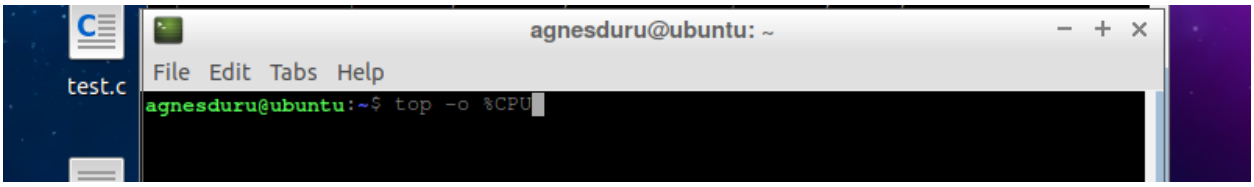
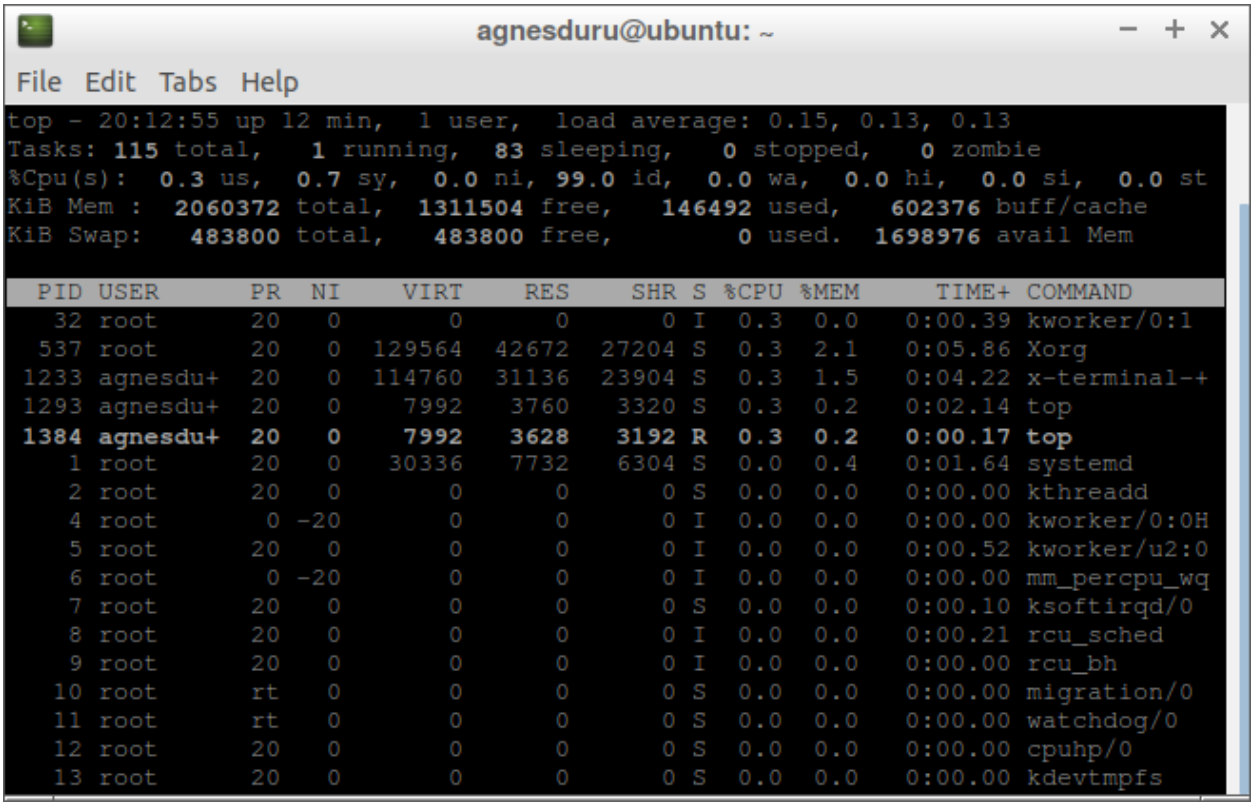
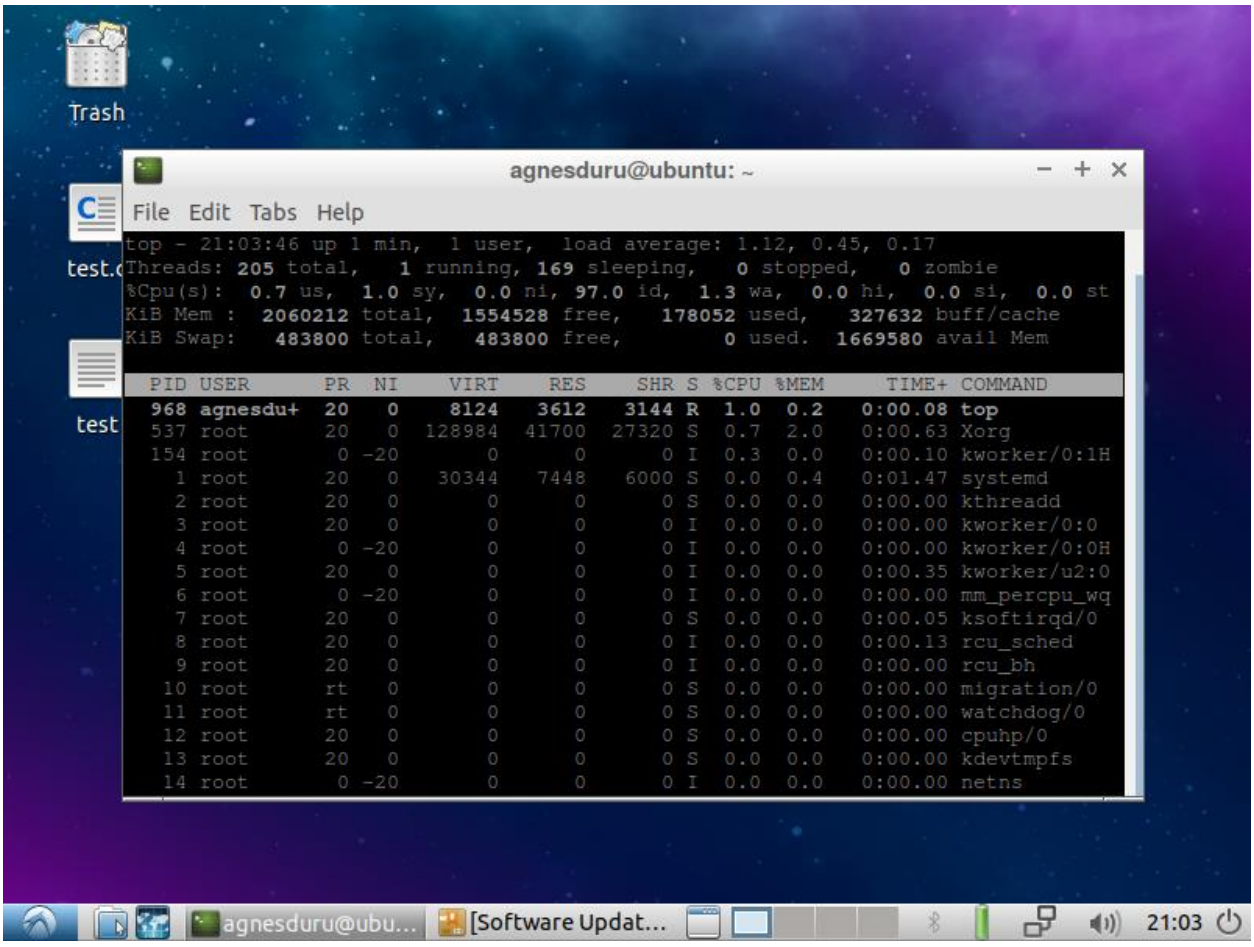
Agnes Duru 3/26/2020

