


Lab 4: The Linux fs

Question 1: The Linux Filesystem

Directories	Their Usage
bin	Essential commands
dev	Device files
etc	System configuration files
home	User home directories
media	Mount point for removable media, such as DVDs and floppy disks
opt	Add-on software packages
proc	Kernel information, process control, system hardware information
srv	Information relating to services that run on the system
usr	Software not essential for system operation, such as applications
var	Dedicated to variable data, such as logs, databases, websites, and temporary spool (e-mail, etc) files that persist from one boot to the next

Command	What it does	Syntax	Example
echo	Display text to the screen	<code>echo + option + text to display</code>	<code>echo -n "Hello World"</code>
apt	Set of tools for managing deb packages	<code>sudo + apt + option + package name</code>	<code>sudo apt install vlc</code>
uname	Prints system information	<code>uname + option</code>	<code>uname -a</code>

 maybs248@cis106: /

```
maybs248@cis106:~$ pwd
/home/maybs248
maybs248@cis106:~$ cd Downloads/
maybs248@cis106:~/Downloads$ pwd
/home/maybs248/Downloads
maybs248@cis106:~/Downloads$ cd ..
maybs248@cis106:~$ pwd
/home/maybs248
maybs248@cis106:~$ cd ../../
maybs248@cis106:/$ pwd
/
maybs248@cis106:/$ cd
maybs248@cis106:~$ cd -
/
maybs248@cis106:/$ pwd
/
maybs248@cis106:/$
```

```
maybs248@cis106: /usr

maybs248@cis106:~$ pwd
/home/maybs248
maybs248@cis106:~$ cd
maybs248@cis106:~$ cd /
maybs248@cis106:/$ cd /usr/share/themes
maybs248@cis106:/usr/share/themes$ cd ../../
maybs248@cis106:/usr$ ls -A ~
.bash_history      .gnupg            snap
.bash_logout       .icons            .ssh
.bashrc            .local            .sudo_as_admin_successful
.cache             .mozilla          Templates
cis106             Music             .themes
.cis106.png        Pictures          .vboxclient-clipboard.pid
.config            .pki              .vboxclient-display-svg-x11.pid
Desktop            practicels        .vboxclient-draganddrop.pid
Documents          practicels.tar.xz .vboxclient-seamless.pid
Downloads          .profile          Videos
.gitconfig         Public            .vscode
maybs248@cis106:/usr$
```

```
maybs248@cis106: ~

maybs248@cis106:/usr$ cd; ls -tX cis106/
FinalProject labs weeklyReports
maybs248@cis106:~$ ls -rR ~/cis106/
/home/maybs248/cis106/:
weeklyReports labs FinalProject

/home/maybs248/cis106/weeklyReports:
week4 week3 week2 week1 week0

/home/maybs248/cis106/weeklyReports/week4:
homework4.md

/home/maybs248/cis106/weeklyReports/week3:
'update ubuntu.png' homework3.pdf homework3.md

/home/maybs248/cis106/weeklyReports/week2:
homework2.pdf homework2.md

/home/maybs248/cis106/weeklyReports/week1:
homework1.pdf homework1.md

/home/maybs248/cis106/weeklyReports/week0:
```

```

what-is-ubuntu.pdf  what-is-ubuntu.md  what-is-ubuntu.html

/home/maybs248/cis106/labs:
lab4  lab3  lab2  lab1  lab0

/home/maybs248/cis106/labs/lab4:
q1.2.4.png  q1.2.3.png  q1.2.2.png  q1.2.1.png  q1.1.png  lab4.md

/home/maybs248/cis106/labs/lab3:
q2.1.png  q1.2.png  q1.1.png  linux.pdf  linux.odt  linux.odp  lab3.pdf  lab3.md

/home/maybs248/cis106/labs/lab2:
question4.1.png.png  q3.1.png.png  q2.1.png.png  lab2.pdf  lab2.md

/home/maybs248/cis106/labs/lab1:
q6.3.png  q6.2.png  q6.1.png  lab1submissions.pdf  lab1submissions.md

/home/maybs248/cis106/labs/lab0:
xubuntu.png  ubuntu.png  mate.png  kylin.png  desktop.png  budgie.png
whatisubuntu.pdf  studio.png  lubuntu.png  kubuntu.png  core.png

/home/maybs248/cis106/FinalProject:

