PART 1

I have used the Terminal before navigating between directory and files, while in this lesson, I learnt to navigate files and also use `cd` to move back and forward between directories. I think using `cd` to go back to home directory and `cd ..` to move back one directory is quite helpful. While removing files in a directory, the "interactive" flag `-i` really helps since adding `-i` will ask us to confirm before deleting files. `nano` is also new to me, but this text editor is simple to use to write a file.

I think the most helpful thing I learn from working with files and directories is that instead of manually create new folder and files, the terminal can simply do all these things by writing short commands. For example, `mkdir` makes a new directory, `mv` can changes the files name, and `cp` copies the file. Also, current directory can be represented by `.` as the second parameter. The Unix Shell has very easy to use command but also considers the details while using it. For example, from the sort command I know that `sort` command itself sort its content alphabetically, while adding `-n` flag sort its content numerically, so I should consider using the leading zeros sometimes.

In addition, `|` allows the shell to print the output with different criteria. The `for` loop in Unix Shell is similar to what I learnt in python. The for loop operate on lists of items and repeat a set of commands for every item in a list, and its really flexible to just write one `for` loop and have both print output and saved file.

I feel like learning shell scripting is easier than learning Python, because there is not many rules. I can just do it from bash and working with files and getting data from one program into another, and don't need to install anything. For example, I can write Python and SQL scripts from Unix shell. One of the interesting features it has is the tab completion, where I just need to press tab so that the shell will automatically gives me the name of the file I want to write.

Even though the Unix shell does not have a trash bin that we can recover deleted files from, it records each command and I could easily access it from history. The wildcard expression is similar to regular expressions while I am not sure how wildcard expression works if I want to express multiple file names or extensions. The most common ones are `*` which matches zero or more characters and `?` which only matches a single character. There are few commands and symbols to remember, but they are all pretty straightforward. For example, `>>` append the content of one or more files to another file and saved it in the directory. `grep` and `find` to find files and things in files.

PART 2

In Working With Files and Directories (lesson 03)

- Creating Files a Different Way

1. The `touch` command creates a new empty text file called `my_file.txt` in my home directory. When I look at my home directory using `ls`, the file I created shows up.

```
[$ cd
[$ pwd
/Users/mikedu
[$ touch my_file.txt
[$ ls
Applications            Movies                  Temperature.csv
Desktop                 Music                   laxMonthlyPrecip.csv
Documents               Part2.kml               laxWeather.csv
Downloads               Part3.kml               my_file.txt
EC_Plot2                Pictures                sfoMonthlyPrecip.csv
Fullname.csv            Proj1                   sfoWeather.csv
HW9_Plot                Public                  stateoftheunion1790.txt
Library                 SiteReadings.csv        survey.db
```

2. Use `ls -l` to inspect myfile.txt, the file is `0` in size.

```
[$ ls -l my_file.txt
-rw-r--r--@ 1 mikedu  staff  0 Nov 19 23:22 my_file.txt
```

3. I use touch command to create a file with the name already exist in another directory, and the touch command creates a new empty text file with the same name.

```
[$ cd
[$ pwd
/Users/mikedu
[$ touch stateoftheunion.txt
[$ ls -l stateoftheunion.txt
-rw-r--r--  1 mikedu  staff  0 Nov 19 23:26 stateoftheunion.txt
```

I then use touch command to create a file with the name exist in the home directory, and the touch command keeps the size of the original file and only updates the date last modified of the file.

```
[$ cd
[$ pwd
/Users/mikedu
[$ touch stateoftheunion1790.txt
[$ ls -l stateoftheunion1790.txt
-rw-r--r--@ 1 mikedu  staff  10154969 Nov 19 22:54 stateoftheunion1790.txt
```

So touch command can be use to create a file when the file doesn't exit or when I want to update the timestamp of an existing file the directory.

