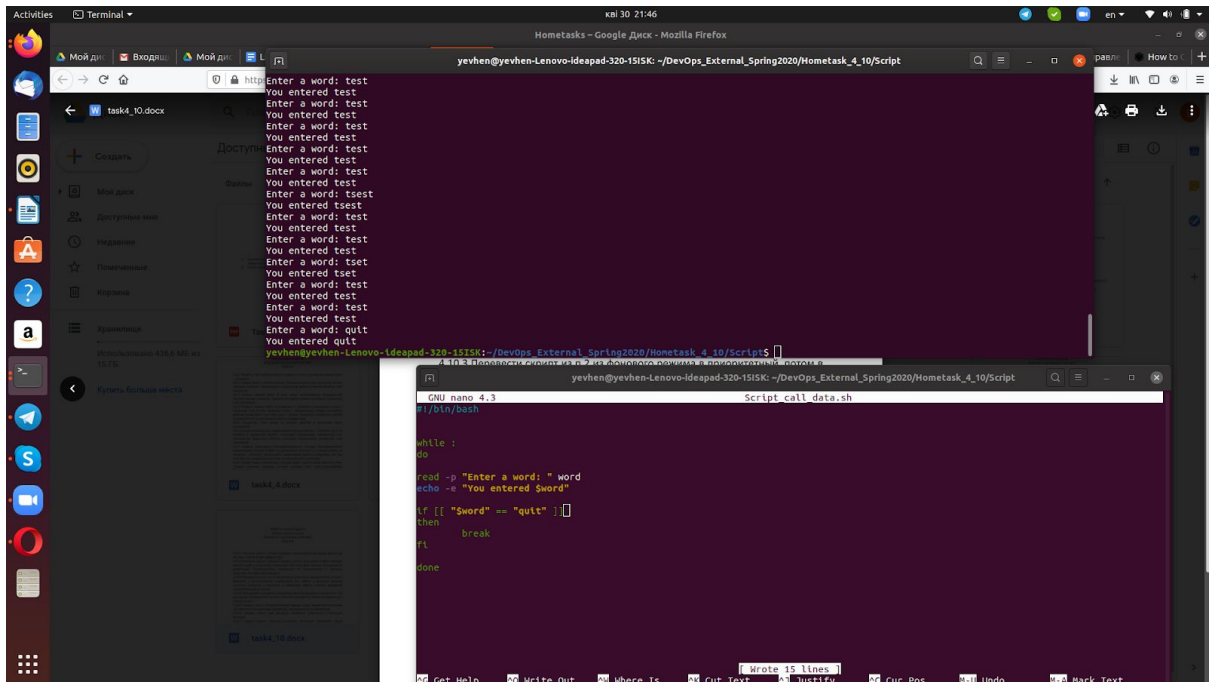


Linux Essentials with Bash Programming

1. Create script that call data before word quit will be enter

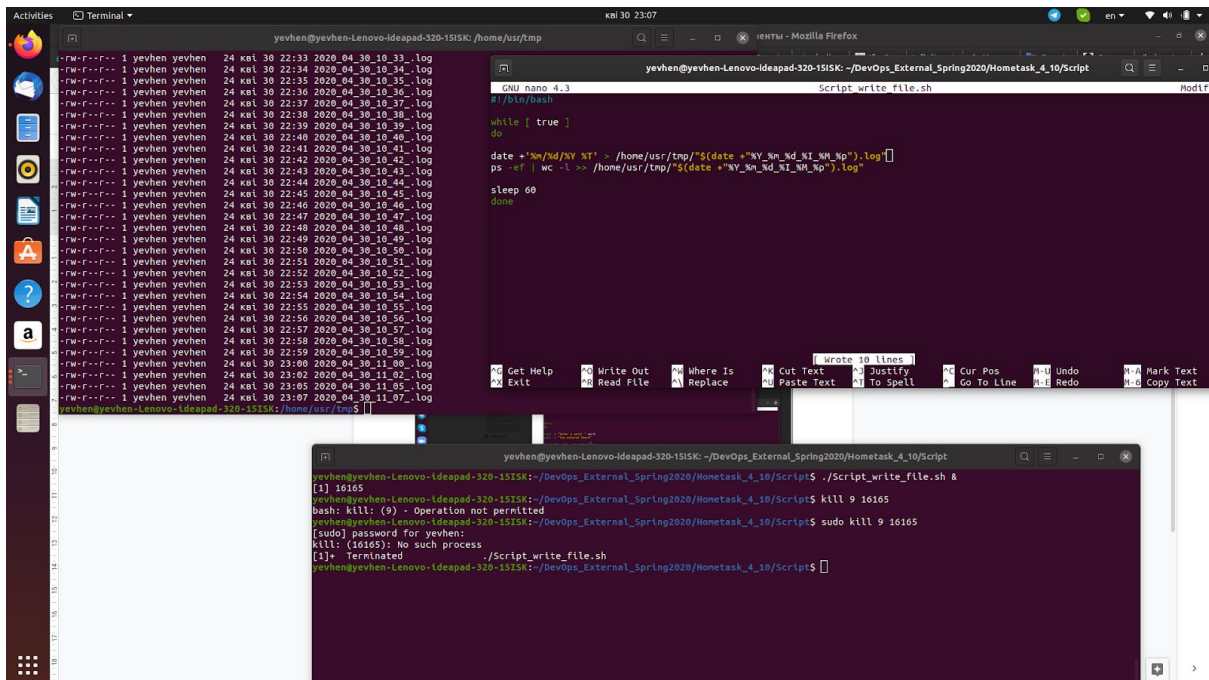


The screenshot shows a Linux desktop environment. In the background, a web browser displays a page with a form that repeatedly prompts "Enter a word: test". In the foreground, a terminal window shows the execution of a script named `Script_call_data.sh`. The script uses a `while` loop to read input from the user and echo it back. The input "test" is entered multiple times, and the script continues to prompt for input until "quit" is entered.

```
#!/bin/bash

while :
do
    read -p "Enter a word: " word
    echo -e "You entered $word"
    if [[ "$word" == "quit" ]]
    then
        break
    fi
done
```

2. Create script that every minute write current time and date with count of process into file in /home/usr/tmp, in background mode



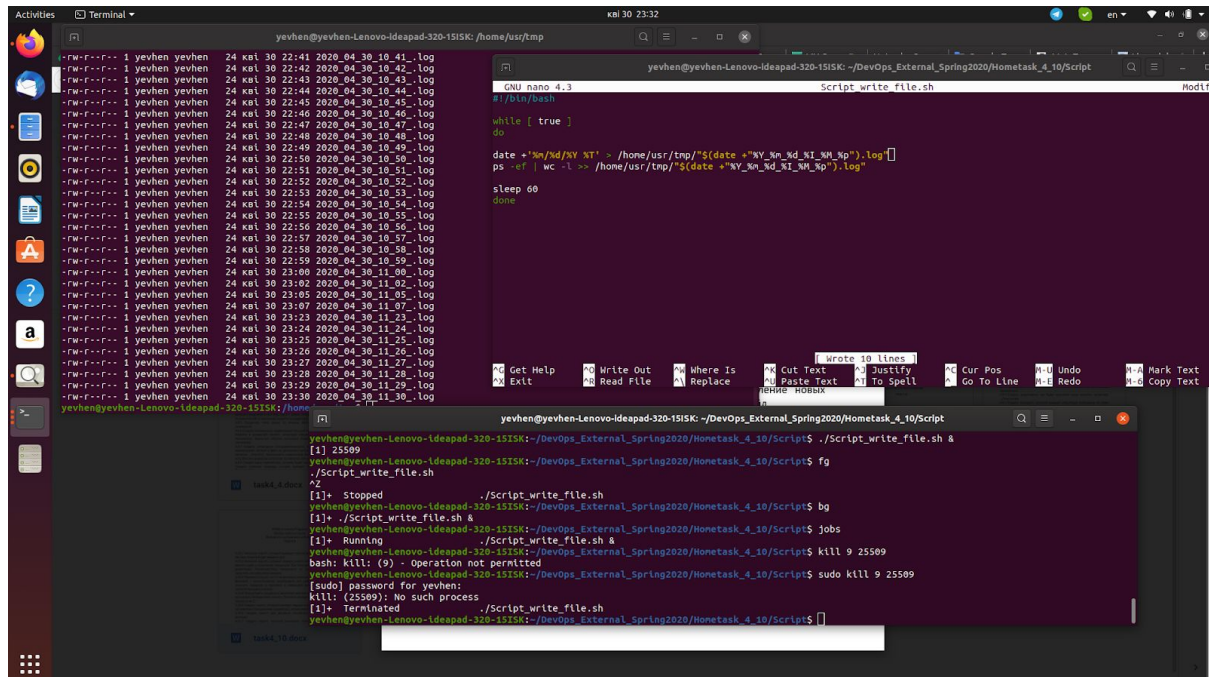
The screenshot shows a Linux desktop environment. In the background, a terminal window displays the output of a script named `Script_write_file.sh`. The script uses a `while` loop to write the current date and time, along with the count of processes, to a file in `/home/usr/tmp`. The output shows a series of log entries with timestamps and process counts. In the foreground, another terminal window shows the execution of the script using `./Script_write_file.sh &`, followed by `kill 9 16165` to terminate the background process. The output shows the process being terminated and the script being run again.

```
#!/bin/bash

while [ true ]
do
    date +"%m/%d/%Y %T" > /home/usr/tmp/"$(date +"%Y_%m_%d_%H_%M_%S").log"
    ps -ef | wc -l >> /home/usr/tmp/"$(date +"%Y_%m_%d_%H_%M_%S").log"
    sleep 60
done
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$ ./Script_write_file.sh &
[1] 16165
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$ kill 9 16165
bash: kill: (9) - Operation not permitted
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$ sudo kill 9 16165
[sudo] password for yevhen:
kill: (16165): no such process
[1]+  Terminated                  ./Script_write_file.sh
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$
```

