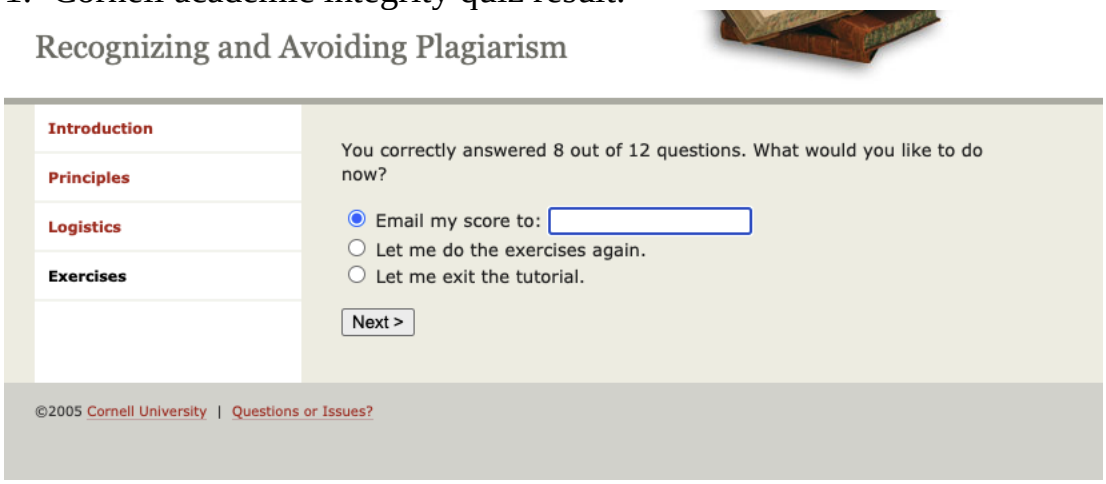
ECE5725: Homework 1

1. Cornell academic integrity quiz result:

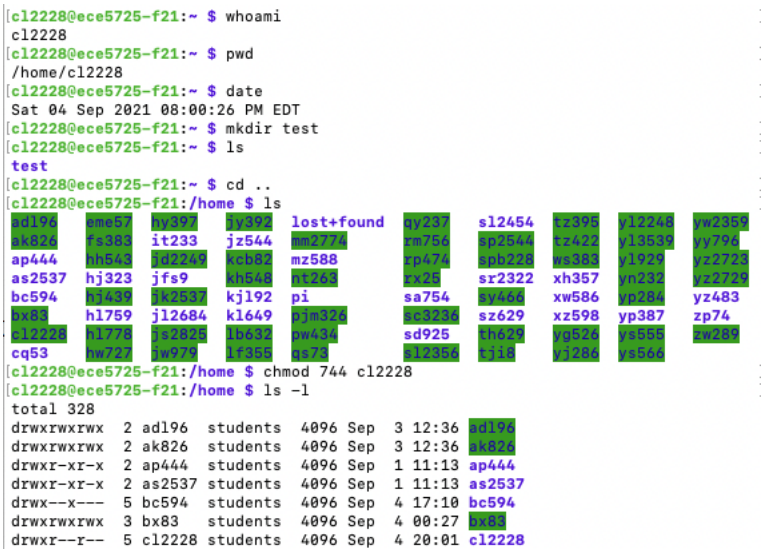


2. The SD card has been set up and backed up, I will show them to TA at Lab1.

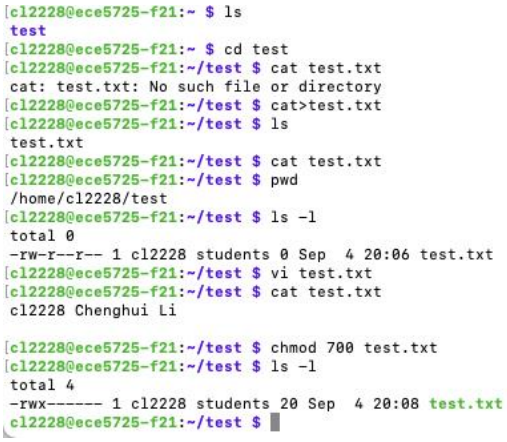
3. The principle of Linux file permission is "-/d/l rwx rwx rwx". The three group of "rwx" are for user, group, global, respectively. And the rwx is usually calculated by binary number. For example, 111 means readable, writable, executable; however, 000 means unreadable, unwritable, and un-executable.

   We used Integer to represent the binary number, so 777 means 111 111 111, that this file can be read, written, executed by the user, group, as well as anyone that reaches this file. This is dangerous because all users can change the file, making it totally unsecure. 644 means 110 100 100, that the user can read and write the file, while others can only read that file. 700 means 111 000 000, that the user has all authorities for the file, while others have none.

