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STATS 419
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r-intro

Handshake

This function will determine how many handshakes are possible between a given number of people. The arguments for the function `handshake(n,plotme=F)` are `n` which is a positive integer and `plotme` which is a boolean value to determine if a graphical representation should be displayed the default value for plotme is `plotme=FALSE`. The following formula is what the handshake function uses to determine the number of possible handshakes.

$$\frac{n(n-1)}{2}$$

```
handshake(4,T)
```

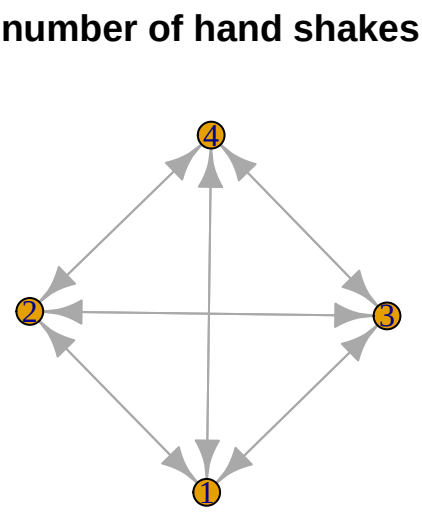


Figure 1: Plot produced from handshake(n=4,plotme=T)

Letter count

The function `letter_count(string)` will take a string and will count the number of occurrences for each letter in the string. The `string` parameter for the function `letter_count` can be any kind of string data type.

Letter count of the Declaration of Independance draft

The following data frame shows the letter with their associated counts. The column other is any other character that is not a letter.

```
fileName <- 'draft.txt' # declare the file as a variable
original = readChar(fileName, file.info(fileName)$size) # read the file as a string of characters
original_df = letter_count(original) # compute the letter count
original_df
```

```
##     a   b   c   d    e   f   g   h   i  j  k   l   m   n   o   p q   r   s   t
## 1 555 117 225 260 1090 246 164 441 575 19 20 264 196 546 658 180 7 556 572 791
##     u  v   w  x   y z OTHER
## 1 244 97 130 12 108 3   238
```

Letter count of Declaration of Independance signed by Congress

The following data frame shows the letters and their associated counts for the Declaration of Independence.

```
fileName <- 'final.txt' # declare the file as a variable
final = readChar(fileName, file.info(fileName)$size) # read the file as a string of characters
final_df = letter_count(final) # compute the letter count
final_df
```

```
##     a  b   c   d   e   f   g   h   i  j  k   l   m   n   o   p q   r   s   t
## 1 483 95 186 254 867 182 130 352 454 16 14 229 146 488 517 138 6 428 481 648
##     u  v  w x  y z OTHER
## 1 212 74 97 9 81 4   169
```

Declaration of Independance draft Visualization

Here is a bar plot to help visualize the count of each letter.

```
# generate frequency of letters
og_table = as.table(as.matrix(original_df))
# display the frequencies as a bar plot
barplot(og_table,main="Letter Count of draft.txt")
```