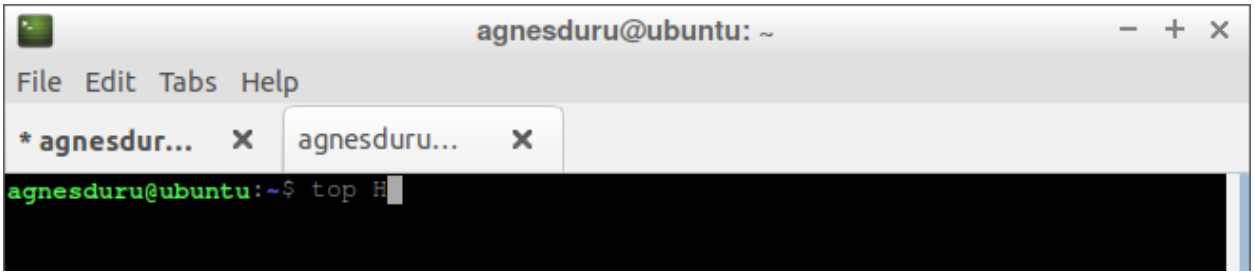
Operating Systems Assignment #2- Programming Part

- Part 1 – Explore you VM or Linux-Based Machine
    - a. Processes and Threads currently running: Task/ Processes : 115 and Threads: 205

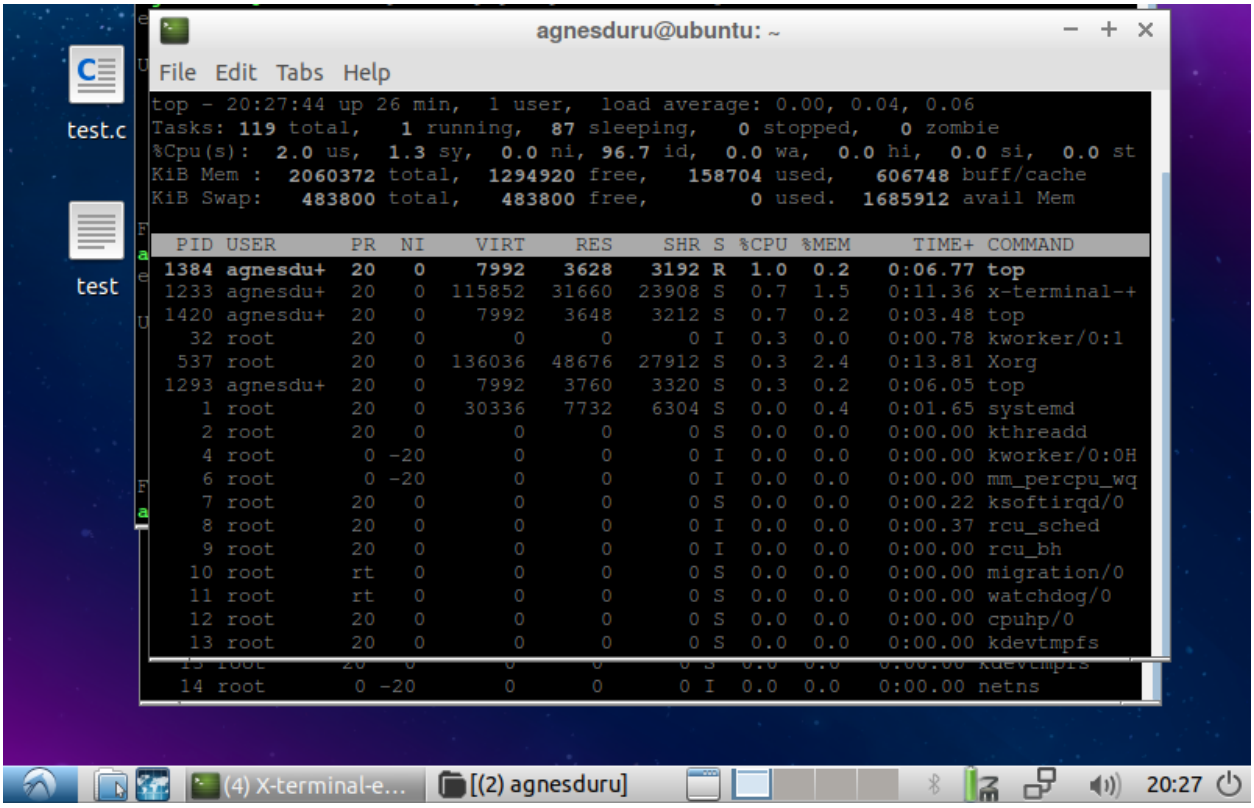




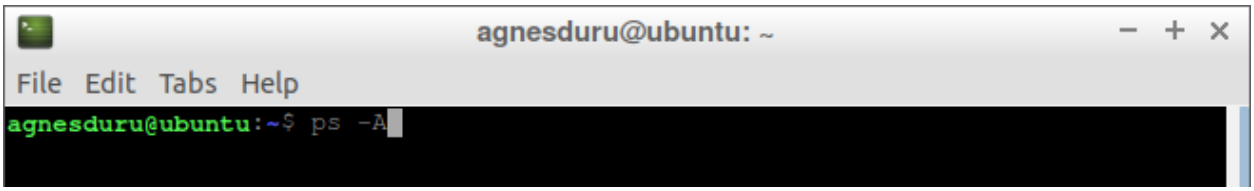

Trash
test.c
test
agnesduru@ubuntu: ~
File Edit Tabs Help
top - 21:03:46 up 1 min, 1 user, load average: 1.12, 0.45, 0.17
Threads: 205 total, 1 running, 169 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.7 us, 1.0 sy, 0.0 ni, 97.0 id, 1.3 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 2060212 total, 1554528 free, 178052 used, 327632 buff/cache
KiB Swap: 483800 total, 483800 free, 0 used. 1669580 avail Mem
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
968 agnesdu+ 20 0 8124 3612 3144 R 1.0 0.2 0:00.08 top
537 root 20 0 128984 41700 27320 S 0.7 2.0 0:00.63 Xorg
154 root 0 -20 0 0 0 I 0.3 0.0 0:00.10 kworker/0:1H
1 root 20 0 30344 7448 6000 S 0.0 0.4 0:01.47 systemd
2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd
3 root 20 0 0 0 0 I 0.0 0.0 0:00.00 kworker/0:0
4 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/0:0H
5 root 20 0 0 0 0 I 0.0 0.0 0:00.35 kworker/u2:0
6 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 mm_percpu_wq
7 root 20 0 0 0 0 S 0.0 0.0 0:00.05 ksoftirqd/0
8 root 20 0 0 0 0 I 0.0 0.0 0:00.13 rcu_sched
9 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_bh
10 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration/0
11 root rt 0 0 0 0 S 0.0 0.0 0:00.00 watchdog/0
12 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/0
13 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kdevtmpfs
14 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 netns
agnesduru@ubu...
[Software Updat...
21:03

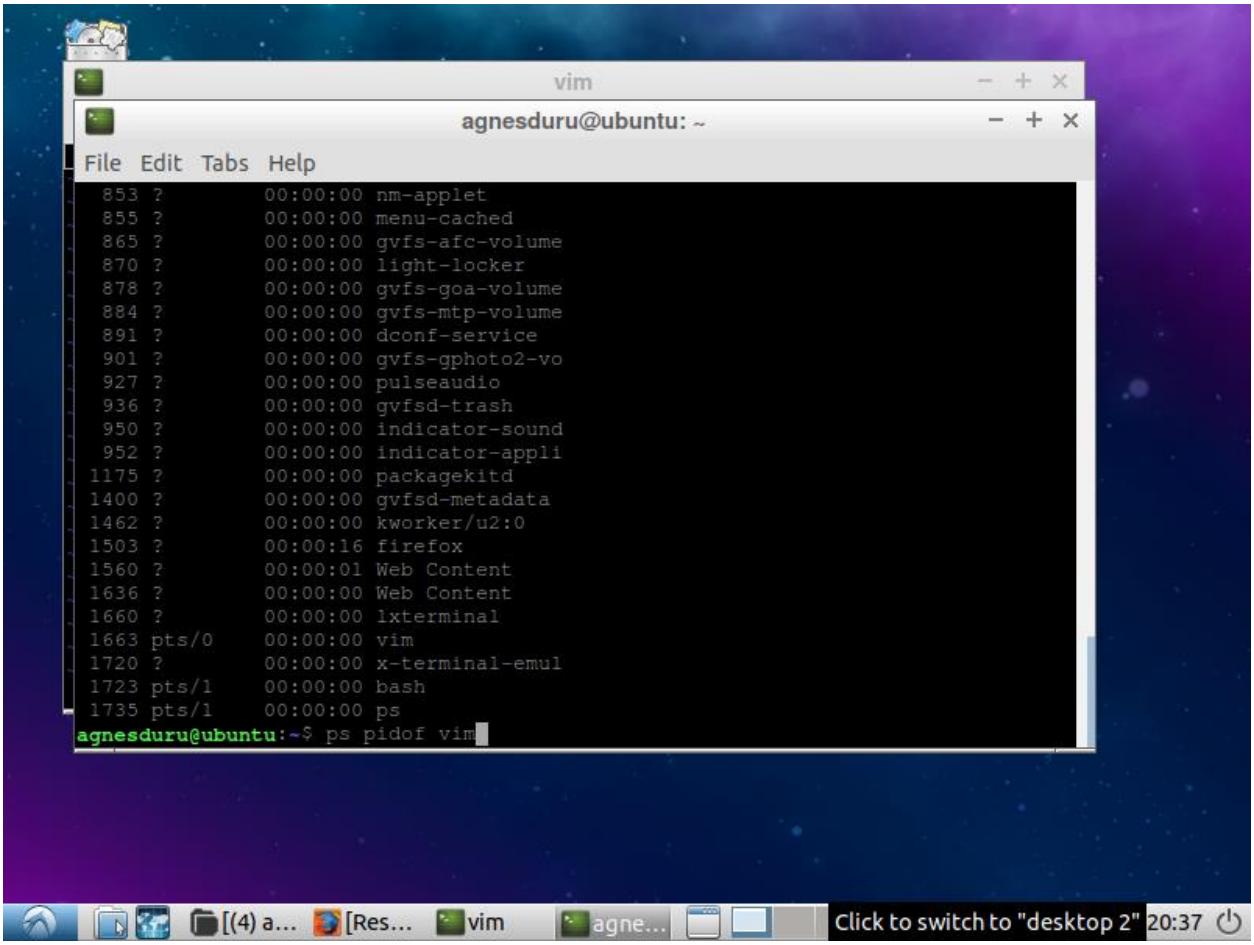

agnesduru@ubuntu: ~
File Edit Tabs Help
* agnesdur...
agnesduru...
agnesduru@ubuntu:~$ top H

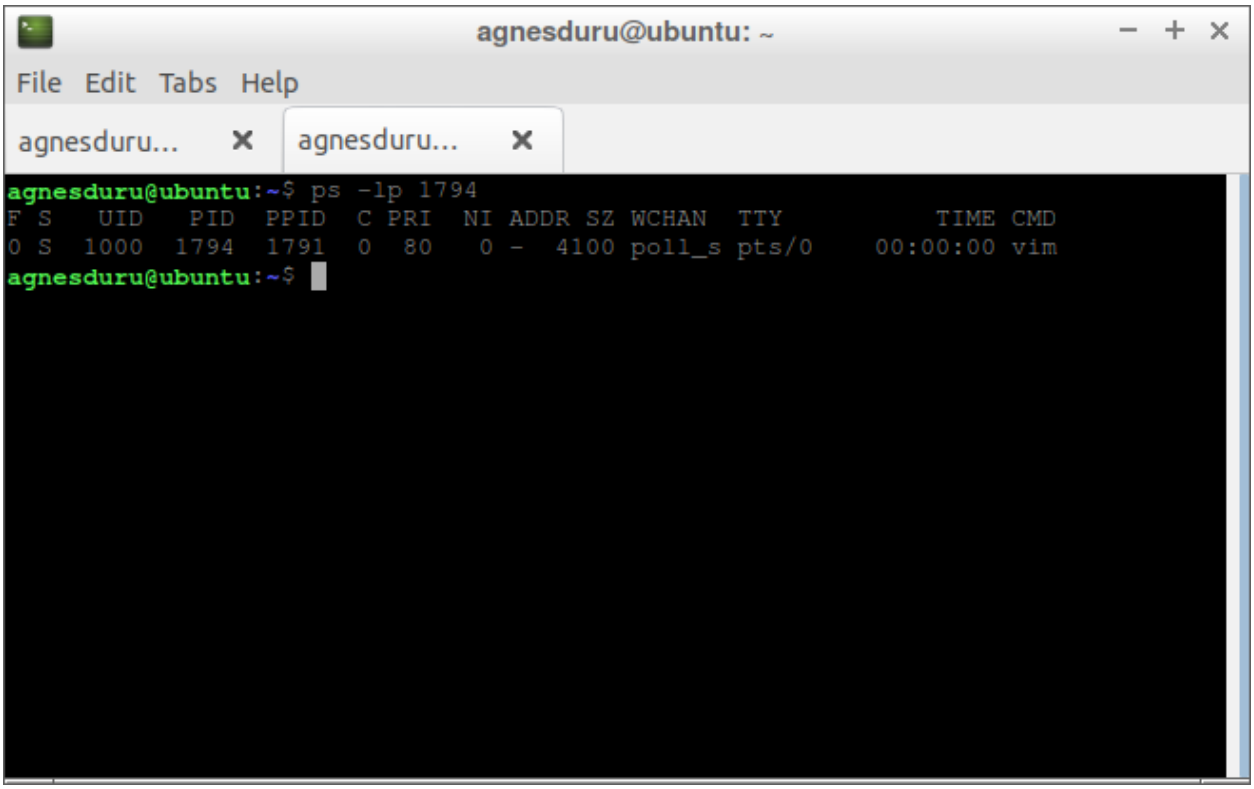
- b. The PID 1384 has consumed the most CPU



