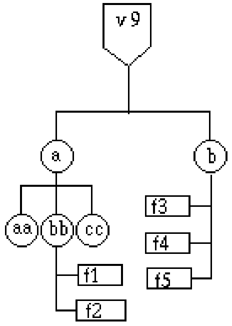


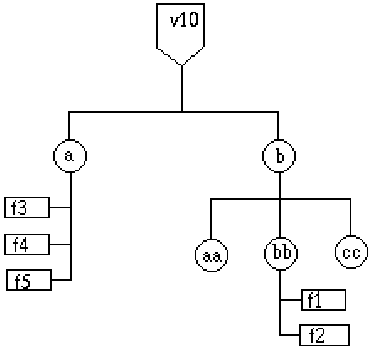


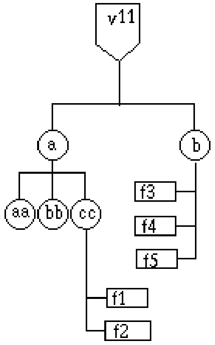


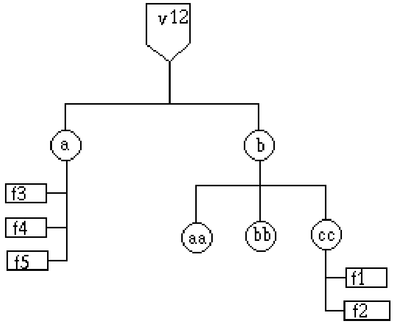


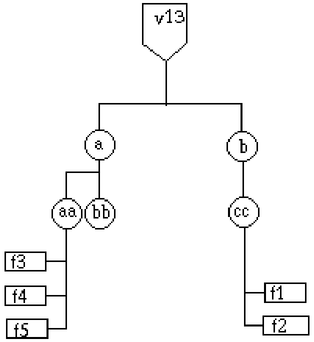


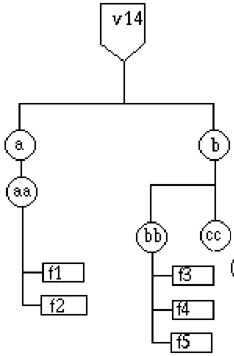


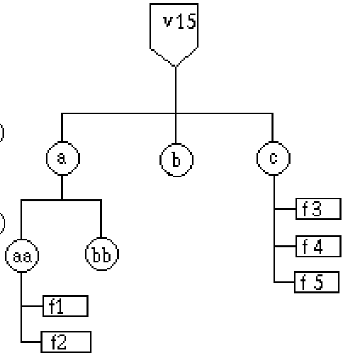


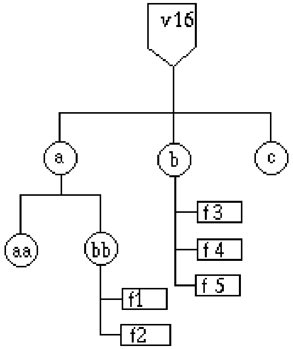


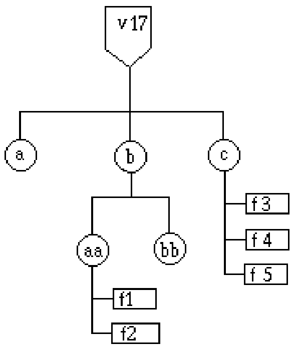


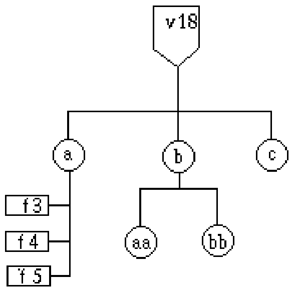

v13
a
b
aa
bb
cc
f3
f4
f5
f1
f2

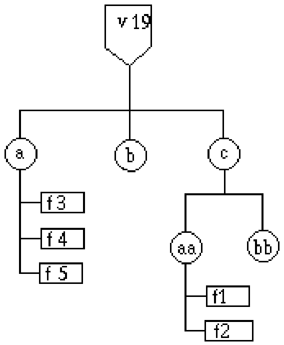

v14
a
b
aa
bb
cc
f1
f2
f3
f4
f5

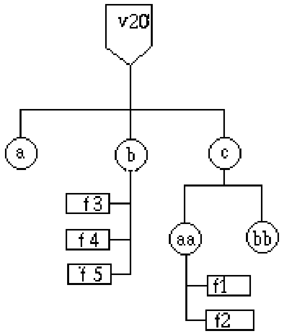

v15
a
b
c
aa
bb
f1
f2
f 3
f 4
f 5


v16
a
b
c
aa
bb
f1
f2
f3
f 4
f 5









REPORT

Make a report about this work (Screenshots 1-4 and Tables 1-3) and send it to the teacher’s email.

REPORT FOR LAB WORK 04: LINUX/UNIX COMMAND LINE BASICS

Student Name Surname	Student ID (Variant Nr)	Date

Insert: Variant Generation, Screenshot 1, Screenshot 2, Table 1, Table 2, Table 3, Screenshot 3, Screenshot 4.

GUIDELINES
GENERATE YOU VARIANT NR.

Write your Surname in the letters of the English alphabet. Must be at least 7 letters, if not enough, then add the required number ofletters from the Name (if not enough, then repeat Surname and Name).

For example, for Li Yurijs there will be LIYURIJS.

Replace the first 7 letters with their ordinal numbers in the alphabet.

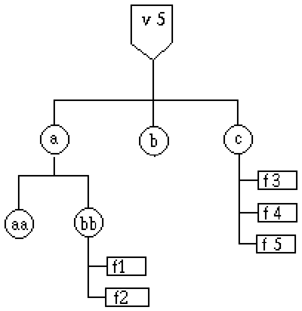
For example, 12 09 25 21 18 09 10.

Consistently add modulo 20 these 7 numbers and add 1.

For example, (12 + 09 + 25 + 21 +18 + 09 + 10)mod20 + 1 = 104mod20 + 1 = 4 +1 = 5

The resulting will be your variant Nr.

For example, Variant Nr = 5 (odd Variant Nr).



USER ACCOUNT MANAGEMENT BASIC.

Create new user account, example stud. Use **adduser** command. (make a Screenshot 1 for adduser)