4. Screenshot:



5. Screenshot:



6. Already done that.

7. The full name of ‘df’ is disk free, used to show the free space of disks, the /home directory is used to store data of all students participating in ECE 5725 so it is allocated the largest space by using an external driver which is 1TB. Using ‘df -h’ can make display human-readable by showing B/KB/MB/GB. Screen shots:

```
cl2228@ece5725-f21:/home $ df
Filesystem     1K-blocks    Used Available Use% Mounted on
/dev/root       14988544 3384548  10941712  24% /
devtmpfs          793684       0    793684   0% /dev
tmpfs             958548       0    958548   0% /dev/shm
tmpfs             958548   99064    859484  11% /run
tmpfs               5120       4      5116   1% /run/lock
tmpfs             958548       0    958548   0% /sys/fs/cgroup
/dev/mmcblk0p1    258095   50381    207715  20% /boot
/dev/sda1      960380648  611040 910915148   1% /home
tmpfs             191708       0    191708   0% /run/user/1000
tmpfs             191708       0    191708   0% /run/user/1029
tmpfs             191708       0    191708   0% /run/user/1023
tmpfs             191708       0    191708   0% /run/user/1062
tmpfs             191708       0    191708   0% /run/user/1036
tmpfs             191708       0    191708   0% /run/user/1016
tmpfs             191708       0    191708   0% /run/user/1047
tmpfs             191708       0    191708   0% /run/user/1046
tmpfs             191708       0    191708   0% /run/user/1028
tmpfs             191708       0    191708   0% /run/user/1011
tmpfs             191708       0    191708   0% /run/user/1014
cl2228@ece5725-f21:/home $ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        15G  3.3G   11G  24% /
devtmpfs        776M     0  776M   0% /dev
tmpfs           937M     0  937M   0% /dev/shm
tmpfs           937M   97M  840M  11% /run
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           937M     0  937M   0% /sys/fs/cgroup
/dev/mmcblk0p1  253M   50M  203M  20% /boot
/dev/sda1       916G  597M  869G   1% /home
tmpfs           188M     0  188M   0% /run/user/1000
tmpfs           188M     0  188M   0% /run/user/1029
tmpfs           188M     0  188M   0% /run/user/1023
tmpfs           188M     0  188M   0% /run/user/1062
tmpfs           188M     0  188M   0% /run/user/1036
tmpfs           188M     0  188M   0% /run/user/1016
tmpfs           188M     0  188M   0% /run/user/1047
tmpfs           188M     0  188M   0% /run/user/1046
tmpfs           188M     0  188M   0% /run/user/1028
tmpfs           188M     0  188M   0% /run/user/1011
tmpfs           188M     0  188M   0% /run/user/1014
cl2228@ece5725-f21:/home $
```