- Moving to the Current Folder

`analyzed` is the directory of `sucrose.dat` and `maltose.dat` currently in, so `mv` keeps the filenames of these two files but put at somewhere new, `.` means to put the file in the directory name we just specified `cd raw/`

```
$ ls -F raw/analyzed
fructose.dat    glucose.dat     maltose.dat     sucrose.dat
$ cd raw/
$ mv analyzed/sucrose.dat analyzed/maltose.dat .
$ ls
analyzed        maltose.dat     sucrose.dat
```

- Using `rm` Safely

When we type `rm -i thesis/quotations.txt`, the shell asks whether we are sure about removing the file.
If we are concerned about what we might be deleting, adding the "interactive" flag `-i` to `rm` will ask us for confirmation before each step, so that we won't delete file accidentally and cannot recover the file.

```
$ pwd
/Users/mikedu/Desktop/thesis
$ cd ..
$ pwd
/Users/mikedu/Desktop
$ rm -i thesis/quotations.txt
remove thesis/quotations.txt? n
$ rm -i thesis/quotations.txt
remove thesis/quotations.txt? y
```

In Pipes and Filters (lesson 04)

- What Does sort -n Do?

`sort` command sort its content alphabetically, while adding `-n` flag specify that the sort is **numerical** instead of alphabetical.

- What Does < Mean?

< redirects its input
`$ wc -l mydata.dat` gets a command line parameter telling it what file to open.

```
$ wc -l mydata.txt
       5 mydata.txt
```

`$ wc -l < mydata.dat,` `wc` doesn't have any command line parameters, so it reads from standard input, but we have told the shell to send the contents of `mydata.dat` to `wc`'s standard input.

```
$ wc -l < mydata.txt
       5
```

- Wildcard Expressions

1. ∗ matches zero or more characters in a filename, so `∗A.txt ∗B.txt` matches all files ending in A.txt or B.txt.

```
$ ls
234e.txt        erat.txt        mydatA.txt      wtqB.txt
A.txt           erb.txt         wa.txt
$ ls *A.txt
A.txt           mydatA.txt
$ ls *B.txt
wtqB.txt
$ ls *A.txt *B.txt
A.txt           mydatA.txt      wtqB.txt
```

In Loops (lesson 05)

- Variables in Loops

The first for loop is for each file ending with `.dat`, list all the files ending with `.dat`. Since there are total three files ending with `.dat`, the loop returns three files for three times, so each file is repeated three times.

```
$ for datafile in *.dat
> do
> ls *.dat
> done
fructose.dat    glucose.dat     sucrose.dat
fructose.dat    glucose.dat     sucrose.dat
fructose.dat    glucose.dat     sucrose.dat
```

The shell starts by expanding `∗.dat` to create the list of files it will process. This for loop is for each file ending with `.dat`, list that file. There are three files in total, so loop three time returns one file each time.

```
$ for datafile in *.dat
> do
> ls $datafile
> done
fructose.dat
glucose.dat
sucrose.dat
```

- Saving to a File in a Loop - Part One

Prints fructose.dat, glucose.dat, and sucrose.dat, and the text from sucrose.dat will be saved to a file called xylose.dat.

The shell starts by expanding `∗.dat` to create the list of files it will process. The loop body then executes two commands for each of those files. The first, echo, since the shell expands `$sugar` to be the name of a file, echo `$sugar` just prints the name of the file.

`cat` stands for "concatenate" and prints the contents of each file one after another. The greater than symbol, >, tells the shell to redirect the contents of the file to a file called `xylose.dat` instead of printing it to the screen. The temporary file is created in the same directory. The final output of `xylose.dat` only contains the content of `sucrose.dat`.

```
$ for sugar in *.dat
> do
> echo $sugar
> cat $sugar > xylose.dat
> done
fructose.dat
glucose.dat
sucrose.dat
```

- Saving to a File in a Loop - Part Two

All of the text from fructose.dat, glucose.dat and sucrose.dat would be concatenated and saved to a file called sugar.dat.

The shell starts by expanding `*.dat` to create the list of files it will process. The loop body then executes the commands for each of those files. `cat` prints the contents of each file one after another. >> tells the shell to append the contents of `$sugar` to a file called `sugar.dat` instead of printing it to the screen. The final output of `sugar.dat` contains the content of each `*.dat` file.

```
$ for datafile in *.dat
> do cat $datafile >> sugar.dat
> done
```

In Shell Scripts (lesson 06):

- Why Record Commands in the History Before Running Them?

The shell always adds commands to the log before running them so that the history contains all the commands in the session, It prints the history list, so that one can recall and edit particular commands and for setting parameters such as the number of past commands to retain in the list, and also allows one to search command.