3. Make that script from background to the priority mode, than in background with stop and renew to the background mode, show information about that script. Finish work.



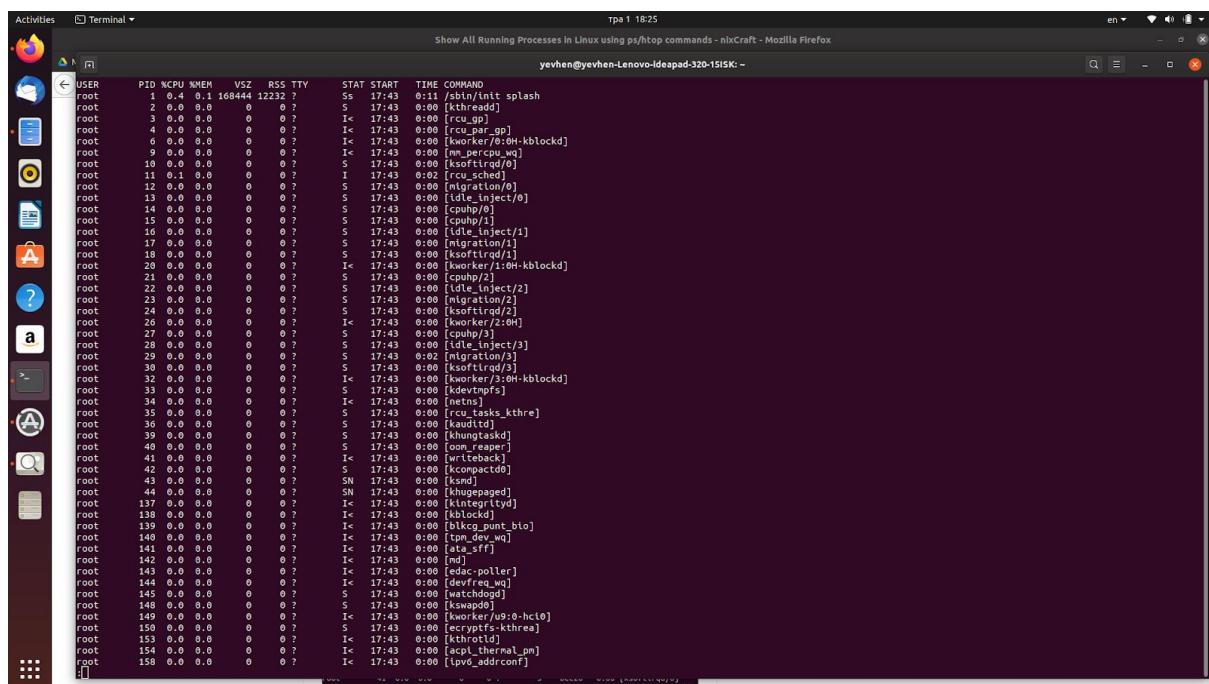
```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/home/usr/tmp
24 kat 30 22:41 2020_04_30_10_41_log
24 kat 30 22:42 2020_04_30_10_42_log
24 kat 30 22:43 2020_04_30_10_43_log
24 kat 30 22:44 2020_04_30_10_44_log
24 kat 30 22:45 2020_04_30_10_45_log
24 kat 30 22:46 2020_04_30_10_46_log
24 kat 30 22:47 2020_04_30_10_47_log
24 kat 30 22:48 2020_04_30_10_48_log
24 kat 30 22:49 2020_04_30_10_49_log
24 kat 30 22:50 2020_04_30_10_50_log
24 kat 30 22:51 2020_04_30_10_51_log
24 kat 30 22:52 2020_04_30_10_52_log
24 kat 30 22:53 2020_04_30_10_53_log
24 kat 30 22:54 2020_04_30_10_54_log
24 kat 30 22:55 2020_04_30_10_55_log
24 kat 30 22:56 2020_04_30_10_56_log
24 kat 30 22:57 2020_04_30_10_57_log
24 kat 30 22:58 2020_04_30_10_58_log
24 kat 30 22:59 2020_04_30_10_59_log
24 kat 30 23:00 2020_04_30_11_00_log
24 kat 30 23:02 2020_04_30_11_02_log
24 kat 30 23:05 2020_04_30_11_05_log
24 kat 30 23:07 2020_04_30_11_07_log
24 kat 30 23:23 2020_04_30_11_23_log
24 kat 30 23:24 2020_04_30_11_24_log
24 kat 30 23:25 2020_04_30_11_25_log
24 kat 30 23:26 2020_04_30_11_26_log
24 kat 30 23:27 2020_04_30_11_27_log
24 kat 30 23:28 2020_04_30_11_28_log
24 kat 30 23:29 2020_04_30_11_29_log
24 kat 30 23:30 2020_04_30_11_30_log

yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/home/usr/tmp
GNU nano 4.3
#!/bin/bash
while [ true ]
do
date +"%m/%d/%Y NT" > /home/usr/tmp/"$(date +"%Y_%m_%d_%H_%M_%S").log"
ps -ef | wc -l >> /home/usr/tmp/"$(date +"%Y_%m_%d_%H_%M_%S").log"
sleep 60
done

yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/home/usr/tmp
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$ ./Script_write_file.sh &
[1] 25509
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$ fg
./Script_write_file.sh
^Z
[1]+  Stopped                  ./Script_write_file.sh
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$ bg
[1]+  ./Script_write_file.sh &
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$ jobs
[1]+  Running                  ./Script_write_file.sh &
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$ kill 9 25509
bash: kill: (9)  Operation not permitted
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$ sudo kill 9 25509
[sudo] password for yevhen:
kill: (25509): No such process
[1]+  Terminated              ./Script_write_file.sh
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spring2020/Hometask_4_10/Script$
```