8. Screenshots:

```
[cl2228@ece5725-f21:/home $ ps -alef
F S UID          PID  PPID  C PRI  NI ADDR SZ WCHAN  STIME TTY          TIME CMD
4 S root           1     0  0  80   0 -  8509 -      Aug31 ?        00:00:39 /sbin
1 S root           2     0  0  80   0 -     0 -      Aug31 ?        00:00:00 [kthr
1 I root           3     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [rcu_
1 I root           4     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [rcu_
1 I root           8     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [mm_p
1 S root           9     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [rcu_
1 S root          10     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [rcu_
1 S root          11     2  0  80   0 -     0 -      Aug31 ?        00:00:07 [ksof
1 I root          12     2  0  80   0 -     0 -      Aug31 ?        00:04:53 [rcu_
1 S root          13     2  0 -40   - -     0 -      Aug31 ?        00:00:00 [migr
1 S root          14     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [cpuh
1 S root          15     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [cpuh
1 S root          16     2  0 -40   - -     0 -      Aug31 ?        00:00:00 [migr
1 S root          17     2  0  80   0 -     0 -      Aug31 ?        00:00:01 [ksof
1 S root          20     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [cpuh
1 S root          21     2  0 -40   - -     0 -      Aug31 ?        00:00:00 [migr
1 S root          22     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [ksof
1 S root          25     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [cpuh
1 S root          26     2  0 -40   - -     0 -      Aug31 ?        00:00:00 [migr
1 S root          27     2  0  80   0 -     0 -      Aug31 ?        00:00:03 [ksof
5 S root          30     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [kdev
1 I root          31     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [netn
1 S root          34     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [kaud
1 S root          36     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [khun
1 S root          37     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [oom_
1 I root          38     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [writ
1 S root          39     2  0  80   0 -     0 -      Aug31 ?        00:00:29 [kcom
1 I root          57     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [kblo
1 I root          58     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [blkc
1 S root          59     2  0   9   - -     0 -      Aug31 ?        00:00:00 [watc
1 I root          62     2  0  60 -20 -     0 -      Aug31 ?        00:00:08 [kwor
1 I root          63     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [rpci
1 I root          64     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [kwor
1 I root          65     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [xprt
1 S root          66     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [kswa
1 I root          67     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [nfsi
1 I root          68     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [kthr
1 I root          69     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [iscs
1 I root          70     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [iscs
1 I root          71     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [nvme
1 I root          72     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [nvme
1 I root          73     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [nvme
1 I root          76     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [DWC
1 I root          77     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [uas]
1 S root          78     2  0  61 -19 -     0 -      Aug31 ?        00:00:00 [vchi
1 S root          79     2  0  61 -19 -     0 -      Aug31 ?        00:00:00 [vchi
1 S root          80     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [vchi
1 I root          81     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [zswa
1 I root          86     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [sdhc
1 S root          87     2  0   9   - -     0 -      Aug31 ?        00:00:00 [irq/
1 I root          89     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [mmc_
1 S root          90     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [scsi
1 I root          91     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [scsi
1 S root          92     2  0  80   0 -     0 -      Aug31 ?        00:00:01 [usb-
1 I root          93     2  0  60 -20 -     0 -      Aug31 ?        00:00:02 [kwor
1 S root          94     2  0  80   0 -     0 -      Aug31 ?        00:00:07 [jbd2
1 I root          95     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [ext4
1 I root          97     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [ipv6
1 I root          99     2  0  60 -20 -     0 -      Aug31 ?        00:00:02 [kwor
1 I root         111     2  0  60 -20 -     0 -      Aug31 ?        00:00:02 [kwor
4 S root         125     1  0  80   0 -  9492 -      Aug31 ?        00:02:48 /lib/
4 S root         160     1  0  80   0 -  4657 -      Aug31 ?        00:00:01 /lib/
1 S root         183     2  0  80   0 -     0 -      Aug31 ?        00:00:00 [vchi
1 S root         184     2  0  70 -10 -     0 -      Aug31 ?        00:00:00 [SMIO
1 I root         189     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [mmal
1 I root         190     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [mmal
1 I root         191     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [mmal
1 I root         192     2  0  60 -20 -     0 -      Aug31 ?        00:00:00 [mmal
[cl2228@ece5725-f21:/home $ ps -alef | grep cl2228
4 S root        1036   499  0  80   0 -  3060 -      19:59 ?        00:00:00 sshd: cl2228 [priv]
4 S cl2228      1039     1  0  80   0 -  3682 do_epo 19:59 ?        00:00:00 /lib/systemd/systemd --user
5 S cl2228      1040  1039  0  80   0 -  8894 -      19:59 ?        00:00:00 (sd-pam)
5 S cl2228      1054  1036  0  80   0 -  3060 -      19:59 ?        00:00:00 sshd: cl2228@pts/11
0 S cl2228      1055  1054  0  80   0 -  2122 do_wai 19:59 pts/11   00:00:00 -bash
0 R cl2228      1354  1055  0  80   0 -  2447 -      20:12 pts/11   00:00:00 ps -alef
0 S cl2228      1355  1055  0  80   0 -  1837 pipe_r 20:12 pts/11   00:00:00 grep --color=auto cl2228
cl2228@ece5725-f21:/home $
```

9. Components of the Raspberry Pi are quite similar to those in servers or laptops. Our SD card can be regarded as Raspberry's disk; Raspberry's core, the Raspberry Pi 4 for example, is a 1.5GHz 64-bit quad-core ARM Cortex-A7x processor, this is different from laptops, which usually use Intel or AMD or Apple M1 as CPUs. Raspberry Pi is absolutely a money saver because a server that perfectly allows all students use in the ECE5725 only costs no more than $100, if we use a PC, it will cost more than $1,000, much more expensive than the Raspberry Pi. But if we need to run some programs or models that need high computing resources such as deep-learning model training, then raspberry Pi cannot fulfill the needs as the task need high-performance GPUs and CPUs. In general, raspberry Pi is winner in the price, but it has capability limit.

10. The main differences between top and htop is that htop is colorful and has a nicer interface, allows users to scroll the process list, allows many operations with mouse. More importantly, htop allows us to kill a process without finding and entering PIDs. According to the above advantages, htop is a better choice to use.