```
$ sudo adduser stud
```

(NOTE. You can use the command “userdell –rf stud” to delete stud account from your Linux. Do not do it now!)
Logout from student account (**logout**) and login as stud.
Use the **passwd** command for change password for stud.
Test execution of command **sudo -i poweroff** for stud (not sudo user).
Logout from stud account (**logout**) and login as student.
Test execution of command **sudo -i poweroff** for student (sudo user).

USE APT PACKAGE MANAGER ON UBUNTU COMMAND LINE.

When you begin to use the Ubuntu operating system, the first choice of installing software is through the graphical Ubuntu Softwaremanager.

Although many programs are available in this collection, you will soon know that it lacks many powerful utilities especially that for thecommand line. Then is the time to switch to the more powerful software installation utility, the apt-get. With apt you can:

Listing available and installed packages
Update the package repositories
Upgrade installed software
Search for available packages
Install a packages
Remove a software from your system

List the software packages on Ubuntu (all and installed).

```
$ sudo apt list
$ sudo apt list --installed
```

Update the package repositories with apt.

A repository is a list of available software packages in a given snapshot in time. Since the packages in this list are sometimes added, removed and updated, you need to update your system repositories from time to time. The lists of available packages are fetched from the location(s) specified in /etc/apt/sources.list.

It is best to update the repositories before installing a new software by running the following command as root:

```
$ sudo apt update
```

Upgrade installed software with apt.

Option upgrade is used to install the newest versions of all packages currently installed on the system from the sources enumerated in /etc/apt/sources.list. Use the following command as root in order to upgrade software on your system:

```
$ sudo apt upgrade  # Caution, there may be problems problems with your Linux, first make SnapShot!
```

Search for available packages with apt (testing with bc)

```
$ apt search <package-name-keyword>
```

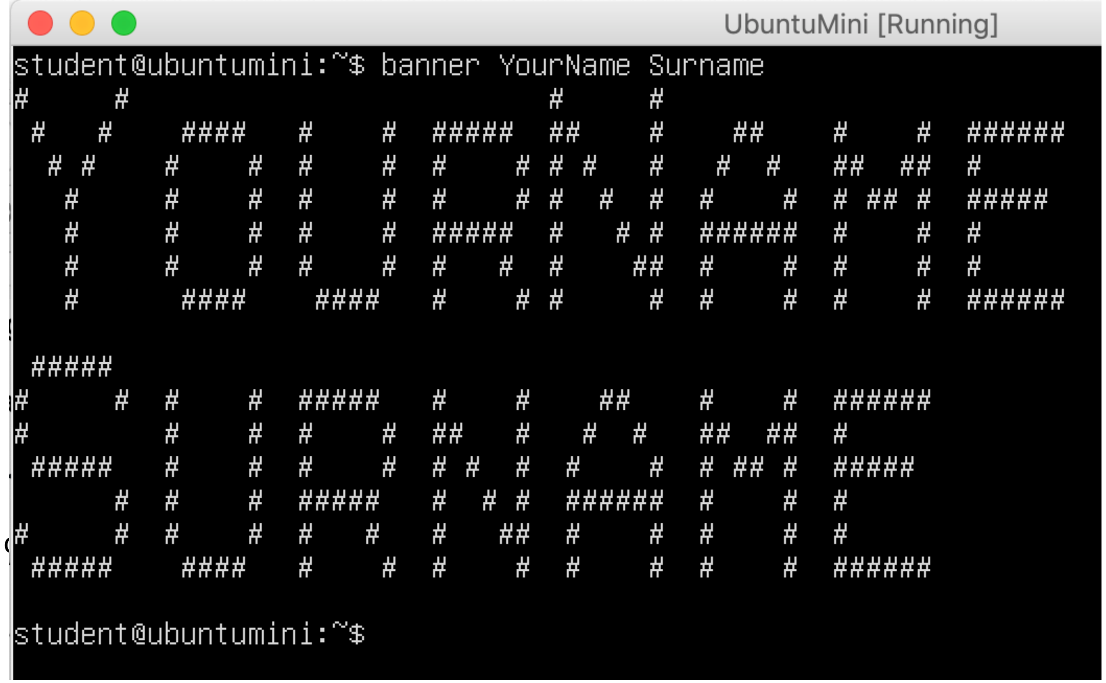
Install a package with apt (testing with bc)

```
$ sudo apt install <package-name>
```

Remove a software from your system (testing with bc)

```
$ sudo apt remove <package-name>
```

Install sysvbanner package for banner command.



```
student@ubuntumini:~$ banner YourName Surname
#     #                         #     #
 #   #   ####   #    #  #####   ##    #   ##    #    #  ######
  # #   #    #  #    #  #    #  # #   #  #  #   ##  ##  #
   #    #    #  #    #  #    #  #  #  # #    #  # ## #  #####
   #    #    #  #    #  #####   #   # # ######  #    #  #
   #    #    #  #    #  #   #   #    ## #    #  #    #  #
   #     ####    ####   #    #  #     # #    #  #    #  ######

 #####
#     # #    #  #####   #    #    ##    #    #  ######
#       #    #  #    #  ##   #   #  #   ##  ##  #
 #####  #    #  #    #  # #  #  #    #  # ## #  #####
      # #    #  #####   #  # #  ######  #    #  #
#     # #    #  #   #   #   ##  #    #  #    #  #
 #####   ####   #    #  #    #  #    #  #    #  ######

student@ubuntumini:~$
```

Login as a student. Use “**sudo apt install sysvbanner**”.Test **banner** c

```
$ banner YourName Surname
```

COMMAND LINE STRUCTURE

Command line.