4. Show process in real time, how much memories does that process take, change priority for that process low on 2 points.

ps aux | less



```
USER      PID  PPID  CPU  MEM  VSZ  RSS  TTY  STAT  START  TIME  COMMAND
root      1    0    0.0  0.0  0 0 0  Ss   17:43  0:11  /sbin/init splash
root      2    0    0.0  0.0  0 0 0  S    17:43  0:00  [kthreadd]
root      3    0    0.0  0.0  0 0 0  S    17:43  0:00  [rcu_gp]
root      4    0    0.0  0.0  0 0 0  S    17:43  0:00  [rcu_par_gp]
root      6    0    0.0  0.0  0 0 0  S    17:43  0:00  [kworker/0:0H-kblockd]
root      9    0    0.0  0.0  0 0 0  S    17:43  0:00  [mm_percpu_wq]
root     10    0    0.0  0.0  0 0 0  S    17:43  0:00  [ksftirqd/0]
root     11    0    0.1  0.0  0 0 0  S    17:43  0:02  [rcu_sched]
root     12    0    0.0  0.0  0 0 0  S    17:43  0:00  [migration/0]
root     13    0    0.0  0.0  0 0 0  S    17:43  0:00  [idle_inject/0]
root     14    0    0.0  0.0  0 0 0  S    17:43  0:00  [cpuhp/0]
root     15    0    0.0  0.0  0 0 0  S    17:43  0:00  [cpuhp/1]
root     16    0    0.0  0.0  0 0 0  S    17:43  0:00  [idle_inject/1]
root     17    0    0.0  0.0  0 0 0  S    17:43  0:00  [migration/1]
root     18    0    0.0  0.0  0 0 0  S    17:43  0:00  [ksftirqd/1]
root     20    0    0.0  0.0  0 0 0  S    17:43  0:00  [kworker/1:0H-kblockd]
root     21    0    0.0  0.0  0 0 0  S    17:43  0:00  [cpuhp/2]
root     22    0    0.0  0.0  0 0 0  S    17:43  0:00  [idle_inject/2]
root     23    0    0.0  0.0  0 0 0  S    17:43  0:00  [migration/2]
root     24    0    0.0  0.0  0 0 0  S    17:43  0:00  [ksftirqd/2]
root     26    0    0.0  0.0  0 0 0  S    17:43  0:00  [kworker/2:0H]
root     27    0    0.0  0.0  0 0 0  S    17:43  0:00  [cpuhp/3]
root     28    0    0.0  0.0  0 0 0  S    17:43  0:00  [idle_inject/3]
root     29    0    0.0  0.0  0 0 0  S    17:43  0:02  [migration/3]
root     30    0    0.0  0.0  0 0 0  S    17:43  0:00  [ksftirqd/3]
root     32    0    0.0  0.0  0 0 0  S    17:43  0:00  [kworker/3:0H-kblockd]
root     33    0    0.0  0.0  0 0 0  S    17:43  0:00  [kdevtmpfs]
root     34    0    0.0  0.0  0 0 0  S    17:43  0:00  [netns]
root     35    0    0.0  0.0  0 0 0  S    17:43  0:00  [rcu_tasks_kthre]
root     36    0    0.0  0.0  0 0 0  S    17:43  0:00  [kauditd]
root     39    0    0.0  0.0  0 0 0  S    17:43  0:00  [khungtaskd]
root     40    0    0.0  0.0  0 0 0  S    17:43  0:00  [oom_reaper]
root     41    0    0.0  0.0  0 0 0  S    17:43  0:00  [writeback]
root     42    0    0.0  0.0  0 0 0  S    17:43  0:00  [kcompactd0]
root     43    0    0.0  0.0  0 0 0  S    17:43  0:00  [ksmd]
root     44    0    0.0  0.0  0 0 0  S    17:43  0:00  [khugepaged]
root     127    0    0.0  0.0  0 0 0  S    17:43  0:00  [kintegrityd]
root     138    0    0.0  0.0  0 0 0  S    17:43  0:00  [kblockd]
root     139    0    0.0  0.0  0 0 0  S    17:43  0:00  [blkcg_punt_bio]
root     140    0    0.0  0.0  0 0 0  S    17:43  0:00  [tpm_dev_wq]
root     141    0    0.0  0.0  0 0 0  S    17:43  0:00  [ata_sff]
root     142    0    0.0  0.0  0 0 0  S    17:43  0:00  [nd]
root     143    0    0.0  0.0  0 0 0  S    17:43  0:00  [edac-poller]
root     144    0    0.0  0.0  0 0 0  S    17:43  0:00  [devfreq_wq]
root     145    0    0.0  0.0  0 0 0  S    17:43  0:00  [watchdogd]
root     148    0    0.0  0.0  0 0 0  S    17:43  0:00  [kswapd0]
root     149    0    0.0  0.0  0 0 0  S    17:43  0:00  [kworker/uq:0-hct0]
root     150    0    0.0  0.0  0 0 0  S    17:43  0:00  [ecryptfs_kthre]
root     153    0    0.0  0.0  0 0 0  S    17:43  0:00  [kthrotld]
root     154    0    0.0  0.0  0 0 0  S    17:43  0:00  [acpi_thermal_pn]
root     158    0    0.0  0.0  0 0 0  S    17:43  0:00  [lpvd_addrconf]
```


A terminal window on a Linux system. The user runs `ps -o pid,comm,pri,nice -p $(pgrep firefox)`, showing Firefox processes with priority 19 and nice value 0. Then, the user runs `sudo renice 2 -p 11774`, changing the priority of process 11774 to 2. A second `ps` command shows the updated priority and nice value.

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ ps -o pid,comm,pri,nice -p $(pgrep firefox)
PID COMMAND      PRI NI
11774 firefox      19  0
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ sudo renice 2 -p 11774
11774 (process ID) old priority 0, new priority 2
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ ps -o pid,comm,pri,nice -p $(pgrep firefox)
PID COMMAND      PRI NI
11774 firefox      17  2
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$
```

5. Create script that return square numbers absolutely from count

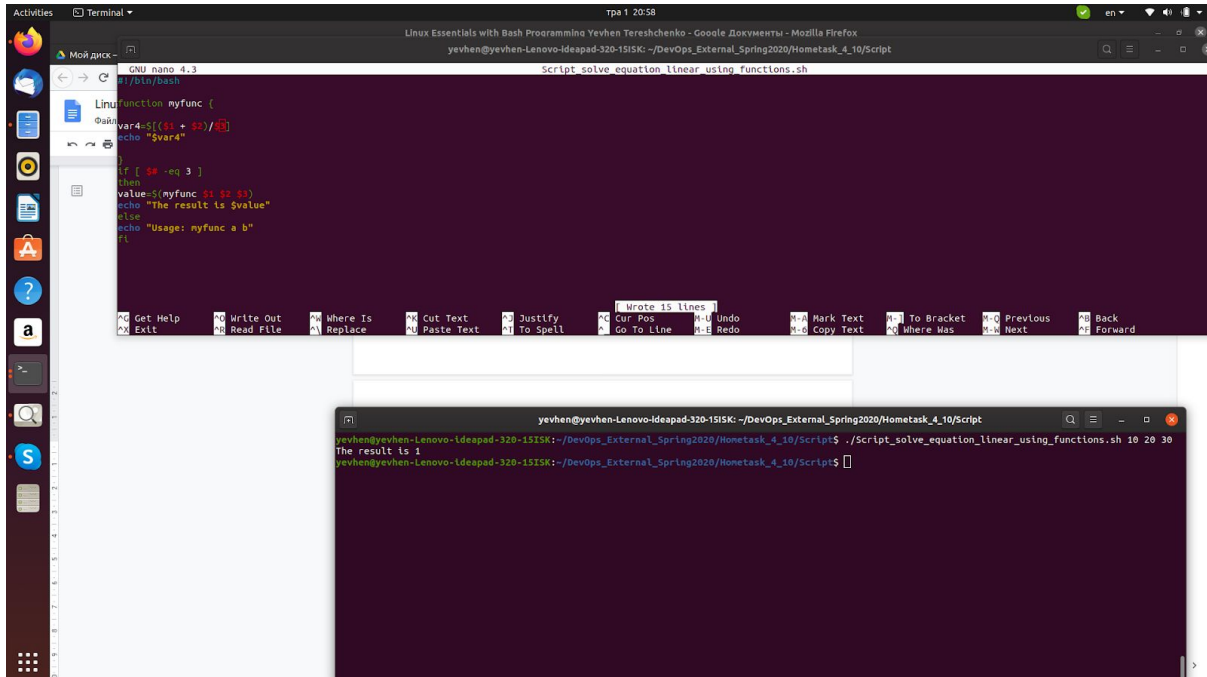
A terminal window showing the execution of a script `Script_count_square.sh` with arguments 1, 2, 3, 4, 5. The script outputs the squares of these numbers. Below, another terminal window shows the script's contents, which include a loop to calculate squares and a function to write the results to a file.

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$ ./Script_count_square.sh 1 2 3 4 5
Square of 1 = 1
Square of 2 = 4
Square of 3 = 9
Square of 4 = 16
Square of 5 = 25
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$

yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$ ls -la
total 20
drwxr-xr-x 2 yevhen yevhen 4096 tpa 1 20:22 .
drwxr-xr-x 3 yevhen yevhen 4096 kai 30 20:58 ..
-rwxr-xr-x 1 yevhen yevhen 133 kai 30 21:17 Script_call_data.sh
-rwxr-xr-x 1 yevhen yevhen 88 tpa 1 20:06 Script_count_square.sh
-rwxr-xr-x 1 yevhen yevhen 185 kai 30 23:03 Script_write_file.sh
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$ cat Script_count_square.sh
#!/bin/bash

while [ -n "$1" ]
do
var=$((1*$1))
echo "Square of $1 = $var"
shift
done
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~/DevOps_External_Spring2020/Hometask_4_10/Script$
```

6. Create script that solve linear equation using functions



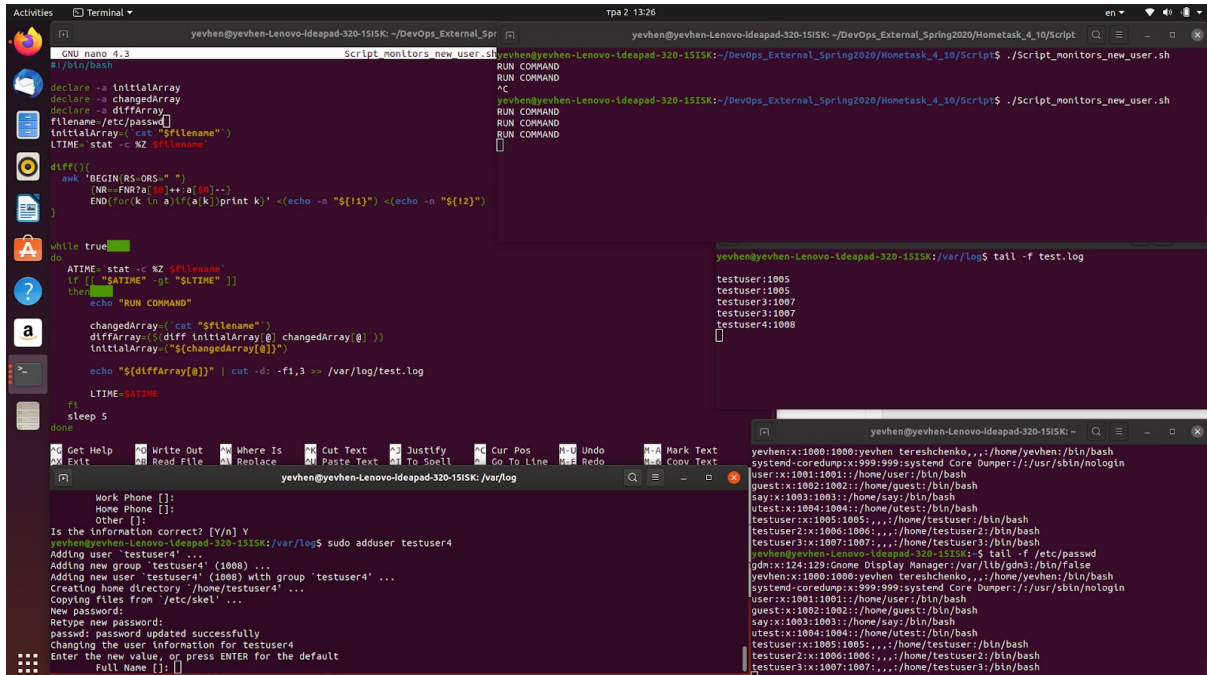
The screenshot shows a terminal window with a script named `Script_solve_equation_linear_using_functions.sh` being edited in `nano`. The script defines a function `myfunc` that takes two arguments, `a` and `b`, and calculates the value of $4a + 3b$. It then calls `myfunc` with `1` and `2`, and prints the result. The terminal output shows the script being executed and the result `10` being printed.

```
#!/bin/bash

function myfunc {
    local a=$1
    local b=$2
    echo "The result is $(4*a + 3*b)"
}

myfunc 1 2
echo "Usage: myfunc a b"
```