```

```

maybs248@cis106:~$ ls -lh ~
total 2.2M
drwxrwxr-x 6 maybs248 maybs248 4.0K Mar  1 16:39 cis106
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar 12 10:31 Desktop
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar  2 12:38 Documents
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar 12 10:19 Downloads
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar  1 14:24 Music
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar 12 11:10 Pictures
drwxrwxr-x 2 maybs248 maybs248 4.0K Feb 27 13:46 practicels
-rw-rw-r-- 1 maybs248 maybs248 2.2M Mar 12 10:19 practicels.tar.xz
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar  1 14:24 Public
drwx----- 4 maybs248 maybs248 4.0K Mar  1 15:36 snap
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar  1 14:24 Templates
drwxr-xr-x 2 maybs248 maybs248 4.0K Mar  1 14:24 Videos

```

```

maybs248@cis106:~$ ls -lgG --full-time ~
total 2224
drwxrwxr-x 6      4096 2022-03-01 16:39:12.550561396 -0500 cis106
drwxr-xr-x 2      4096 2022-03-12 10:31:01.331335786 -0500 Desktop
drwxr-xr-x 2      4096 2022-03-02 12:38:05.966682608 -0500 Documents
drwxr-xr-x 2      4096 2022-03-12 10:19:13.117389529 -0500 Downloads
drwxr-xr-x 2      4096 2022-03-01 14:24:30.070651556 -0500 Music
drwxr-xr-x 2      4096 2022-03-12 11:10:23.892079712 -0500 Pictures
drwxrwxr-x 2      4096 2022-02-27 13:46:18.000000000 -0500 practicels
-rw-rw-r-- 1 2229212 2022-03-12 10:19:08.314989000 -0500 practicels.tar.xz
drwxr-xr-x 2      4096 2022-03-01 14:24:30.070651556 -0500 Public
drwx----- 4      4096 2022-03-01 15:36:34.866476061 -0500 snap
drwxr-xr-x 2      4096 2022-03-01 14:24:30.070651556 -0500 Templates
drwxr-xr-x 2      4096 2022-03-01 14:24:30.070651556 -0500 Videos

```

```

maybs248@cis106: ~/practicels
maybs248@cis106:~/practicels$ ls
book.txt          history-debian.pdf  movie.mp4          song.mp3           tux-penguin.gif
countries.xml     homework.docx       people.csv         tux-nobg.png
maybs248@cis106:~/practicels$ ls -A
book.txt          history-debian.pdf  movie.mp4          song.mp3           tux-penguin.gif
countries.xml     homework.docx       people.csv         tux-nobg.png
maybs248@cis106:~/practicels$ ls -h
book.txt          history-debian.pdf  movie.mp4          song.mp3           tux-penguin.gif
countries.xml     homework.docx       people.csv         tux-nobg.png
maybs248@cis106:~/practicels$ ls -l
total 2932
-rw-rw-r-- 1 maybs248 maybs248 1043 Feb 27 13:39 book.txt
-rw-rw-r-- 1 maybs248 maybs248 23972 Feb 27 13:46 countries.xml
-rw-rw-r-- 1 maybs248 maybs248 163057 Feb 27 13:41 history-debian.pdf
-rw-rw-r-- 1 maybs248 maybs248 111303 Feb 22 14:14 homework.docx
-rw-rw-r-- 1 maybs248 maybs248 1570024 Feb 27 13:42 movie.mp4
-rw-rw-r-- 1 maybs248 maybs248 284042 Feb 27 13:45 people.csv
-rw-rw-r-- 1 maybs248 maybs248 764176 Feb 27 13:44 song.mp3
-rw-rw-r-- 1 maybs248 maybs248 21314 Feb 27 13:40 tux-nobg.png
-rw-rw-r-- 1 maybs248 maybs248 44299 Jan 31 2020 tux-penguin.gif
maybs248@cis106:~/practicels$

```

```

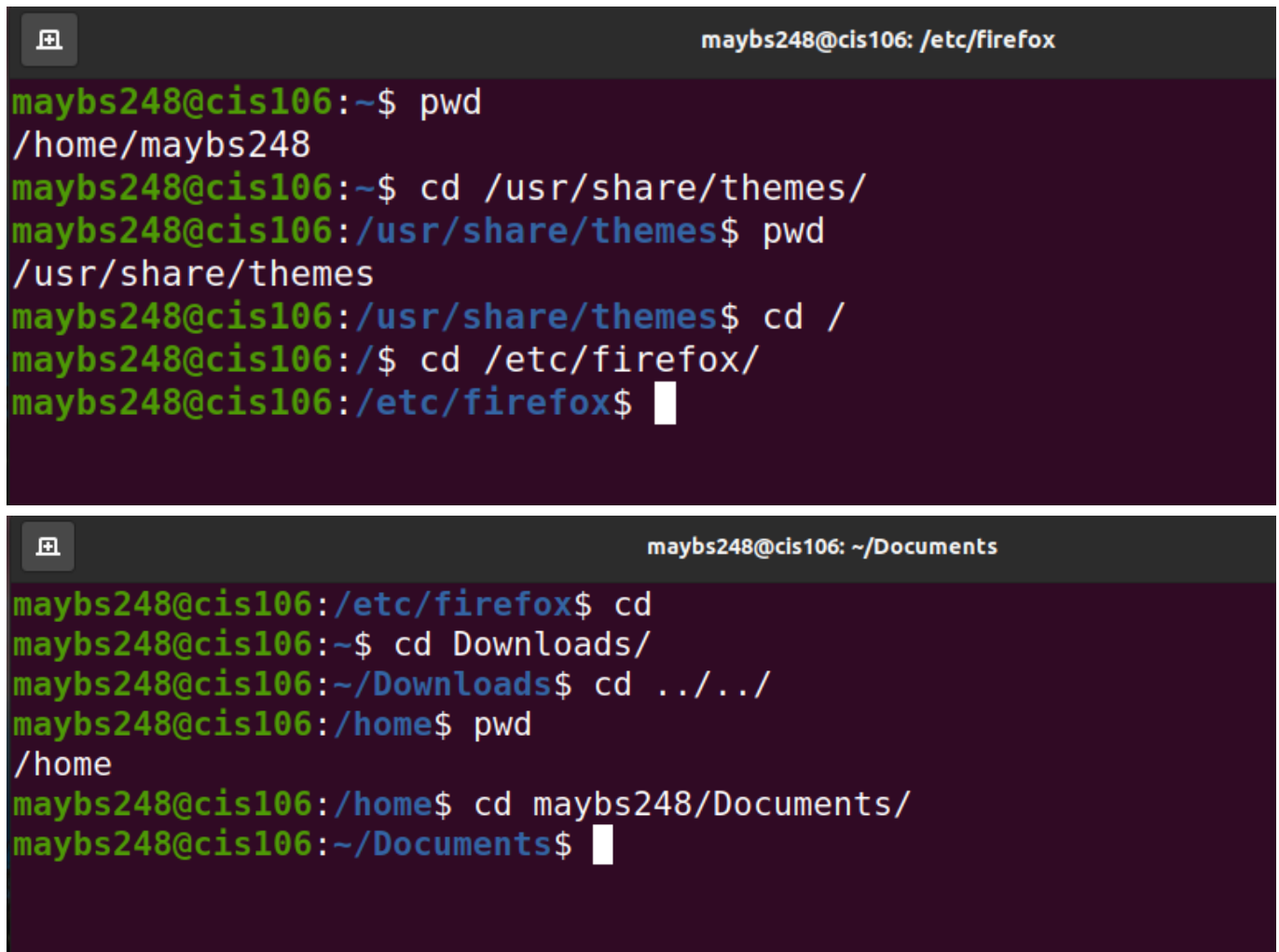
maybs248@cis106: ~/practicels
maybs248@cis106:~/practicels$ ls -lh
total 2.9M
-rw-rw-r-- 1 maybs248 maybs248 1.1K Feb 27 13:39 book.txt
-rw-rw-r-- 1 maybs248 maybs248 24K Feb 27 13:46 countries.xml
-rw-rw-r-- 1 maybs248 maybs248 160K Feb 27 13:41 history-debian.pdf
-rw-rw-r-- 1 maybs248 maybs248 109K Feb 22 14:14 homework.docx
-rw-rw-r-- 1 maybs248 maybs248 1.5M Feb 27 13:42 movie.mp4
-rw-rw-r-- 1 maybs248 maybs248 278K Feb 27 13:45 people.csv
-rw-rw-r-- 1 maybs248 maybs248 747K Feb 27 13:44 song.mp3
-rw-rw-r-- 1 maybs248 maybs248 21K Feb 27 13:40 tux-nobg.png
-rw-rw-r-- 1 maybs248 maybs248 44K Jan 31 2020 tux-penguin.gif
maybs248@cis106:~/practicels$ ls -lht
total 2.9M
-rw-rw-r-- 1 maybs248 maybs248 24K Feb 27 13:46 countries.xml
-rw-rw-r-- 1 maybs248 maybs248 278K Feb 27 13:45 people.csv
-rw-rw-r-- 1 maybs248 maybs248 747K Feb 27 13:44 song.mp3
-rw-rw-r-- 1 maybs248 maybs248 1.5M Feb 27 13:42 movie.mp4
-rw-rw-r-- 1 maybs248 maybs248 160K Feb 27 13:41 history-debian.pdf
-rw-rw-r-- 1 maybs248 maybs248 21K Feb 27 13:40 tux-nobg.png
-rw-rw-r-- 1 maybs248 maybs248 1.1K Feb 27 13:39 book.txt
-rw-rw-r-- 1 maybs248 maybs248 109K Feb 22 14:14 homework.docx
-rw-rw-r-- 1 maybs248 maybs248 44K Jan 31 2020 tux-penguin.gif

```

```
maybs248@cis106: ~/practicels
maybs248@cis106:~/practicels$ ls -lhGg
total 2.9M
-rw-rw-r-- 1 1.1K Feb 27 13:39 book.txt
-rw-rw-r-- 1 24K Feb 27 13:46 countries.xml
-rw-rw-r-- 1 160K Feb 27 13:41 history-debian.pdf
-rw-rw-r-- 1 109K Feb 22 14:14 homework.docx
-rw-rw-r-- 1 1.5M Feb 27 13:42 movie.mp4
-rw-rw-r-- 1 278K Feb 27 13:45 people.csv
-rw-rw-r-- 1 747K Feb 27 13:44 song.mp3
-rw-rw-r-- 1 21K Feb 27 13:40 tux-nobg.png
-rw-rw-r-- 1 44K Jan 31 2020 tux-penguin.gif
maybs248@cis106:~/practicels$ ls -lhGgS
total 2.9M
-rw-rw-r-- 1 1.5M Feb 27 13:42 movie.mp4
-rw-rw-r-- 1 747K Feb 27 13:44 song.mp3
-rw-rw-r-- 1 278K Feb 27 13:45 people.csv
-rw-rw-r-- 1 160K Feb 27 13:41 history-debian.pdf
-rw-rw-r-- 1 109K Feb 22 14:14 homework.docx
-rw-rw-r-- 1 44K Jan 31 2020 tux-penguin.gif
-rw-rw-r-- 1 24K Feb 27 13:46 countries.xml
-rw-rw-r-- 1 21K Feb 27 13:40 tux-nobg.png
-rw-rw-r-- 1 1.1K Feb 27 13:39 book.txt

maybs248@cis106: ~/practicels
-rw-rw-r-- 1 278K Feb 27 13:45 people.csv
-rw-rw-r-- 1 160K Feb 27 13:41 history-debian.pdf
-rw-rw-r-- 1 109K Feb 22 14:14 homework.docx
-rw-rw-r-- 1 44K Jan 31 2020 tux-penguin.gif
-rw-rw-r-- 1 24K Feb 27 13:46 countries.xml
-rw-rw-r-- 1 21K Feb 27 13:40 tux-nobg.png
-rw-rw-r-- 1 1.1K Feb 27 13:39 book.txt
maybs248@cis106:~/practicels$ ls -mr
tux-penguin.gif, tux-nobg.png, song.mp3, people.csv, movie.mp4, homework.docx, history-debian.pdf,
countries.xml, book.txt
maybs248@cis106:~/practicels$ ls -lX
people.csv
homework.docx
tux-penguin.gif
song.mp3
movie.mp4
history-debian.pdf
tux-nobg.png
book.txt
countries.xml
maybs248@cis106:~/practicels$
```