- Show me screenshots that you followed along with making Nelle's Pipeline: Creating a Script. Also attach the shell script that you created in the process.

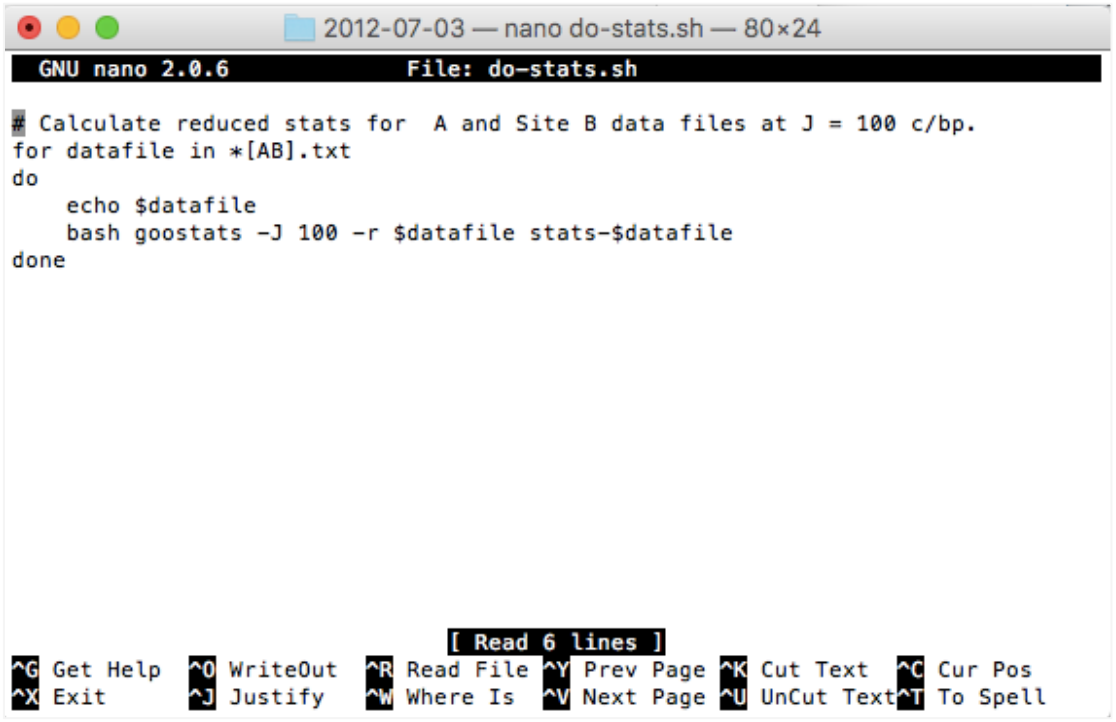
```
$ cd
$ cd data-shell/north-pacific-gyre/2012-07-03
$ pwd
/Users/mikedu/data-shell/north-pacific-gyre/2012-07-03
$ nano do-stats.sh
$ bash do-stats.sh *[AB].txt
NENE01729A.txt
NENE01729B.txt
NENE01736A.txt
NENE01751A.txt
NENE01751B.txt
NENE01812A.txt
NENE01843A.txt
NENE01843B.txt
NENE01978A.txt
NENE01978B.txt
NENE02018B.txt
NENE02040A.txt
NENE02040B.txt
NENE02043A.txt
NENE02043B.txt
$ cd
$ cd data-shell/north-pacific-gyre/2012-07-03
$ nano do-stats.sh
$ bash do-stats.sh *[AB].txt | wc -l
      15
```

2012-07-03 — nano do-stats.sh — 80×24

```
 GNU nano 2.0.6                File: do-stats.sh

# Calculate reduced stats for data files at J = 100 c/bp.
for datafile in "$@"
do
    echo $datafile
    bash goostats -J 100 -r $datafile stats-$datafile
done

                              [ Read 6 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```


2012-07-03 — nano do-stats.sh — 80×24
GNU nano 2.0.6 File: do-stats.sh
Calculate reduced stats for A and Site B data files at J = 100 c/bp.
for datafile in *[AB].txt
do
echo $datafile
bash goostats -J 100 -r $datafile stats-$datafile
done
[Read 6 lines]
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell