Executive Summary Report 2

Course Name: ALY6000 Introduction to Analytics

CRN 22279

Student Name: Sanjana Sandeep Mohile

Date: January 29,2022

Professor: Mohammad Shafiqul Islam

NUID: 002123793

INTRODUCTION

The following project will provide you with a thorough understanding of R and RStudio as well as some hands-on experience. The objective of the project is to learn:

- How to load and install several libraries
- How to only show a portion of the dataset's observations
- How to create a new dataset from an existing one
- How to decipher a dataset's structure and summary
- With a given set of specifications, how to generate a scatterplot, histogram, overdense plot, regression line, and legend

A. Provide an analysis of descriptive characteristics of the data set provided by your instructor. This includes pertinent statistics including mean, median, quartiles, variance, standard deviation, skew, kurtosis, outliers, etc. Include R console screenshots to support your observations and conclusions. Below is a sample excerpt of an analysis of Harrison Lake fish from the BullTroutRML2 dataset.

```
> str(harrison_data_new)                #Q7
'data.frame':   61 obs. of  4 variables:
 $ age : int  14 12 10 10 9 9 9 8 8 7 ...
 $ fl  : int  459 449 471 446 400 440 462 480 449 437 ...
 $ lake: Factor w/ 2 levels "Harrison","Osprey": 1 1 1 1 1 1 1 1 1 1 ...
 $ era : Factor w/ 2 levels "1977-80","1997-01": 1 1 1 1 1 1 1 1 1 1 ...
```

Explanation: -

- ➔ On applying a filter [lake == Harrison] to the original dataset i.e.BullTroutRML2 , we get a new dataset which is named harrison_data_new in this document.
- ➔ This new dataset contains 61 observations and 4 variables: namely – age, fl, lake, era.
- ➔ Here, age and fl are of same data type i.e. int whereas lake and era belong to factor data structure.

➔ Lake and era, both have two elements each; namely – Harrison and Osprey; 1977-80 and 1997-01 respectively.

```
> summary(harrison_data_new)            #Q8
      age                fl            lake          era
 Min.   : 0.000   Min.   : 20   Harrison:61   1977-80:23
 1st Qu.: 3.000   1st Qu.:221   Osprey  : 0   1997-01:38
 Median : 6.000   Median :372
 Mean   : 5.754   Mean   :319
 3rd Qu.: 8.000   3rd Qu.:425
 Max.   :14.000   Max.   :480
```

Explanation: -

➔ The following is the summary of the filtered dataset harrison_data_new.

➔ Harrison Lake has a minimum age of 0 years and a maximum of 14 years. The mean age of the lake is found to be 5.754 years and its median is seen to be 6.

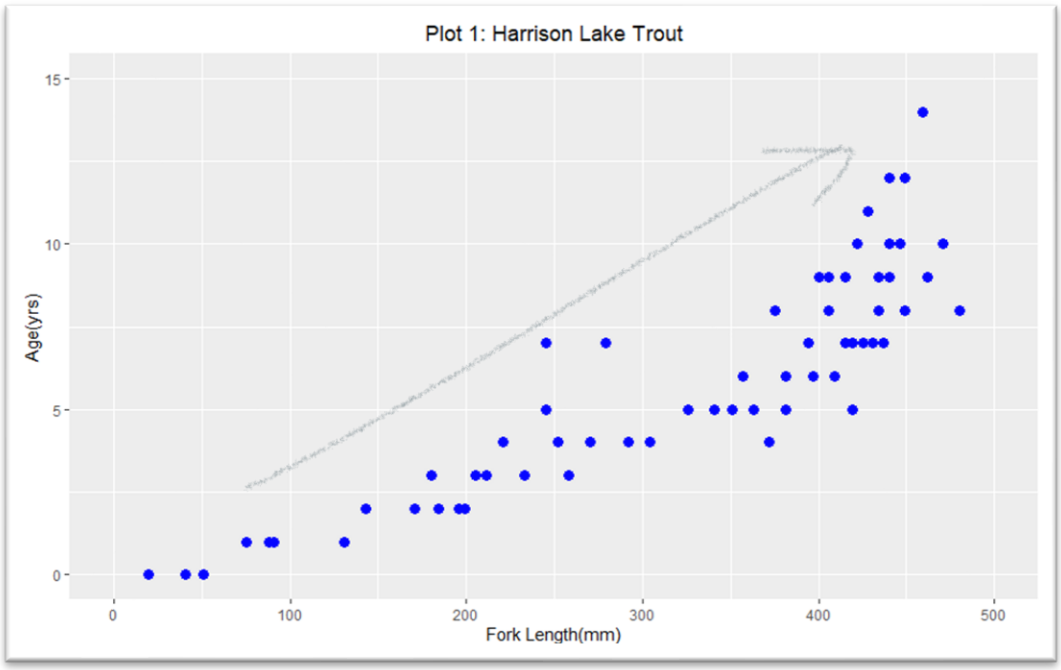
➔ The fork length has a minimum of 20mm and a maximum of 480mm. Its median is seen to be 372mm and the mean is found to be 319mm.

➔ Since the data set is filtered with Harrison Lake's observations, only the Osprey number is zero and all the 61 observations are of Harrison Lake only.

➔ The era has two levels, 1977-1980 and 1997-2001 has 23 and 38 observations respectively.

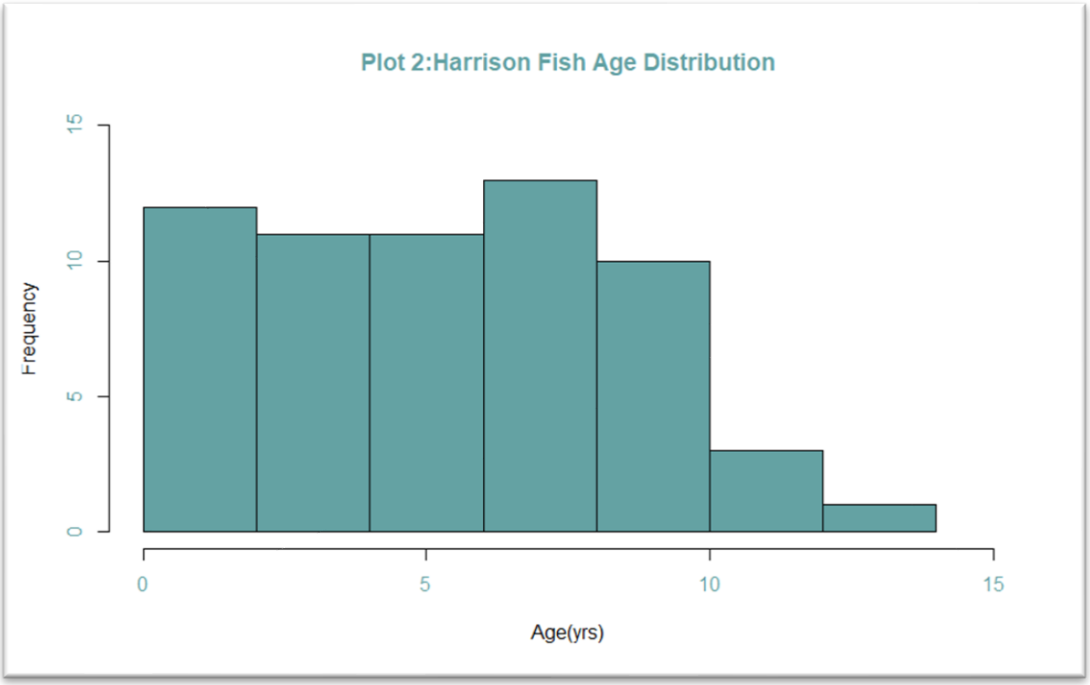
B. Provide the executive with visualizations (at least 6) in that help them see the key characteristics you want to highlight. They can be boxplots, histograms, frequency and probability distributions, barplots (bar charts) or pareto. Not only is the goal to present your visual results, but also to explain the significance of what the visuals are displaying.

1]



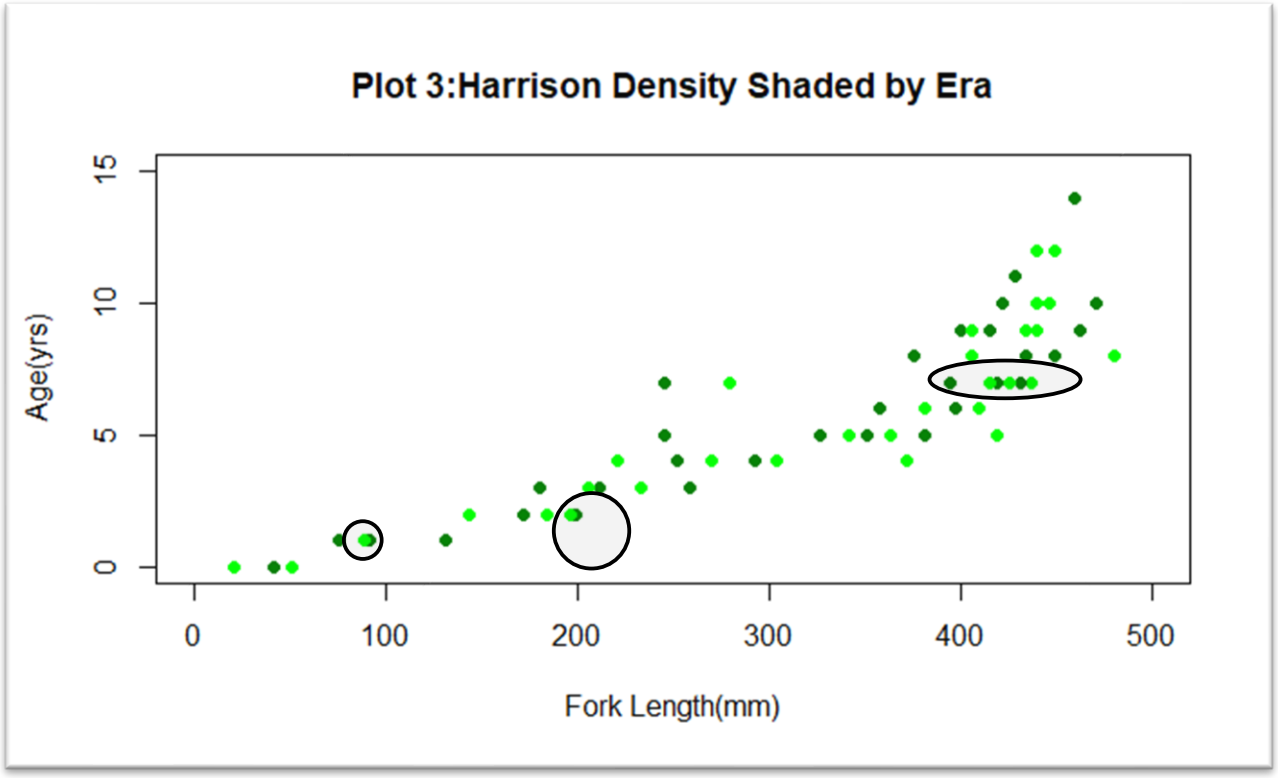
- ➔ The Harrison Lake Trout Scatter plot is plotted using the harrison_data_new dataset.
- ➔ On the x-axis, fork length is measured in mm whereas on the y-axis age is measured in years.
- ➔ By observing, one thing becomes very clear and that is the length of the lake has increased gradually over time.
- ➔ Over the age of 15 years, the lake rose from 20mm (which is the minimum length we observed above, on giving the command summary(harrison_data_new)) to 480mm(which was again observed from the summary(harrison_data_new)).