7. Create script that regularly monitors the emergence of new users and write them logins and uid into log file



The screenshot shows a terminal window with a script named `Script_monitors_new_user.sh` being edited in `nano`. The script uses `diff` to compare the current state of the `/etc/passwd` file with a previous state stored in `initialArray`. It then uses `tail -f` to monitor the `/var/log/test.log` file for new users. The terminal output shows the script being executed and the result `10` being printed.

```
#!/bin/bash

declare -a initialArray
declare -a changedArray
filename="/etc/passwd"
initialArray=(cat "$filename")
LTIME=$(stat -c %Z "$filename")

diff() {
    local i=0
    while true; do
        LTIME=$(stat -c %Z "$filename")
        if [ "$LTIME" -gt "$LTIME" ]; then
            echo "RUN COMMAND"
            changedArray=(cat "$filename")
            diffArray=(diff initialArray "$changedArray")
            initialArray=(cat "$changedArray")
            echo "${diffArray[@]}" | cut -d: -f1,3 >> /var/log/test.log
            LTIME=$LTIME
            sleep 5
        fi
    done
}
```

```
Activities Terminal tpa 2 13:51 en
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spr
GNU nano 4.3 Script monitors new user.sh
#!/bin/bash
declare -a intialArray
declare -a changedArray
filename=/etc/passwd
intialArray=(cat "$filename")
LTIME=stat -c %Z "$filename"

diff() {
    awk 'BEGIN{RS=ORS=" "}
    (NR--FNR?A[0]++:A[0]--){
        END{for(k in A){print k} <(echo -n "${11}") <(echo -n "${12}")
    }

while true
do
    ATIME=stat -c %Z "$filename"
    if [[ "$SATIME" != "$LTIME" ]]
    then
        echo "RUN COMMAND"

        changedArray=(cat "$filename")
        diffArray=(diff intialArray[@] changedArray[@])
        intialArray=( "${changedArray[@]}" )

        echo "${diffArray[@]}" | cut -d: -f1,3 >> /var/log/test.log

        LTIME=$ATIME

    fi
    sleep 30
done

Get Help Write Out Where Is Cut Text Justify Cur Pos Undo Mark Text
Exit Read File Replace Paste Text Go To Line Redo Coov Text

Adding new group 'testuser101' (1005) ...
Adding new user 'testuser101' (1005) with group 'testuser101' ...
Creating home directory '/home/testuser101' ...
Copying files from '/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for testuser101
Enter the new value, or press ENTER for the default
Full Name []:
Room Number []:
Work Phone []:
Home Phone []:
Other []:
Is the information correct? [Y/n] Y
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: /var/log$
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: /var/log
testuser:1005
testuser2:1006
testuser3:1007
testuser4:1008
testuser5:1009
utest:1004
say:1003
testuser:1003
testuser:1003
testuser:1003
testuser:1003
testuser100:1004
testuser101:1005
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~
kernoops:x:114:65534:Kernel Oops Tracking Daemon,,,:/usr/sbin/nologin
avahi:x:115:121:Avahi mDNS daemon,,,:/var/run/avahi-daemon:/usr/sbin/nologin
saned:x:116:122:/var/lib/saned:/usr/sbin/nologin
nn-ovpn:x:117:123:NetworkManager OpenVPN,,,:/var/lib/ovpn/chroot:/usr/sbin
/nologin
whoopsie:x:118:124:/nonexistent:/bin/false
colord:x:119:125:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/no
login
hplip:x:120:7:HPLIP system user,,,:/var/run/hplip:/bin/false
geoclue:x:121:126:/var/lib/geoclue:/usr/sbin/nologin
pulse:x:122:127:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologin
gnome-initial-setup:x:123:65534:/run/gnome-initial-setup:/bin/false
gdm:x:124:129:Gnome Display Manager:/var/lib/gdm3:/bin/false
yevhen:x:1000:1000:yevhen tereshchenko,,:/home/yevhen:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:./usr/sbin/nologin
user:x:1001:1001:/home/user:/bin/bash
guest:x:1002:1002:/home/guest:/bin/bash
testuser:x:1003:1003:./home/testuser:/bin/bash
testuser100:x:1004:1004:./home/testuser100:/bin/bash
testuser101:x:1005:1005:./home/testuser101:/bin/bash
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~$
```

```
Activities Terminal tpa 2 13:52 en
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~/DevOps_External_Spr
GNU nano 4.3 Script monitors new user.sh
#!/bin/bash
declare -a intialArray
declare -a changedArray
filename=/etc/passwd
intialArray=(cat "$filename")
LTIME=stat -c %Z "$filename"

diff() {
    awk 'BEGIN{RS=ORS=" "}
    (NR--FNR?A[0]++:A[0]--){
        END{for(k in A){print k} <(echo -n "${11}") <(echo -n "${12}")
    }

while true
do
    ATIME=stat -c %Z "$filename"
    if [[ "$SATIME" != "$LTIME" ]]
    then
        echo "RUN COMMAND"

        changedArray=(cat "$filename")
        diffArray=(diff intialArray[@] changedArray[@])
        intialArray=( "${changedArray[@]}" )

        echo "${diffArray[@]}" | cut -d: -f1,3 >> /var/log/test.log

        LTIME=$ATIME

    fi
    sleep 30
done

Get Help Write Out Where Is Cut Text Justify Cur Pos Undo Mark Text
Exit Read File Replace Paste Text Go To Line Redo Coov Text

New password:
Retype new password:
passwd: password updated successfully
Changing the user information for testuser101
Enter the new value, or press ENTER for the default
Full Name []:
Room Number []:
Work Phone []:
Home Phone []:
Other []:
Is the information correct? [Y/n] Y
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: /var/log$ sudo deluser testuser100
Removing user 'testuser100' ...
Warning: group 'testuser100' has no more members.
Done.
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: /var/log$
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: /var/log
testuser2:1006
testuser3:1007
testuser4:1008
testuser5:1009
utest:1004
say:1003
testuser:1003
testuser:1003
testuser:1003
testuser:1003
testuser100:1004
testuser101:1005
testuser100:1004
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~
false
kernoops:x:114:65534:Kernel Oops Tracking Daemon,,,:/usr/sbin/nologin
avahi:x:115:121:Avahi mDNS daemon,,,:/var/run/avahi-daemon:/usr/sbin/nologin
saned:x:116:122:/var/lib/saned:/usr/sbin/nologin
nn-ovpn:x:117:123:NetworkManager OpenVPN,,,:/var/lib/ovpn/chroot:/usr/sbin
/nologin
whoopsie:x:118:124:/nonexistent:/bin/false
colord:x:119:125:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/no
login
hplip:x:120:7:HPLIP system user,,,:/var/run/hplip:/bin/false
geoclue:x:121:126:/var/lib/geoclue:/usr/sbin/nologin
pulse:x:122:127:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologin
gnome-initial-setup:x:123:65534:/run/gnome-initial-setup:/bin/false
gdm:x:124:129:Gnome Display Manager:/var/lib/gdm3:/bin/false
yevhen:x:1000:1000:yevhen tereshchenko,,:/home/yevhen:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:./usr/sbin/nologin
user:x:1001:1001:/home/user:/bin/bash
guest:x:1002:1002:/home/guest:/bin/bash
testuser:x:1003:1003:./home/testuser:/bin/bash
testuser101:x:1005:1005:./home/testuser101:/bin/bash
yevhen@yevhen-Lenovo-Ideapad-320-15ISK: ~$
```