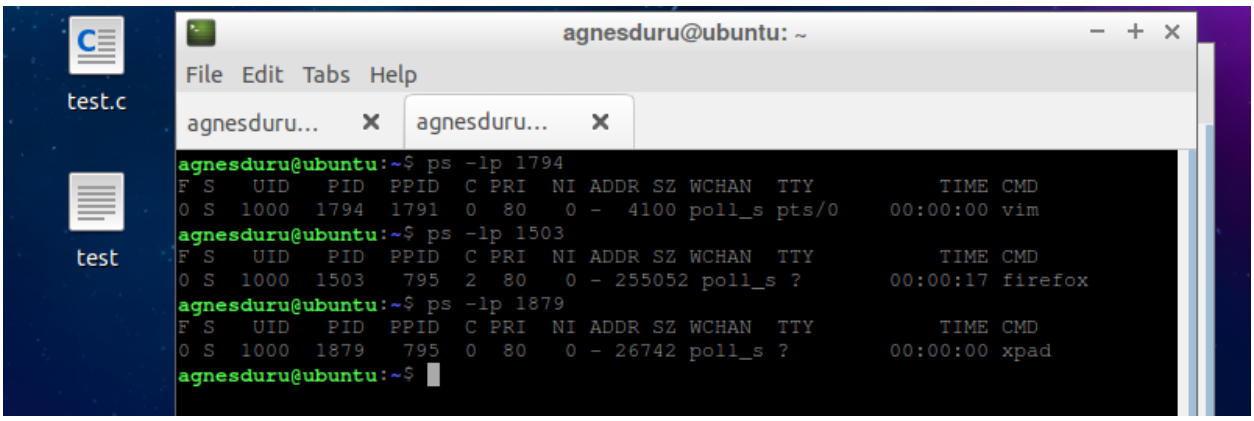
- c. The priority assigned to the user process Vim is 80.







- d. The priority assigned to user processes on my computer is 80. I opened many user systems including Firefox and found that they all share this priority. The default priority assigned to user processes on my system is 20. I found this by using the command and it displayed the default processes and default priority.



```
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$ ps ecl
F   UID   PID  PPID PRI  NI    VSZ   RSS WCHAN  STAT TTY        TIME COMMAND
0  1000  1804  1801  20   0   6844  4240 wait   Ss   pts/1      0:00 bash
0  1000  1817  1801  20   0   6844  4300 poll_s Ss+  pts/2      0:00 bash
0  1000  1998  1801  20   0   6844  4136 poll_s Ss+  pts/0      0:00 bash
0  1000  2055  1804  20   0   7252  1920 -      R+   pts/1      0:00 ps
agnesduru@ubuntu:~$
```

- e. The processes running on my system by me are:

```
agnesduru@ubuntu: ~
File  Edit  Tabs  Help
agnesduru...   agnesduru...   agnesduru...
agnesduru@ubuntu:~$ ps -u
USER       PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
agnesdu+  1804  0.0  0.2   6844  4240 pts/1    Ss+  20:41   0:00 bash
agnesdu+  1817  0.0  0.2   6844  4300 pts/2    Ss+  20:41   0:00 bash
agnesdu+  1998  0.3  0.2   6844  4136 pts/0    Ss   20:53   0:00 bash
agnesdu+  2010  0.0  0.1   7796  3364 pts/0    R+   20:53   0:00 ps -u
agnesduru@ubuntu:~$
```

- f. A system process with command bash and pid 1 had priority is 80 and I found this by getting the pid of a command in brackets and using the ps -lp command to display its priority

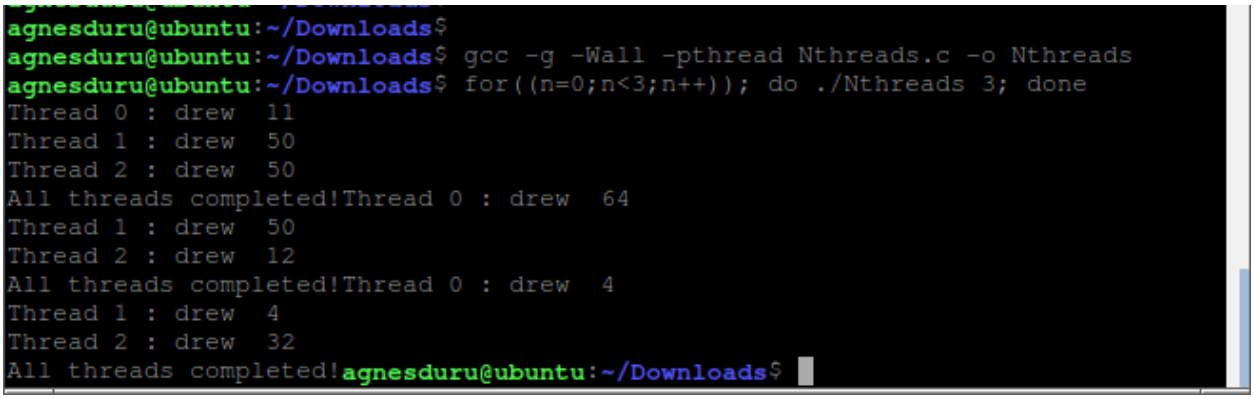
```
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$ ps -lp 1
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
4 S     0     1     0  0  80   0 -  7584 -      ?        00:00:01 systemd
agnesduru@ubuntu:~$
```

- g. The maximum user processes allowed on my virtual machine is: unlimited

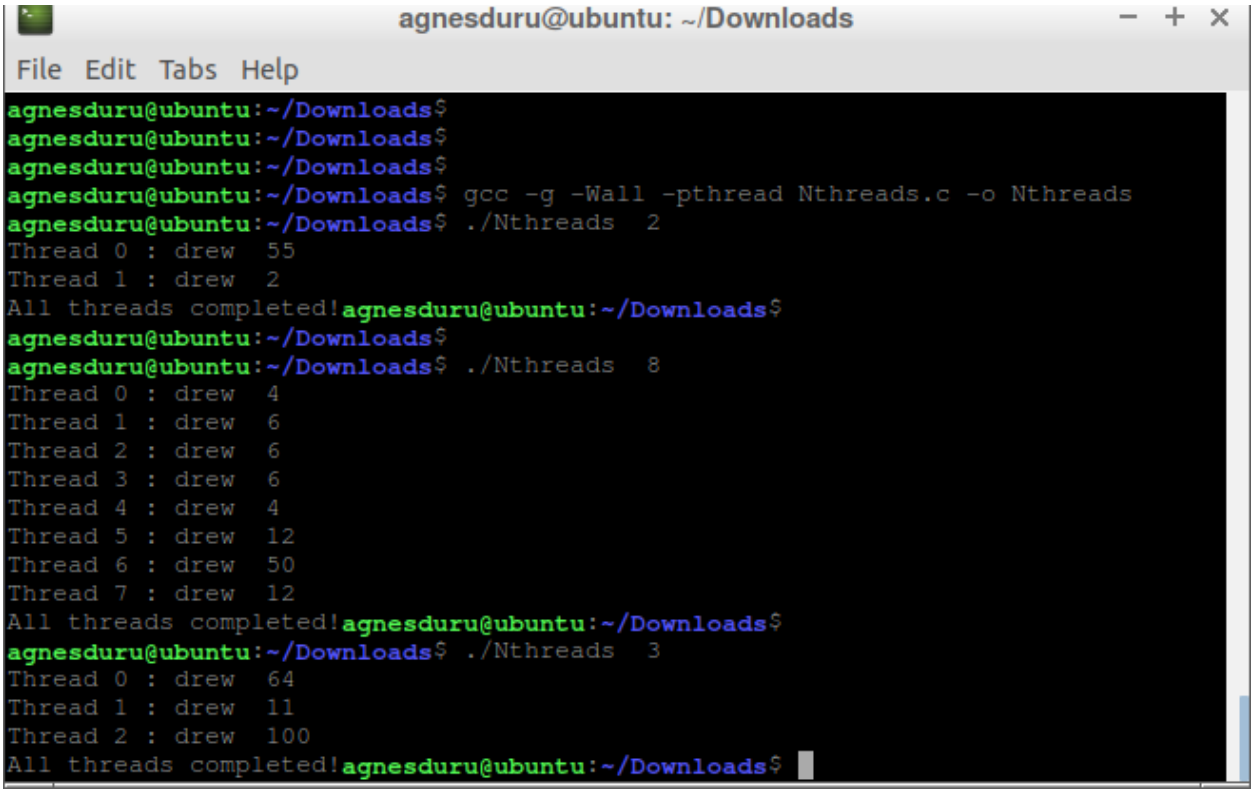
SCREENSHOT

```
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$
agnesduru@ubuntu:~$ ulimit
unlimited
agnesduru@ubuntu:~$ ulimit
unlimited
agnesduru@ubuntu:~$
```

- # Part 2 – Nthreads:
  - Output:
    - Same N:



    - Different N:



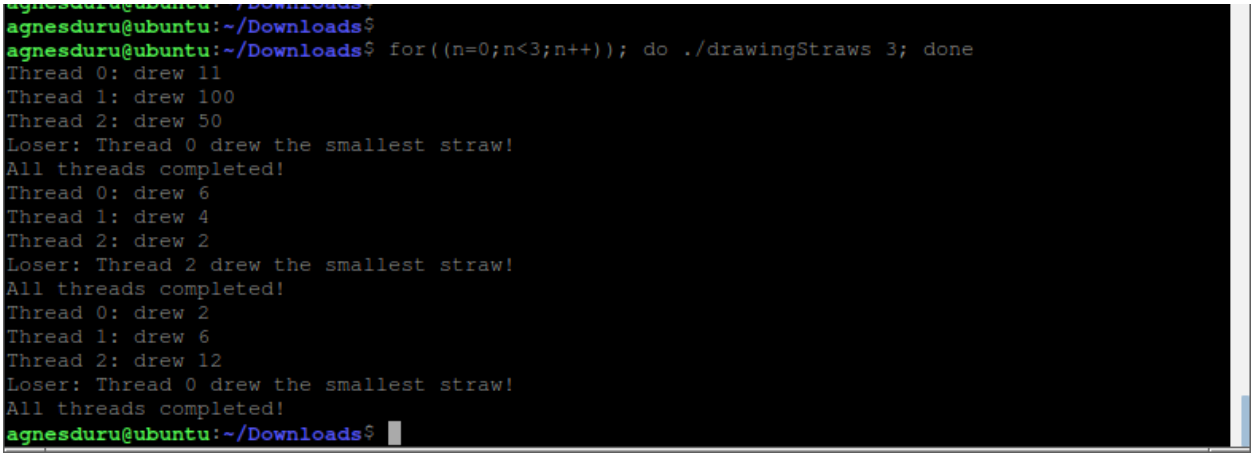
- User Error:
  - Out of Range:

```
agnesduru@ubuntu:~/Downloads$
agnesduru@ubuntu:~/Downloads$
agnesduru@ubuntu:~/Downloads$ gcc -g -Wall -pthread Nthreads.c -o Nthreads
agnesduru@ubuntu:~/Downloads$ ./Nthreads -9
Your seccond Argument must be in the following range from 1 to 9agnesduru@ubunt
:~/Downloads$ gcc -g -Wall -pthread Nthreads.c -o Nthreads
agnesduru@ubuntu:~/Downloads$ ./Nthreads 0
Your seccond Argument must be in the following range from 1 to 9agnesduru@ubunt
:~/Downloads$ gcc -g -Wall -pthread Nthreads.c -o Nthreads
agnesduru@ubuntu:~/Downloads$ ./Nthreads dog
Your seccond Argument must be in the following range from 1 to 9agnesduru@ubunt
:~/Downloads$ gcc -g -Wall -pthread Nthreads.c -o Nthreads
agnesduru@ubuntu:~/Downloads$ ./Nthreads 10
Your seccond Argument must be in the following range from 1 to 9agnesduru@ubunt
:~/Downloads$ gcc -g -Wall -ptgcc -g -Wall -pthread Nthreads.c -o Nthreads
agnesduru@ubuntu:~/Downloads$ ./Nthreads 100
Your seccond Argument must be in the following range from 1 to 9agnesduru@ubunt
:~/Downloads$
```