2]



- ➔ The above histogram depicts the frequency of fishes in Harrison lake on the basis of their age.
- ➔ On observing the graph we see that the maximum age of fishes is 13-14 years approximately.
- ➔ There are at least 12 fishes aged from 0 to 2 years.
- ➔ Approximately, there are 11 fish those range from 3 to 6 years.
- ➔ Their maximum frequency is seen to be approximately 13 at the age of 6-8 years.
- ➔ After crossing 8 years, their frequency is decreased from 13 to 10.
- ➔ There is a sudden decrease in the frequency of fishes at the age of 10 years which was to be recorded as 2-3 by the age of 12 years and 1-2 by the age of 14 years.

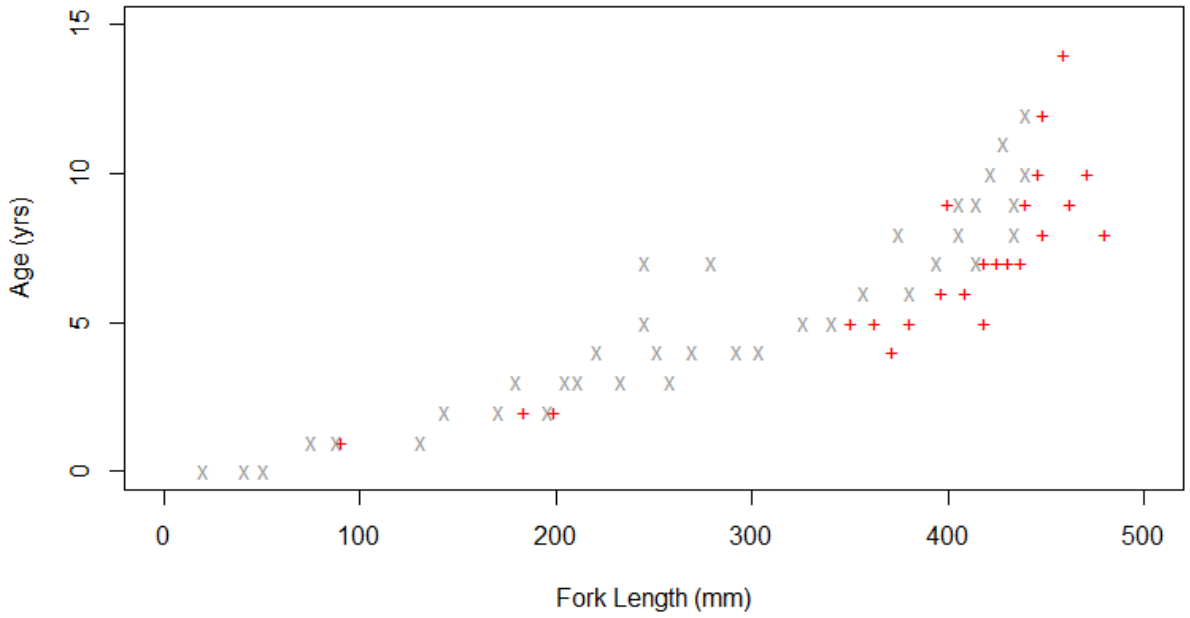
Q3]



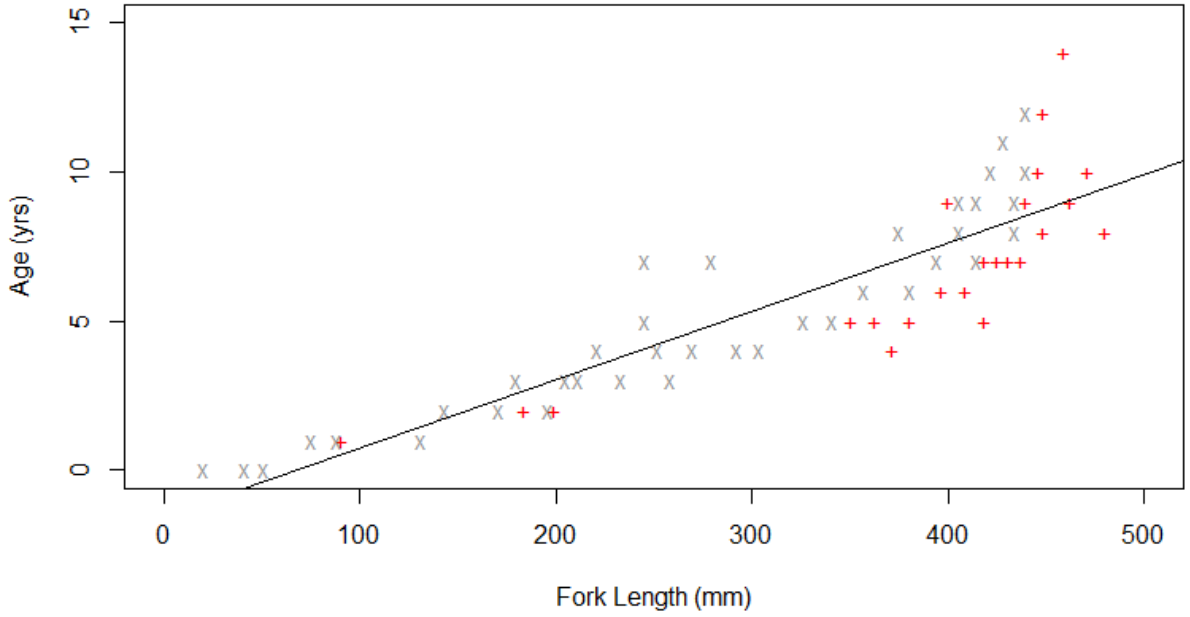
- ➔ The above is an overdense plot of harrison_data_new dataset, in which fork length is measured vs the age of the lake.
- ➔ Since there are two levels of the era, we have two different colored points.
- ➔ The minimum fork length is measured to be approximately 20mm and the maximum is seen to be 480mm.
- ➔ On observing the graph, you can see three black circles. These circles show the overlapping of the two eras.