Question 2: The pwd and cd command



```
maybs248@cis106: /etc/firefox

maybs248@cis106:~$ pwd
/home/maybs248
maybs248@cis106:~$ cd /usr/share/themes/
maybs248@cis106:/usr/share/themes$ pwd
/usr/share/themes
maybs248@cis106:/usr/share/themes$ cd /
maybs248@cis106:/$ cd /etc/firefox/
maybs248@cis106:/etc/firefox$ █

maybs248@cis106: ~/Documents

maybs248@cis106:/etc/firefox$ cd
maybs248@cis106:~$ cd Downloads/
maybs248@cis106:~/Downloads$ cd ../../
maybs248@cis106:/home$ pwd
/home
maybs248@cis106:/home$ cd maybs248/Documents/
maybs248@cis106:~/Documents$ █
```

Question 3: The ls command

```

maybs248@cis106:~$ cd /usr/share/
maybs248@cis106:/usr/share$ ls /home/maybs248/lab4files/
countries.json  document.docx  helloWorld.c  sample.xls  Ubuntu.pdf
csvfile.csv     globe.avi      Linux.pdf     Tux.png     website.html
maybs248@cis106:/usr/share$ cd ~/lab4files/
maybs248@cis106:~/lab4files$ ls -lh
total 6.5M
-rw-rw-r-- 1 maybs248 maybs248 20K Feb 22 14:16 countries.json
-rw-rw-r-- 1 maybs248 maybs248 278K Feb 22 14:15 csvfile.csv
-rw-rw-r-- 1 maybs248 maybs248 747K Feb 22 14:13 document.docx
-rw-rw-r-- 1 maybs248 maybs248 726K Feb 22 14:12 globe.avi
-rw-rw-r-- 1 maybs248 maybs248 76 Feb 22 14:18 helloWorld.c
-rw-rw-r-- 1 maybs248 maybs248 2.5M Feb 22 14:10 Linux.pdf
-rw-rw-r-- 1 maybs248 maybs248 8.5K Feb 22 14:12 sample.xls
-rw-rw-r-- 1 maybs248 maybs248 42K Feb 22 14:10 Tux.png
-rw-rw-r-- 1 maybs248 maybs248 2.1M Feb 22 14:11 Ubuntu.pdf
-rw-rw-r-- 1 maybs248 maybs248 135K Feb 22 14:16 website.html

```

```

maybs248@cis106:~/lab4files$ ls -lhS
total 6.5M
-rw-rw-r-- 1 maybs248 maybs248 2.5M Feb 22 14:10 Linux.pdf
-rw-rw-r-- 1 maybs248 maybs248 2.1M Feb 22 14:11 Ubuntu.pdf
-rw-rw-r-- 1 maybs248 maybs248 747K Feb 22 14:13 document.docx
-rw-rw-r-- 1 maybs248 maybs248 726K Feb 22 14:12 globe.avi
-rw-rw-r-- 1 maybs248 maybs248 278K Feb 22 14:15 csvfile.csv
-rw-rw-r-- 1 maybs248 maybs248 135K Feb 22 14:16 website.html
-rw-rw-r-- 1 maybs248 maybs248 42K Feb 22 14:10 Tux.png
-rw-rw-r-- 1 maybs248 maybs248 20K Feb 22 14:16 countries.json
-rw-rw-r-- 1 maybs248 maybs248 8.5K Feb 22 14:12 sample.xls
-rw-rw-r-- 1 maybs248 maybs248 76 Feb 22 14:18 helloWorld.c