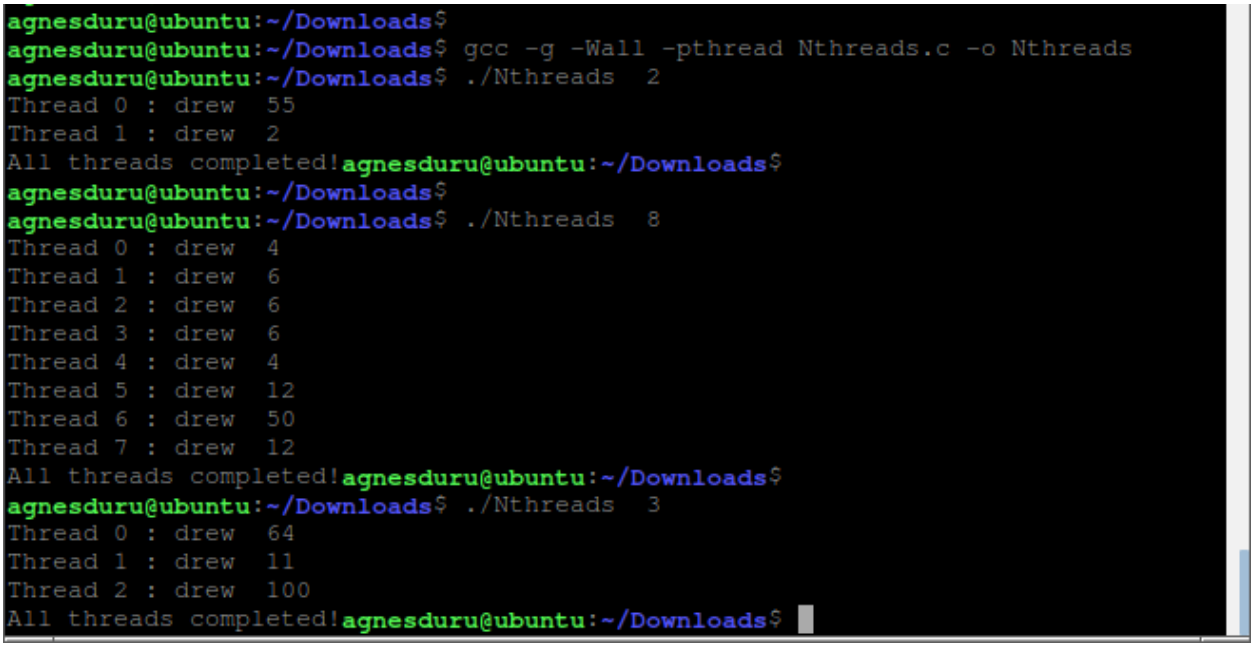
  - No input:

```
agnesduru@ubuntu:~/Downloads$
agnesduru@ubuntu:~/Downloads$ gcc -g -Wall -pthread Nthreads.c -o Nthreads
agnesduru@ubuntu:~/Downloads$ ./Nthreads
usage:./Nthreads <integer value>
agnesduru@ubuntu:~/Downloads$
```

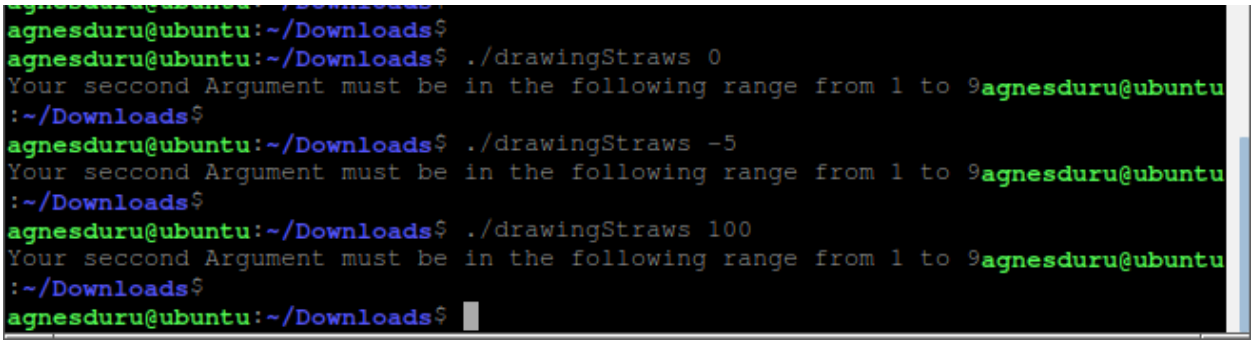
- # Part 3 – Drawing Straws:
  - Output:
    - Same N:



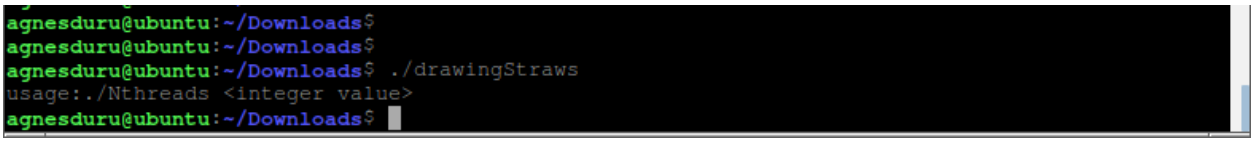
    - Different N:



- User Error:
  - Out of Range:

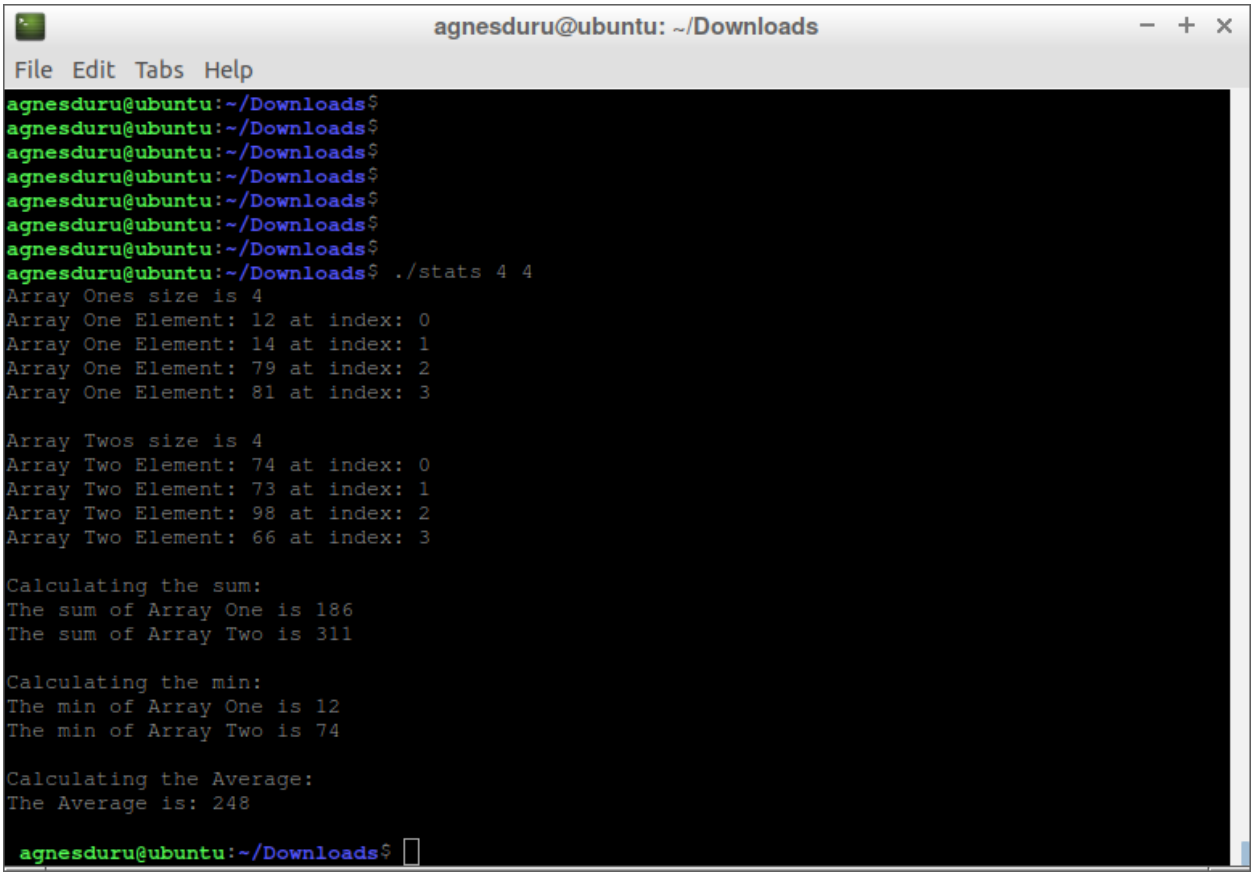


  - No input:

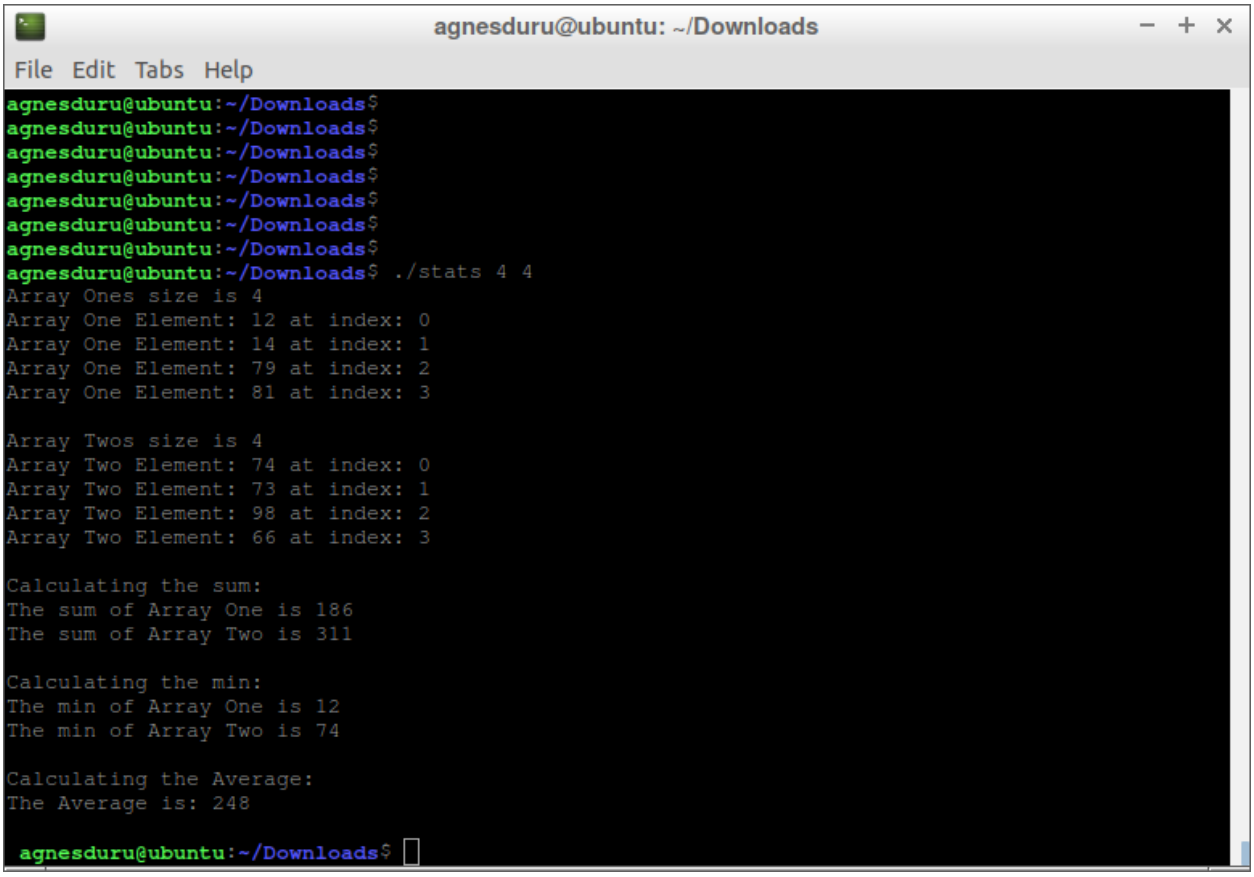


Answer: No two numbers from the global array would get picked twice . This is so because I stored the index of the array that was randomly picked. After it had been used accordingly I set the value of array at that index to 0. I then added that it would continue to search for a new index while the array value at that index is not equal to 0.