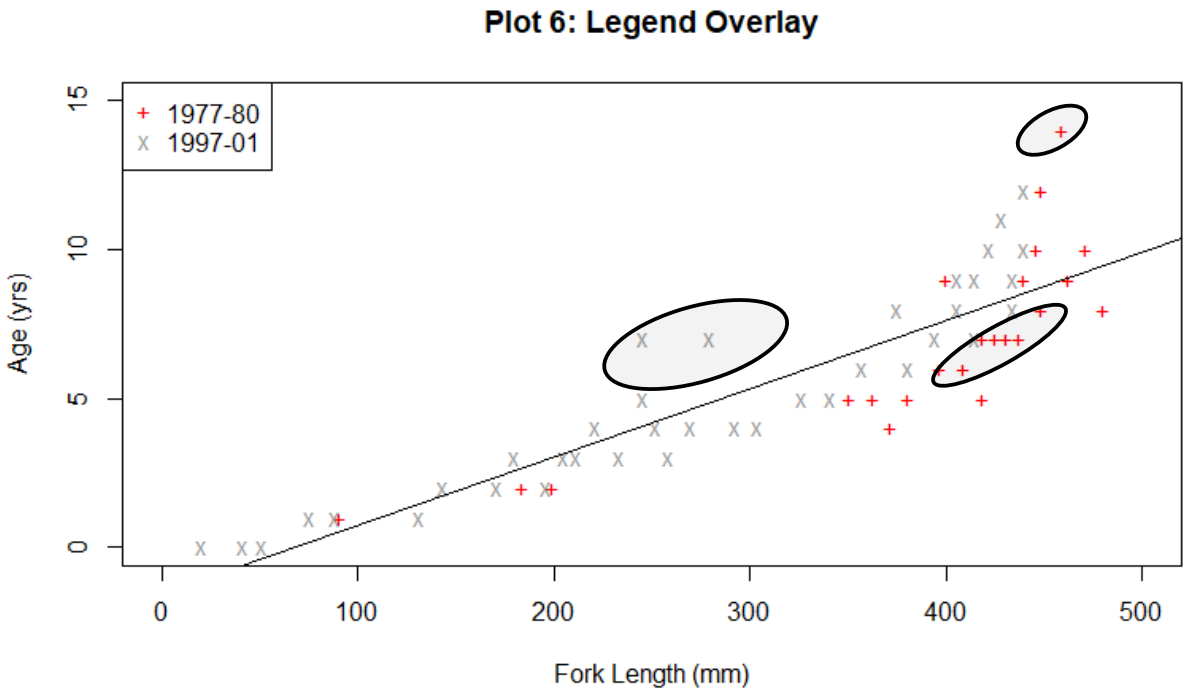
Q4]

Plot 4: Symbol & Color by Era



Plot 5: Regression Overlay





- ➔ The above plots 4,5 and 6 are fork length vs age graph of the filtered data set i.e. harrison_new_data. Fork length is measured in mm and age is measured in years.
- ➔ In all the three graphs, the eras are of two levels. One is represented by the red cross and another s represented by grey Xs.
- ➔ Plot 4 shows the two different levels of eras whereas plot 5 has a regression line as well. Plot 6 includes both the attributes of plots 4 and 5. In addition to that, it also has a legend which makes it easy for an individual to understand the graph.
- ➔ The red cross represents the first era i.e. of 1977-80 and the grey X represents the second era 1997-01.
- ➔ We can also observe that not all the points lay on the regression line. Some points are seen to be below the regression line, whereas some are seen to be above it.
- ➔ Observing plot 6 gave me some insights into the data. Almost 80% of the data lie on the regression line or above/below it. And hence regression model is said to be a good fit model. We can depend on this model for prediction purposes as well.

➔ Because we had to plot only a single variable i.e. [age~fork length] linear regression was a good option, in case of multiple variables we should use other regression models.

C. Summary

The dataset which was used to compile this report was harrison_data_new. After applying a filter to the original dataset, BullTroutRML2, this dataset was created. The original dataset contains information on Harrison Lake and Osprey Lake, but only Harrison Lake data is included in harrison_data_new. Further, this new dataset has 61 observations and four variables: age, fl, lake, and era. The age of the lake and the length of its fork are found to be directly proportional. The data was visually represented in such a way that it was evident that two eras were involved. When we created a regression line, we observed that not all of the points were on it. Some are found both below and above the regression line. Takeaways of every graph are explained in detail in the above pages.

Bibliography

1. **Filter Data by multiple conditions in R using dplyr(Geeksforgeeks, January 2022)**
   https://www.geeksforgeeks.org/filter-data-by-multiple-conditions-in-r-using-dplyr
   Last Accessed: 27th January 2022
2. **How to check the data structure of an object in R (November 2021)**
   str in R: How to Check Data Structure of Object in R (r-lang.com)
   Last Accessed: 27th January 2022
3. **Scatter Plot in R using ggplot2 (Guru99, December 2021)**
   https://www.guru99.com/r-scatter-plot-ggplot2.html
   Last Accessed: 27th January 2022
4. **ggplot title, subtitle, and caption(Datanovia,November 2021)**
   GGPlot Title, Subtitle and Caption : The Ultimate Guide - Datanovia
5. **Histograms in R Language(Geeksforgeeks December 2021)**
   https://www.geeksforgeeks.org/histograms-in-r-language/
   Last Accessed: 27th January 2022
6. **PCH In R Best Tips(Datanovia,December 2021)**
   PCH in R Best Tips - Datanovia