The command line may contain one or more commands listed through a semicolon.Each command has a name and may have modifiers and arguments.

Command line structure (Bakus-Naur Form):

<command line>: = <command> [; <command>] ...
<command>: = <name> [-<modifiers>] [<arguments>] [&]
<modifiers>: = [<modifier> [<modifier>] ...]
<arguments>: = [<argument> [<argument>] ...]

Examples:

```
$ pwd           # no modifiers, no arguments
$ cd /home      # have only 1 arguments
$ cat f1 f2 f3  # have 3 arguments
$ ps -aux       # have 3 modifiers
```

Example:

```
$ ls -al -u file1 dir1 & # Remark string
```

Here:

$ - command line prompt (equal $PS1 (Prompt String 1)
ls (from listing - list) - the name of the command;
-a -l -u – 3 modifiers (-alu variant);
file1 and dir1 are arguments;
& - sign indicates the background execution of the team.
# - after this sign is a remark string (for script notation)

All these elements are **lexemes** of the command.

Space, Tab, NewLine - **separators** between lexemes.

Name and path of the file (or directory)

Files are identified by name. These names usually somehow reflect the content.
File names can contain any characters (except the slash “/” character) and are limited to **255 characters** in length.
Importantly, all file and command names are **case sensitive**.
File names can contain a dot at any position, for example, the name "..." is acceptable.
Files starting with a dot is **hidden** in UNIX and are not used in many commands without special instructions (compare $ ls ; ls -a).
UNIX systems have a standard File System Hierarchy (**FSH**) directory structure.
FSH is a directory tree starting with the root directory “/”.
Each user has his own separate directory (specified in the /etc/passwd file) as his **home directory**. ($ more /etc/passwd)
Usually the user's home directory is under the /home directory and is called the username, for example /home/student.
At the initial login, your home directory automatically becomes your **working directory**.
You can access a file through its **absolute name**, or, based on your location, through a **relative name**.

The following **synonyms** can be used for directories:
~ (tilde)- home,
. (dot) - current
.. (dot-dot) - parent directories.
Example,

```
$ cd /home/student     # absolute name
$ cd abc # relative name
$ cd ˜/bin          # relative name
$ cd ../../usr/sbin          # relative name
```

To read/write/execute commands and move to some directories, you must have permissions.
Example,

```
$ cd /root          # Testing “Permissions denied” message
```

File (Directory) Name Generation.

The following **wildcards** can be used for file/directories name generation:
? - any non-empty character in the given position of the template, For example, *.??? - all files ending with a “dot and three symbol”;
***** - any number of allowed characters, including empty. For example, * - all files except those starting with a period;
[list-range] - any one of the characters specified in the list or range, for example: [-abk3] or [A-Za-z0-9_];
[^ list-range] - any of the characters not specified in the list, for example: [^ -abk3] or [^ A-Za-z0-9_].

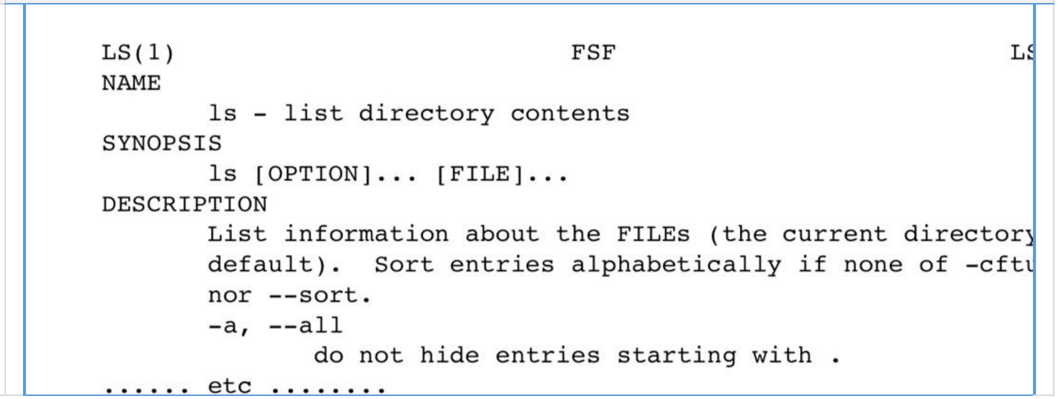
USE THE MAN, INFO, HELP.

Every UNIX has manual pages. The man help system contains documentation for various system commands, resources, and configuration files.

The UNIX Reference Manual contains 8 sections:	The description of the command consists of the following sections:

Commands;
System calls;
Subroutines;
Special files - descript. sys-files;
File format and convention;
Games;
Macro packages and language conventions;
Administrator commands and procedures.
	NAME- name and function;
	SYNOPSIS- syntax;
	DESCRIPTION- description of the function;
	OPTIONS- description of options;
	SEE ALSO- related teams;
	FILE- used files;
	DIAGNOSTIC- answers to errors;
	BUGS- noticed incorrectness;
	IMPLEMENTATION - who did it.

Navigation Commands in man:	Man call:
<q> - exit from the manual (quit); <space>, <f>, <number> - scrolling forward (forward); <b> - scrolling the manual back (back); </pattern> - search (search) for the pattern forward; </> - search by the previous pattern of the next coincidence; <?> - search by the previous template of the previouscoincidences.	Use man [i] <name> where i is the section number, if i is omitted, i = 1 is implied; <name> is the name of the command. For example, $ man ls

Exercises 1. Testing:
$ man man
$ man 7 signal
$ man passwd
$ man 5 passwd
Exercises 2. Learn commands yourself:
apropos, help info, whatis, whereis, type.
	

```
LS(1)                           FSF                              LS
NAME
       ls - list directory contents
SYNOPSIS
       ls [OPTION]... [FILE]...
DESCRIPTION
       List information about the FILEs (the current directory
       default).  Sort entries alphabetically if none of -cftu
       nor --sort.
       -a, --all
              do not hide entries starting with .
...... etc ........
```

SYSTEM COMMANDS.

Exercises. You must learn and use the following system commands yourself:
$ who; whoami; id, uname; date; clear; ps; df; banner; cal; bc; echo
Table 1. Examples of using system commands. Fill in the table and add it to your Report Table 1.
Note 1. To save space, several logically related commands are written compact on one line and divided (;)

Nr	Commands	Your short interpretation of command string (odd commands Nr for odd Variant Nr; even commands Nr for even Variant Nr)
1	who –m	
2	whoami	
3	who -q	
4	who -l	
5	id; id –u; id –un	
6	id; id –g; id –gn; id –G	
7	uname; uname –s	
8	uname; uname –v	
9	uname –v	
10	uname –i	
11	date +%d%m%Y; date +%s	
12	date +%A; date +%H%M\ %p	
13	clear; ps;	
14	ps –aux	
15	df /dev/sda1	
16	clear; df;	
17	banner `date +%Y`	
18	banner `two words`	
19	cal; cal –y; cal –y 1	
20	cal; cal –y 9999; cal -j	

For Linux funs.

```
$ echo ”1234567890^1234”| bc
$ echo ”scale=10; 4*a(1)” | bc -l
$ echo ”scale=1000; 4*a(1)” | bc -l
$ echo ”scale=10000; 4*a(1)” | bc –l   # calculate very LONG time !!
```

Note. The bc calculator supports up to **23,860,929 significant digits** (applause for UNIX). To exit the calculator, use the quit comman

DIRECTORY COMMANDS.