```

```

maybs248@cis106:~/lab4files$ ls -lhSgGi
total 6.5M
1321159 -rw-rw-r-- 1 2.5M Feb 22 14:10 Linux.pdf
1321161 -rw-rw-r-- 1 2.1M Feb 22 14:11 Ubuntu.pdf
1321164 -rw-rw-r-- 1 747K Feb 22 14:13 document.docx
1321165 -rw-rw-r-- 1 726K Feb 22 14:12 globe.avi
1321163 -rw-rw-r-- 1 278K Feb 22 14:15 csvfile.csv
1321168 -rw-rw-r-- 1 135K Feb 22 14:16 website.html
1321160 -rw-rw-r-- 1 42K Feb 22 14:10 Tux.png
1321162 -rw-rw-r-- 1 20K Feb 22 14:16 countries.json
1321167 -rw-rw-r-- 1 8.5K Feb 22 14:12 sample.xls
1321166 -rw-rw-r-- 1 76 Feb 22 14:18 helloWorld.c
maybs248@cis106:~/lab4files$ ls -Xr
sample.xls  Ubuntu.pdf  countries.json  document.docx  helloWorld.c
Tux.png     Linux.pdf   website.html    csvfile.csv    globe.avi
maybs248@cis106:~/lab4files$

```

Question 4: The tree command


```
maybs248@cis106:~/lab4files$ cd /etc/  
maybs248@cis106:/etc$ tree ~/lab4files/  
/home/maybs248/lab4files/  
├── countries.json  
├── csvfile.csv  
├── document.docx  
├── globe.avi  
├── helloWorld.c  
├── Linux.pdf  
├── sample.xls  
├── Tux.png  
├── Ubuntu.pdf  
└── website.html
```

0 directories, 10 files

```
maybs248@cis106:/etc$
```

```
maybs248@cis106:/etc$ cd ~/Downloads/  
maybs248@cis106:~/Downloads$ tree ../lab4files/ -fph  
../lab4files  
├── [-rw-rw-r-- 20K] ../lab4files/countries.json  
├── [-rw-rw-r-- 277K] ../lab4files/csvfile.csv  
├── [-rw-rw-r-- 746K] ../lab4files/document.docx  
├── [-rw-rw-r-- 725K] ../lab4files/globe.avi  
├── [-rw-rw-r-- 76] ../lab4files/helloWorld.c  
├── [-rw-rw-r-- 2.5M] ../lab4files/Linux.pdf  
├── [-rw-rw-r-- 8.5K] ../lab4files/sample.xls  
├── [-rw-rw-r-- 42K] ../lab4files/Tux.png  
├── [-rw-rw-r-- 2.0M] ../lab4files/Ubuntu.pdf  
└── [-rw-rw-r-- 134K] ../lab4files/website.html
```

0 directories, 10 files

```
maybs248@cis106:~/Downloads$ tree -tug
.
├── [maybs248 maybs248] 4K No Logo G674.jpg
├── [maybs248 maybs248] practicels.tar.xz
└── [maybs248 maybs248] lab4files.zip

0 directories, 3 files
maybs248@cis106:~/Downloads$ tree -X
<?xml version="1.0" encoding="UTF-8"?>
<tree>
  <directory name=".">
    <file name="4K No Logo G674.jpg"></file>
    <file name="lab4files.zip"></file>
    <file name="practicels.tar.xz"></file>
  </directory>
  <report>
    <directories>0</directories>
    <files>3</files>
  </report>
</tree>

maybs248@cis106:~/lab4files$ tree -J
[{"type":"directory","name": ".","contents":[
  {"type":"file","name":"countries.json"},
  {"type":"file","name":"csvfile.csv"},
  {"type":"file","name":"document.docx"},
  {"type":"file","name":"globe.avi"},
  {"type":"file","name":"helloWorld.c"},
  {"type":"file","name":"Linux.pdf"},
  {"type":"file","name":"sample.xls"},
  {"type":"file","name":"Tux.png"},
  {"type":"file","name":"Ubuntu.pdf"},
  {"type":"file","name":"website.html"}
]},
{"type":"report","directories":0,"files":10}
]
```