My Github repository link

https://github.com/SanjanaMohile/ALY6000_Module2.git

Appendix

Module-2-Project.R

mohil

2022-01-27

```
r = getOption("repos")
r["CRAN"]="http://cran.us.r-project.org"
options(repos=r)


#1. Print "Plotting Basics: Lastname"
print("Plotting Basics: Mohile")

## [1] "Plotting Basics: Mohile"

#2.installing required packages
# install.packages('FSA')
# install.packages('FSAdata')
# install.packages('magrittr')
# install.packages('dplyr')
# install.packages('plotrix')
# install.packages('ggplot2')
# install.packages('moments')
#.importing required libraries
install.packages('FSA')

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'FSA' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages

install.packages('FSAdata')

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'FSAdata' successfully unpacked and MD5 sums checked
##
```

```
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages

install.packages('magrittr')

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

##
##   There is a binary version available but the source version is later:
##          binary source needs_compilation
## magrittr  2.0.1  2.0.2              TRUE
##
##   Binaries will be installed
## package 'magrittr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'magrittr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE):
## problem copying C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\00LOCK\magrittr\libs\x64\magrittr.dll
## to C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\magrittr\libs\x64\magrittr.dll: Permission denied

## Warning: restored 'magrittr'

##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages

install.packages('dplyr')

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'dplyr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'dplyr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE):
## problem copying C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\00LOCK\dplyr\libs\x64\dplyr.dll to C:
## \Users\mohil\OneDrive\Documents\R\win-library\4.1\dplyr\libs\x64\dplyr.dll
:
## Permission denied

## Warning: restored 'dplyr'

##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages
```

```
install.packages('plotrix')
```

```
## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)
```

```
## package 'plotrix' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages
```

```
install.packages('ggplot2')
```

```
## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)
```

```
## package 'ggplot2' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages
```

```
install.packages('moments')
```

```
## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)
```

```
## package 'moments' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpCmmfjT\downloaded_packages
```

```
library('FSA')
```

```
## ## FSA v0.9.1. See citation('FSA') if used in publication.
## ## Run fishR() for related website and fishR('IFAR') for related book.
```

```
library('FSAdata')
```

```
## ## FSAdata v0.3.8. See ?FSAdata to find data for specific fisheries analys
es.
```

```
library('magrittr')
library('dplyr')
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

library('plotrix')
library('ggplot2')
library('moments')


#3.loading the data
BullTroutRML2

##    age  fl     lake     era
## 1   14 459 Harrison 1977-80
## 2   12 449 Harrison 1977-80
## 3   10 471 Harrison 1977-80
## 4   10 446 Harrison 1977-80
## 5    9 400 Harrison 1977-80
## 6    9 440 Harrison 1977-80
## 7    9 462 Harrison 1977-80
## 8    8 480 Harrison 1977-80
## 9    8 449 Harrison 1977-80
## 10   7 437 Harrison 1977-80
## 11   7 431 Harrison 1977-80
## 12   7 425 Harrison 1977-80
## 13   7 419 Harrison 1977-80
## 14   6 409 Harrison 1977-80
## 15   6 397 Harrison 1977-80
## 16   5 419 Harrison 1977-80
## 17   5 381 Harrison 1977-80
## 18   5 363 Harrison 1977-80
## 19   5 351 Harrison 1977-80
## 20   4 372 Harrison 1977-80
## 21   2 199 Harrison 1977-80
## 22   2 184 Harrison 1977-80
## 23   1  91 Harrison 1977-80
## 24  12 440 Harrison 1997-01
## 25  11 428 Harrison 1997-01
## 26  10 440 Harrison 1997-01
## 27  10 422 Harrison 1997-01
## 28   9 434 Harrison 1997-01
## 29   9 415 Harrison 1997-01
## 30   9 406 Harrison 1997-01
## 31   8 434 Harrison 1997-01
## 32   8 406 Harrison 1997-01
## 33   8 375 Harrison 1997-01
## 34   7 415 Harrison 1997-01
## 35   7 394 Harrison 1997-01
## 36   6 381 Harrison 1997-01
## 37   6 357 Harrison 1997-01
```

```
## 38   5 341 Harrison 1997-01
## 39   5 326 Harrison 1997-01
## 40   4 304 Harrison 1997-01
## 41   4 292 Harrison 1997-01
## 42   4 270 Harrison 1997-01
## 43   4 252 Harrison 1997-01
## 44   4 221 Harrison 1997-01
## 45   3 258 Harrison 1997-01
## 46   3 233 Harrison 1997-01
## 47   3 211 Harrison 1997-01
## 48   3 205 Harrison 1997-01
## 49   3 180 Harrison 1997-01
## 50   2 196 Harrison 1997-01
## 51   2 171 Harrison 1997-01
## 52   2 143 Harrison 1997-01
## 53   1 131 Harrison 1997-01
## 54   1  88 Harrison 1997-01
## 55   1  75 Harrison 1997-01
## 56   0  51 Harrison 1997-01
## 57   0  41 Harrison 1997-01
## 58   0  20 Harrison 1997-01
## 59   7 245 Harrison 1997-01
## 60   7 279 Harrison 1997-01
## 61   5 245 Harrison 1997-01
## 62   8 360   Osprey 1977-80
## 63   8 357   Osprey 1977-80
## 64   7 357   Osprey 1977-80
## 65   7 329   Osprey 1977-80
## 66   6 385   Osprey 1977-80
## 67   6 323   Osprey 1977-80
## 68   5 369   Osprey 1977-80
## 69   5 326   Osprey 1977-80
## 70   4 357   Osprey 1977-80
## 71   4 326   Osprey 1977-80
## 72   4 258   Osprey 1977-80
## 73   4 239   Osprey 1977-80
## 74   3 221   Osprey 1977-80
## 75   3 258   Osprey 1977-80
## 76   3 276   Osprey 1977-80
## 77  11 688   Osprey 1997-01
## 78  10 369   Osprey 1997-01
## 79   9 400   Osprey 1997-01
## 80   8 381   Osprey 1997-01
## 81   8 332   Osprey 1997-01
## 82   7 394   Osprey 1997-01
## 83   7 388   Osprey 1997-01
## 84   7 354   Osprey 1997-01
## 85   7 320   Osprey 1997-01
## 86   6 320   Osprey 1997-01
## 87   6 347   Osprey 1997-01
```