Exercises. You must learn and use the following directory commands yourself:
$ pwd; cd; ls; mkdir; rmdir; rm; mv; ln; ln -s; du; type

Table 2. Examples of using directory commands. Fill in the table and add it to your Report Table 2.
Note 1. To save space, several logically related commands are written compact on one line and divided (;)

Nr	Commands	Your short interpretation of command string (odd commands Nr for odd Variant Nr; even commands Nr for even Variant Nr)
1	pwd	
2	cd /; pwd	
3	cd ~; pwd	
4	cd /home/vasja; pwd	
5	cd ../../usr; pwd	
6	cd; pwd	
7	ls; ls –u; ls –t;	
8	ls –l; ls –i; ls –a;	
9	ls –d; ls –r; ls –R; ls -F	
10	mkdir ~/letters	
11	cd ~/letters; pwd	
12	mkdir a b c; ls	
13	rmdir a; cd c; pwd; rmdir ../b	
14	cd; rm –r letters	
15	mkdir a b c; ls –il	
16	ln –s a e; ls –il	
17	mv c a; ls –il; ls –l a	
18	cd ~ ;du	
19	cd ~; du –a; du –a /	
20	cd ~; rm –r *	

FILE COMMANDS.

Exercises. You must learn and use the following file commands yourself:
$ touch; cat; cp; mv; rm; more; tail; head; ls; ln; file; type; find

Table 3. Examples of using file commands. Fill in the table and add it to your Report Table 3.

Nr	Commands	Your short interpretation of command string (odd commands Nr for odd Variant Nr; even commands Nr for even Variant Nr)
1	touch leter0	
2	> letter1 <Ctrl>+<D>	
3	cat > letter2 <Ctrl>+<D>	
4	cat letter1	
5	more letter1 letter2	
6	pr letter2	
7	cp /etc/passwd .	
8	tail passwd	For example. Show the last lines of the passwd file (10 lines by default)
9	tail +20 passwd	For example. Show the last 20 lines of the passwd file
10	head passwd	
11	head –5 passwd	
12	cat > masha	
13	ln masha dasha; ls –il masha dasha	
14	rm masha; ls –il	
15	ls –il	
16	ln –s dasha masha; ls –il	
17	rm dasha; ls –il	
18	cp letter1 dasha; ls -il	
19	file masha dasha	
20	file passwd	
21	file /usr/bin/sh .. letter0	
22	type file; type *	
23	find / -name passwd	
24	find ~ -size 10	
25	find / -perm 4000	

26	find /usr -type d	
27	find / –user vasja; find / print	
28	find / -group root –user 0	
29	find . –mtime –7 -exec ls –l {} \;	
30	find /home -name *.bak -exec rm {} \;	

CREATE A BASH-SCRIPT REPORT-VN.

Install **tree** package on your Linux Virtual Machine in the classroom or at home.

Login as a student. Use the **sudo apt install tree** command to install tree package on your system. Test tree command work ($ tree /)

Create script-file report-vN (use **nano** or **vi** or **mc-editor**).

The report-vN creates your version (vN = Your Variant Nr) of the directory-file structure and performs the following actions:
On your home directory makes directory vN (**mkdir**).
On directory vN makes sub-directory structure a, b, c, aa, bb, cc (**mkdir**).
Creates a file f1 containing your Last Name and First Name (**echo**> f1).
Creates a calendar for the year and month of your birth, the result is written to the file f2 (**cal**> f2).
Combines the received files f1 and f2, and writes the result to the file f3 (**cat** f1 f2> f3).
Creates a hard link f4 to the file f3 (**ln** f3 f4).
Counts the number of lines, words, characters in the file f2, and the result is written to the file f5 (**wc** f2> f5)

Make report-vN executable (**chmod**). To run report-vN, use (**./**):

```
$ chmod +x report-vN
$ ./report-vN
```

Recursively delete invalid files and directories with the command **rm**:

```
$ rm -rf vN
```

Make sure that the structure you created matches the task (**ls** -R or **tree**):

```
$ tree vN
```

Add a report-vN script content to the report: (make a Screenshot 3)

```
$ cat report-vN
```

Add a screenshot of the tree command output to the report: (make a Screenshot 4).

```
$ tree vN
```