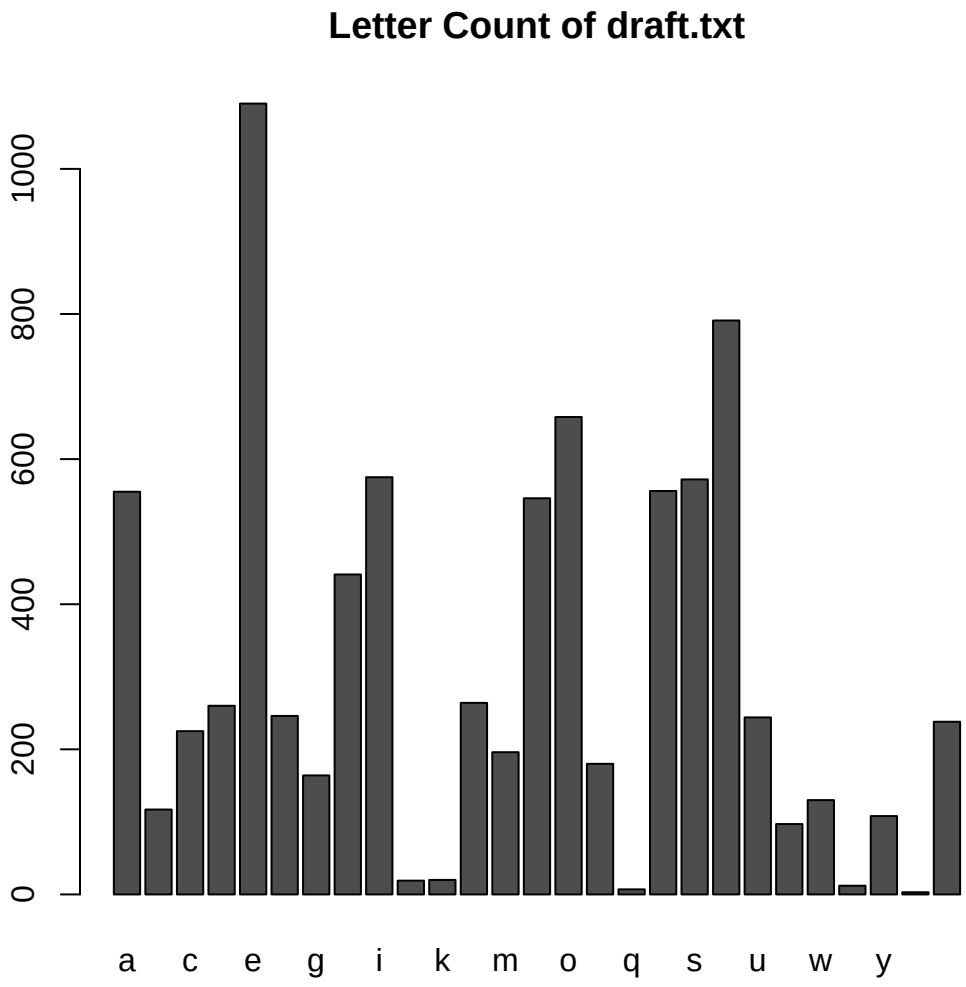
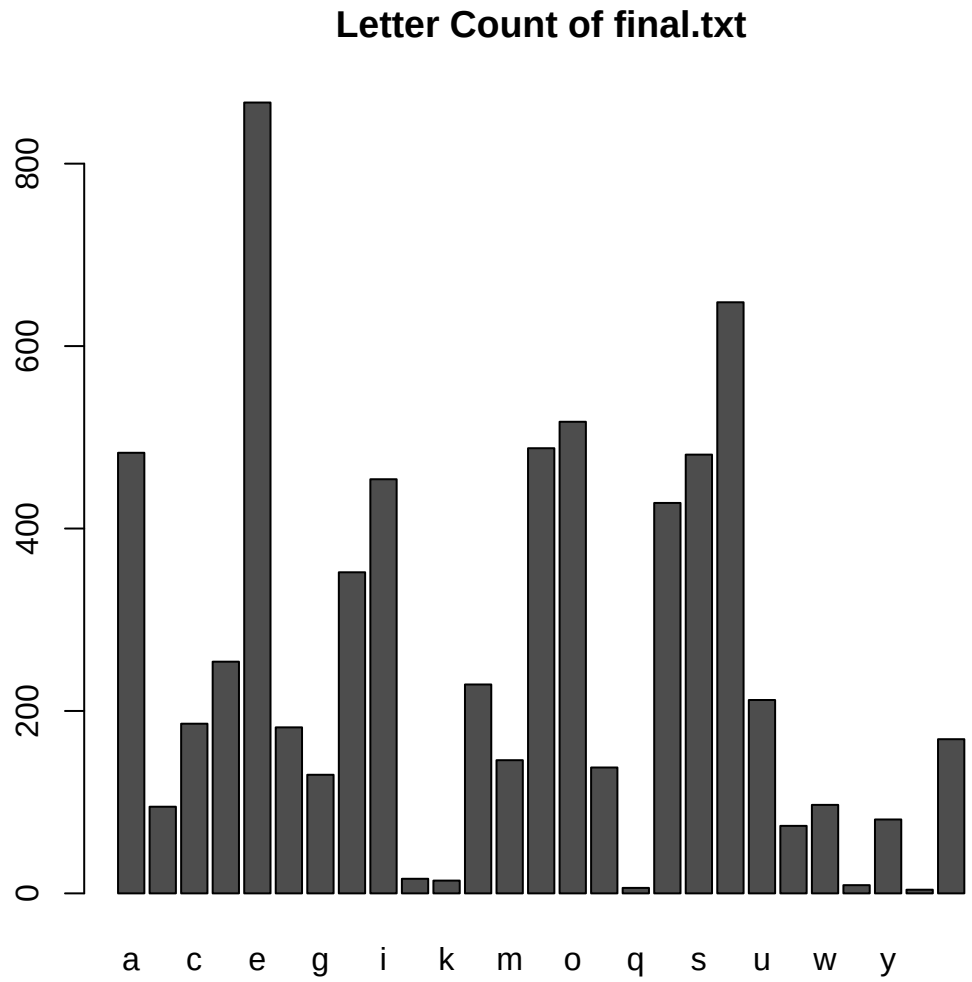


Figure 2: Letter count for the original draft of the Declaration of Independance

Declaration of Independance signed by Congress Visualization

This is a bar plot to help visualize the count of each letter.

```
# generate frequency of letters
final_table = as.table(as.matrix(final_df))
# display the frequencies as a bar plot
barplot(final_table,main="Letter Count of final.txt")
```



Comparing the letter counts between the two Declaration of Independance texts.

As we can see very little change between the original draft and the one Congress signed. We can also see that the letter 'e' is the most common letter as we would expect. If we take the sum of the 'original.txt' letter count including the 'Other' column we get a total of 8,314 characters. If we do the same thing to the 'final.txt' we get a total of 6,760 which is surprising to me since congress usually adds more legal jargon. I also think looking at the frequency of each letter really shows us that some letters are quite a bit more frequent then say the letter 'k' or 'q'.

Compute Determinant

The function `computeDeterminant(m)` takes any square matrix as the argument and performs the determinant calculation. The formula for calculating the determinant of the $3x3$ matrix $A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$ is as follows:

$$|A| = a(ei - fh) - b(di - fg) + c(dh - e)$$

To work out the determinant of a $3x3$ matrix:

- Multiply a by the determinant of the $2x2$ matrix that is not in a's row or column.
- Likewise for b, and for c
- Sum them up, but remember the minus in front of the b

```
# generate a random 3x3 matrix
m = matrix(floor(runif(9,min=1,max=25)),nrow=3,ncol=3)
# display matrix
m
```

```
##      [,1] [,2] [,3]
## [1,]    9    3   15
## [2,]   13   14   15
## [3,]   12   11    8
```

```
# compute determinant
computeDeterminant(m)
```

```
## [1] -624
```

The determinant for the matrix $A = \begin{bmatrix} 9 & 3 & 15 \\ 13 & 14 & 15 \\ 12 & 11 & 8 \end{bmatrix}$ is equal to -624