```
## 88   6 360   Osprey 1997-01
## 89   5 354   Osprey 1997-01
## 90   5 335   Osprey 1997-01
## 91   5 313   Osprey 1997-01
## 92   5 289   Osprey 1997-01
## 93   4 313   Osprey 1997-01
## 94   4 298   Osprey 1997-01
## 95   3 279   Osprey 1997-01
## 96   3 273   Osprey 1997-01
```

```
#4.Printing the first and last 3 records from the BullTroutRMS2 dataset
head(BullTroutRML2,n=3)
```

```
##   age  fl     lake     era
## 1  14 459 Harrison 1977-80
## 2  12 449 Harrison 1977-80
## 3  10 471 Harrison 1977-80
```

```
tail(BullTroutRML2,n=3)
```

```
##    age  fl   lake     era
## 94   4 298 Osprey 1997-01
## 95   3 279 Osprey 1997-01
## 96   3 273 Osprey 1997-01
```

```
#5. Remove all records except those from Harrison Lake
harrison_data_new <- filter(BullTroutRML2, lake=='Harrison')
harrison_data_new
```

```
##    age  fl     lake     era
## 1   14 459 Harrison 1977-80
## 2   12 449 Harrison 1977-80
## 3   10 471 Harrison 1977-80
## 4   10 446 Harrison 1977-80
## 5    9 400 Harrison 1977-80
## 6    9 440 Harrison 1977-80
## 7    9 462 Harrison 1977-80
## 8    8 480 Harrison 1977-80
## 9    8 449 Harrison 1977-80
## 10   7 437 Harrison 1977-80
## 11   7 431 Harrison 1977-80
## 12   7 425 Harrison 1977-80
## 13   7 419 Harrison 1977-80
## 14   6 409 Harrison 1977-80
## 15   6 397 Harrison 1977-80
## 16   5 419 Harrison 1977-80
## 17   5 381 Harrison 1977-80
## 18   5 363 Harrison 1977-80
## 19   5 351 Harrison 1977-80
## 20   4 372 Harrison 1977-80
## 21   2 199 Harrison 1977-80
```

```
## 22   2 184 Harrison 1977-80
## 23   1  91 Harrison 1977-80
## 24  12 440 Harrison 1997-01
## 25  11 428 Harrison 1997-01
## 26  10 440 Harrison 1997-01
## 27  10 422 Harrison 1997-01
## 28   9 434 Harrison 1997-01
## 29   9 415 Harrison 1997-01
## 30   9 406 Harrison 1997-01
## 31   8 434 Harrison 1997-01
## 32   8 406 Harrison 1997-01
## 33   8 375 Harrison 1997-01
## 34   7 415 Harrison 1997-01
## 35   7 394 Harrison 1997-01
## 36   6 381 Harrison 1997-01
## 37   6 357 Harrison 1997-01
## 38   5 341 Harrison 1997-01
## 39   5 326 Harrison 1997-01
## 40   4 304 Harrison 1997-01
## 41   4 292 Harrison 1997-01
## 42   4 270 Harrison 1997-01
## 43   4 252 Harrison 1997-01
## 44   4 221 Harrison 1997-01
## 45   3 258 Harrison 1997-01
## 46   3 233 Harrison 1997-01
## 47   3 211 Harrison 1997-01
## 48   3 205 Harrison 1997-01
## 49   3 180 Harrison 1997-01
## 50   2 196 Harrison 1997-01
## 51   2 171 Harrison 1997-01
## 52   2 143 Harrison 1997-01
## 53   1 131 Harrison 1997-01
## 54   1  88 Harrison 1997-01
## 55   1  75 Harrison 1997-01
## 56   0  51 Harrison 1997-01
## 57   0  41 Harrison 1997-01
## 58   0  20 Harrison 1997-01
## 59   7 245 Harrison 1997-01
## 60   7 279 Harrison 1997-01
## 61   5 245 Harrison 1997-01
```

```
#6. Display the first and last 5 records from the filtered BullTroutRML2 data set
head(harrison_data_new, n=5)
```

```
##   age  fl     lake     era
## 1  14 459 Harrison 1977-80
## 2  12 449 Harrison 1977-80
## 3  10 471 Harrison 1977-80
```

```
## 4  10 446 Harrison 1977-80
## 5   9 400 Harrison 1977-80
```

```
tail(harrison_data_new,n=5)
```

```
##    age  fl     lake     era
## 57   0  41 Harrison 1997-01
## 58   0  20 Harrison 1997-01
## 59   7 245 Harrison 1997-01
## 60   7 279 Harrison 1997-01
## 61   5 245 Harrison 1997-01
```

```
#7. Display the structure of the filtered BullTroutRML2dataset
str(harrison_data_new)
```

```
## 'data.frame':    61 obs. of  4 variables:
##  $ age : int  14 12 10 10 9 9 9 8 8 7 ...
##  $ fl  : int  459 449 471 446 400 440 462 480 449 437 ...
##  $ lake: Factor w/ 2 levels "Harrison","Osprey": 1 1 1 1 1 1 1 1 1 1 ...
##  $ era : Factor w/ 2 levels "1977-80","1997-01": 1 1 1 1 1 1 1 1 1 1 ...
```

```
#8. Display the summary of the filtered BullTroutRML2dataset
summary(harrison_data_new)
```

```
##       age              fl            lake         era
##  Min.   : 0.000   Min.   : 20   Harrison:61   1977-80:23
##  1st Qu.: 3.000   1st Qu.:221   Osprey  : 0   1997-01:38
##  Median : 6.000   Median :372
##  Mean   : 5.754   Mean   :319
##  3rd Qu.: 8.000   3rd Qu.:425
##  Max.   :14.000   Max.   :480
```

```
#9. Create a scatterplot for "age" (y variable) and "fl" (x variable) with th
e following specifications:
# Limit of x axis is (0,500)
# Limit of y axis is (0,15)
# Title of graph is "Plot 1: Harrison Lake Trout
# Y axis label is "Age (yrs)"
# X axis label is "Fork Length (mm)"
# Use a small filled circle for the plotted data points
install.packages('ggplot2')
```

```
## Warning: package 'ggplot2' is in use and will not be installed
```

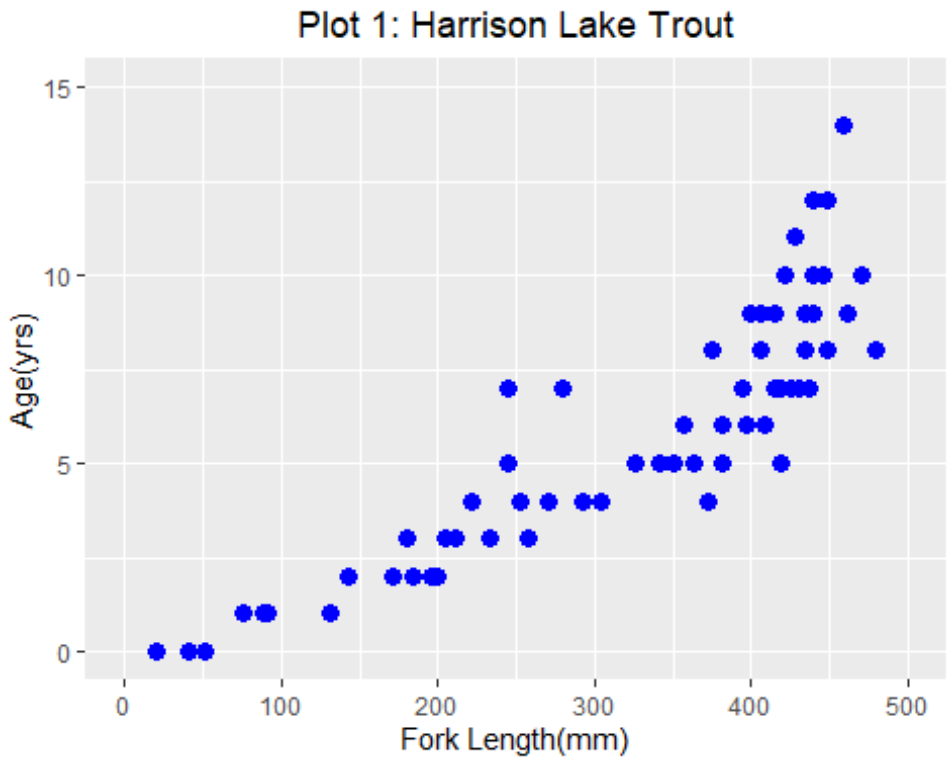
```
library('ggplot2')
```

```
?ggplot
```

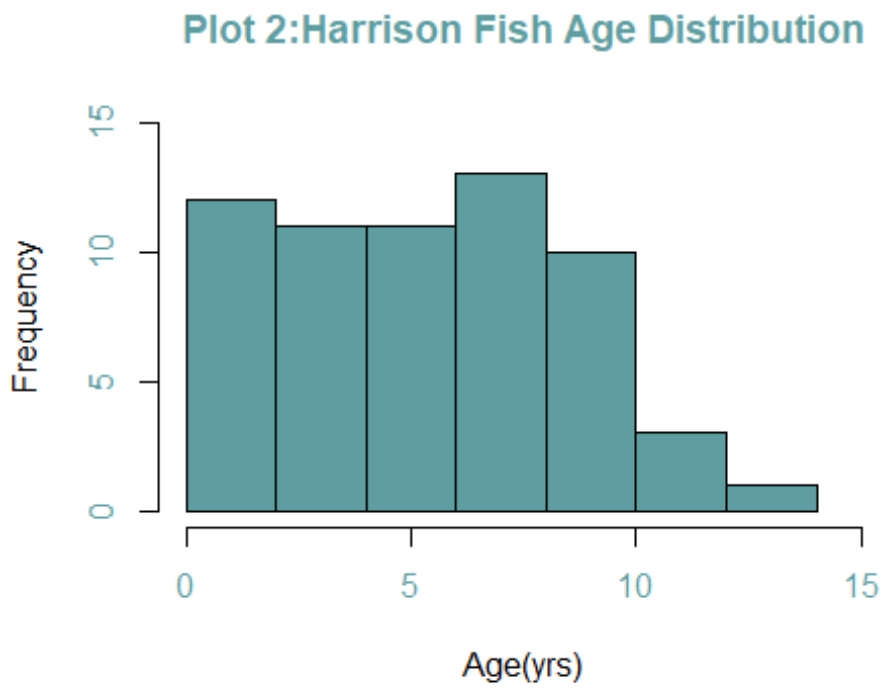
```
## starting httpd help server ...
```

```
##  done
```