- # Part 4 – Stats:
  - Output:
    - Same N: Using 4



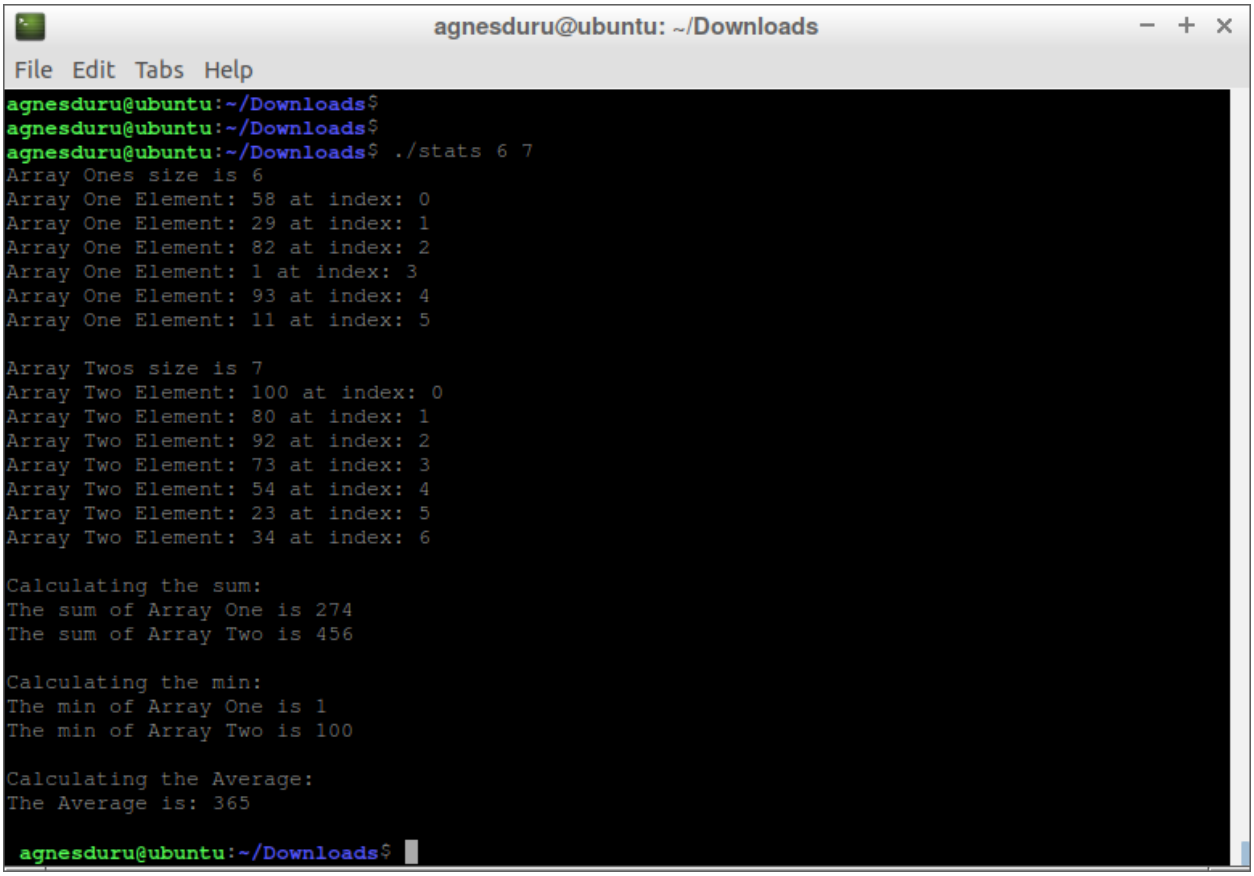
```
agnesduru@ubuntu:~/Downloads$
agnesduru@ubuntu:~/Downloads$ ./stats 4 4
Array Ones size is 4
Array One Element: 58 at index: 0
Array One Element: 12 at index: 1
Array One Element: 34 at index: 2
Array One Element: 25 at index: 3

Array Twos size is 4
Array Two Element: 83 at index: 0
Array Two Element: 68 at index: 1
Array Two Element: 25 at index: 2
Array Two Element: 48 at index: 3

Calculating the sum:
The sum of Array One is 129
The sum of Array Two is 224

Calculating the min:
The min of Array One is 12
The min of Array Two is 83

Calculating the Average:
The Average is: 176

agnesduru@ubuntu:~/Downloads$
```



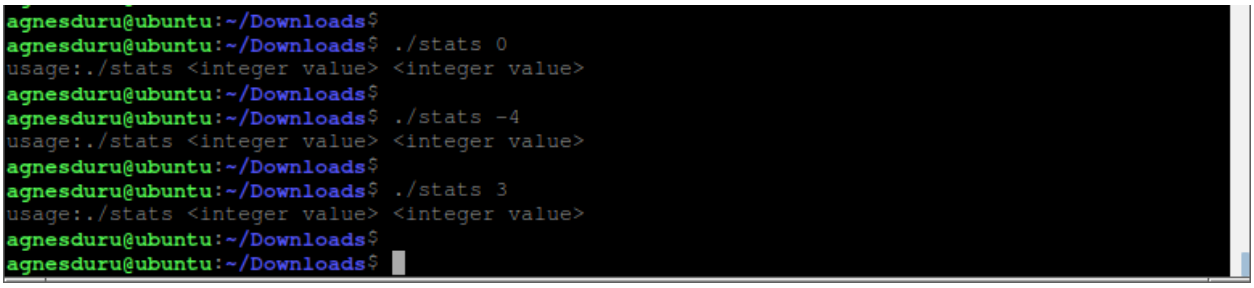
- Different N:

```
agnesduru@ubuntu:~/Downloads$
agnesduru@ubuntu:~/Downloads$ ./stats 3 4
Array Ones size is 3
Array One Element: 87 at index: 0
Array One Element: 52 at index: 1
Array One Element: 39 at index: 2

Array Twos size is 4
Array Two Element: 72 at index: 0
Array Two Element: 3 at index: 1
Array Two Element: 36 at index: 2
Array Two Element: 72 at index: 3

Calculating the sum:
The sum of Array One is 178
The sum of Array Two is 183

Calculating the min:
The min of Array One is 39
The min of Array Two is 72

Calculating the Average:
The Average is: 180

agnesduru@ubuntu:~/Downloads$
```

```
agnesduru@ubuntu:~/Downloads$
agnesduru@ubuntu:~/Downloads$ ./stats 5 6
Array Ones size is 5
Array One Element: 23 at index: 0
Array One Element: 34 at index: 1
Array One Element: 67 at index: 2
Array One Element: 80 at index: 3
Array One Element: 51 at index: 4

Array Twos size is 6
Array Two Element: 99 at index: 0
Array Two Element: 97 at index: 1
Array Two Element: 48 at index: 2
Array Two Element: 22 at index: 3
Array Two Element: 53 at index: 4
Array Two Element: 80 at index: 5

Calculating the sum:
The sum of Array One is 255
The sum of Array Two is 399

Calculating the min:
The min of Array One is 23
The min of Array Two is 99

Calculating the Average:
The Average is: 327

agnesduru@ubuntu:~/Downloads$
```



- User Error:
  - Out of Range:



  - No input:

Answer: The restrictions if any that I had set was including pthread_joins so that I main could retrieve the return value. The other restriction is that I added pthread_exit so that the main thread would not exit and thus terminate all the other threads.