Question 5: The exa command, a modern tool to replace ls

```

maybs248@cis106:~$ exa --help
Usage:
  exa [options] [files...]

META OPTIONS
  -?, --help          show list of command-line options
  -v, --version        show version of exa

DISPLAY OPTIONS
  -l, --oneline        display one entry per line
  -l, --long           display extended file metadata as a table
  -G, --grid           display entries as a grid (default)
  -x, --across         sort the grid across, rather than downwards
  -R, --recurse        recurse into directories
  -T, --tree           recurse into directories as a tree
  -F, --classify       display type indicator by file names
  --colo(u)r=WHEN     when to use terminal colours (always, auto, never)
  --colo(u)r-scale     highlight levels of file sizes distinctly
  --icons             display icons
  --no-icons          don't display icons (always overrides --icons)

FILTERING AND SORTING OPTIONS
  -a, --all            show hidden and 'dot' files
  -d, --list-dirs      list directories as files; don't list their contents
  -L, --level DEPTH   limit the depth of recursion
  -r, --reverse        reverse the sort order
  -s, --sort SORT_FIELD which field to sort by
  --group-directories-first list directories before other files
  -D, --only-dirs      list only directories
  -I, --ignore-glob GLOBS glob patterns (pipe-separated) of files to ignore
  --git-ignore         ignore files mentioned in '.gitignore'
Valid sort fields:
  name, Name, extension, Extension, size, type,
  modified, accessed, created, inode, and none.
  date, time, old, and new all refer to modified.

LONG VIEW OPTIONS
  -b, --binary         list file sizes with binary prefixes
  -B, --bytes          list file sizes in bytes, without any prefixes
  -g, --group          list each file's group
  -h, --header         add a header row to each column
  -H, --links          list each file's number of hard links
  -i, --inode          list each file's inode number
  -m, --modified       use the modified timestamp field
  -n, --numeric        list numeric user and group IDs
  -S, --blocks         show number of file system blocks
  -t, --time FIELD     which timestamp field to list (modified, accessed, created)
  -u, --accessed       use the accessed timestamp field
  -U, --created        use the created timestamp field
  --changed            use the changed timestamp field
  --time-style         how to format timestamps (default, iso, long-iso, full-iso)
  --no-permissions     suppress the permissions field
  --octal-permissions  list each file's permission in octal format
  --no-filesize        suppress the filesize field
  --no-user            suppress the user field
  --no-time            suppress the time field
  --git               list each file's Git status, if tracked or ignored
  --@, --extended      list each file's extended attributes and sizes

```

```

maybs248@cis106:~$ exa -l lab4files/
.rw-rw-r-- 20k maybs248 22 Feb 14:16 countries.json
.rw-rw-r-- 284k maybs248 22 Feb 14:15 csvfile.csv
.rw-rw-r-- 764k maybs248 22 Feb 14:13 document.docx
.rw-rw-r-- 742k maybs248 22 Feb 14:12 globe.avi
.rw-rw-r-- 76 maybs248 22 Feb 14:18 helloWorld.c
.rw-rw-r-- 2.6M maybs248 22 Feb 14:10 Linux.pdf
.rw-rw-r-- 8.7k maybs248 22 Feb 14:12 sample.xls
.rw-rw-r-- 43k maybs248 22 Feb 14:10 Tux.png
.rw-rw-r-- 2.1M maybs248 22 Feb 14:11 Ubuntu.pdf
.rw-rw-r-- 137k maybs248 22 Feb 14:16 website.html
maybs248@cis106:~$ exa -T lab4files/
lab4files
├── countries.json
├── csvfile.csv
├── document.docx
├── globe.avi
├── helloWorld.c
├── Linux.pdf
├── sample.xls
├── Tux.png
├── Ubuntu.pdf
└── website.html

```

```
maybs248@cis106:~$  
maybs248@cis106:~$ exa -l --no-user --no-time lab4files/  
.rw-rw-r-- 20k countries.json  
.rw-rw-r-- 284k csvfile.csv  
.rw-rw-r-- 764k document.docx  
.rw-rw-r-- 742k globe.avi  
.rw-rw-r-- 76 helloWorld.c  
.rw-rw-r-- 2.6M Linux.pdf  
.rw-rw-r-- 8.7k sample.xls  
.rw-rw-r-- 43k Tux.png  
.rw-rw-r-- 2.1M Ubuntu.pdf  
.rw-rw-r-- 137k website.html  
maybs248@cis106:~$
```