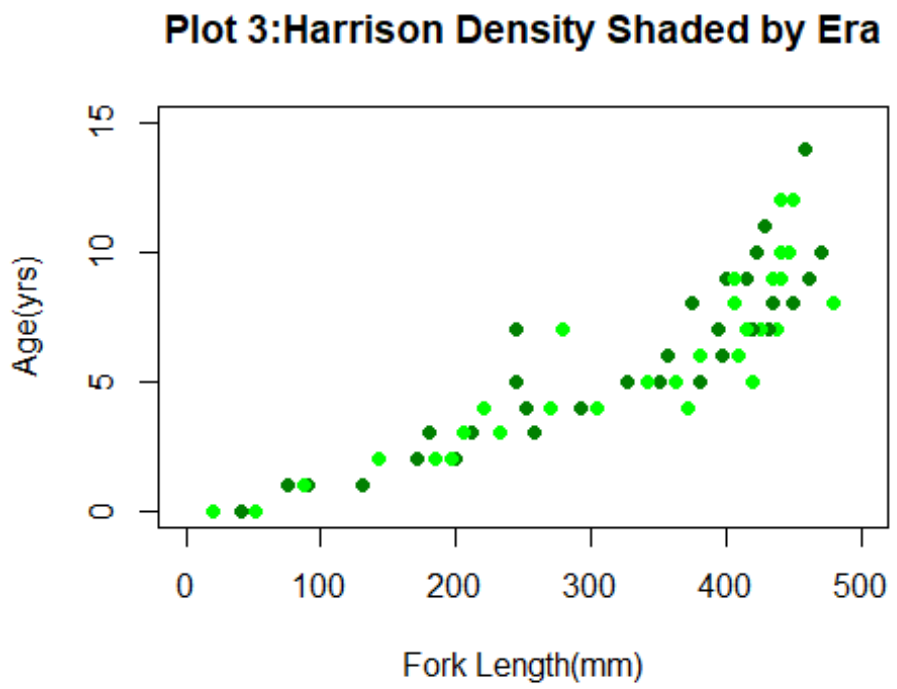
```
scatter_plot <- ggplot(harrison_data_new, aes(x=fl,y=age)) +
                geom_point(colour ="blue",size = 3) +
                xlim(0,500) + ylim(0,15) + labs(x="Fork Length(mm)",
                y="Age(yrs)",title="Plot 1: Harrison Lake Trout")+
                theme(plot.title = element_text(hjust = 0.5))
scatter_plot
```




```
#10. Plot an "Age" histogram with the following specifications
#Y axis label is "Frequency"
#X axis label is "Age (yrs)"
#Title of the histogram is "Plot 2: Harrison Fish Age Distribution"
#X and Y axis limits is 0, 15
#The color of the frequency plots is "cadetblue"
#The color of the Title is "cadetblue"
#to plot the scatter plot graph
hist(harrison_data_new$age,xlab = "Age(yrs)", ylab = "Frequency",
          main = "Plot 2:Harrison Fish Age Distribution", xlim = c(0,15),
          ylim = c(0,15),col = 'cadetblue',col.axis='cadetblue',col.main = 'c
adetblue')
```




```
fl <- harrison_data_new$fl
age <- harrison_data_new$age
#11. Create an overdense plot using the same specifications as the previous s
catterplot. But,
#Title the plot "Plot 3: Harrison Density Shaded by Era"
#Y axis label is "Age (yrs)"
#Y axis limits are 0 to 15
#X axis label is "Fork Length (mm)"
#X axis limits are 0 to 500
#include two levels of shading for the "green" data points.
#Plot solid circles as data points

overdense_plot <- plot(age ~ fl,
                       main = "Plot 3:Harrison Density Shaded by Era",
                       xlab = "Fork Length(mm)",
                       ylab = "Age(yrs)",
                       xlim = c(0,500),
                       ylim = c(0,15),
                       pch = 16,
                       col = rgb(0,(1:2)/2,0))
```




```
#12. Create a new object called "tmp" that includes the first 3 and last 3 re
cords of the BullTroutRML2 data set.
tmp <- headtail(BullTroutRML2,n=3)
tmp
```

```
##    age  fl     lake     era
## 1   14 459 Harrison 1977-80
## 2   12 449 Harrison 1977-80
## 3   10 471 Harrison 1977-80
## 94   4 298   Osprey 1997-01
## 95   3 279   Osprey 1997-01
## 96   3 273   Osprey 1997-01
```

```
#13. Display the "era" column (variable) in the new "tmp" object
tmp$era
```

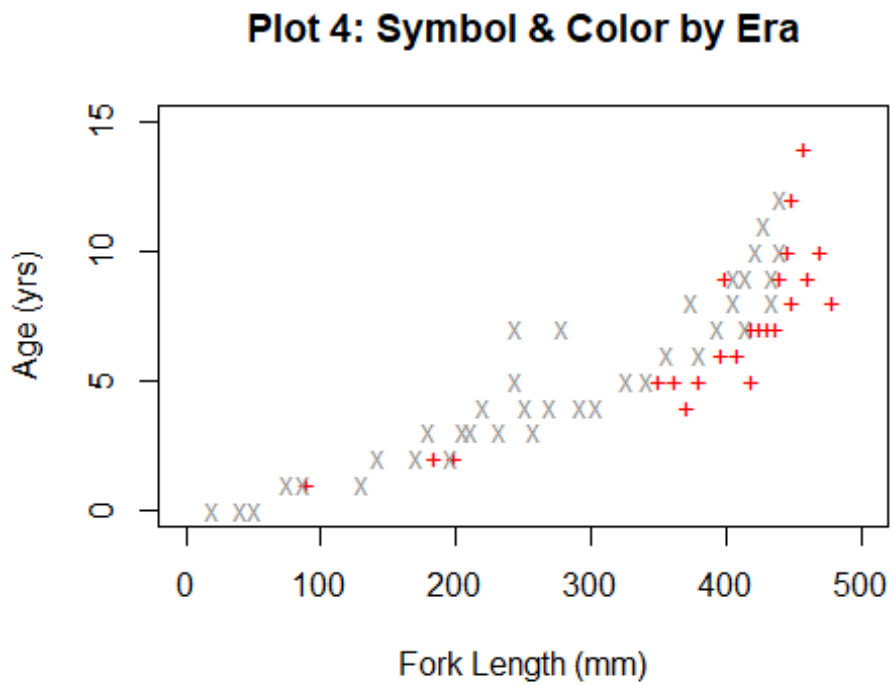
```
## [1] 1977-80 1977-80 1977-80 1997-01 1997-01 1997-01
## Levels: 1977-80 1997-01
```

```
#14.Create a pchs vector with the argument values for + and x.
pchs <- c('+','x')
pchs
```

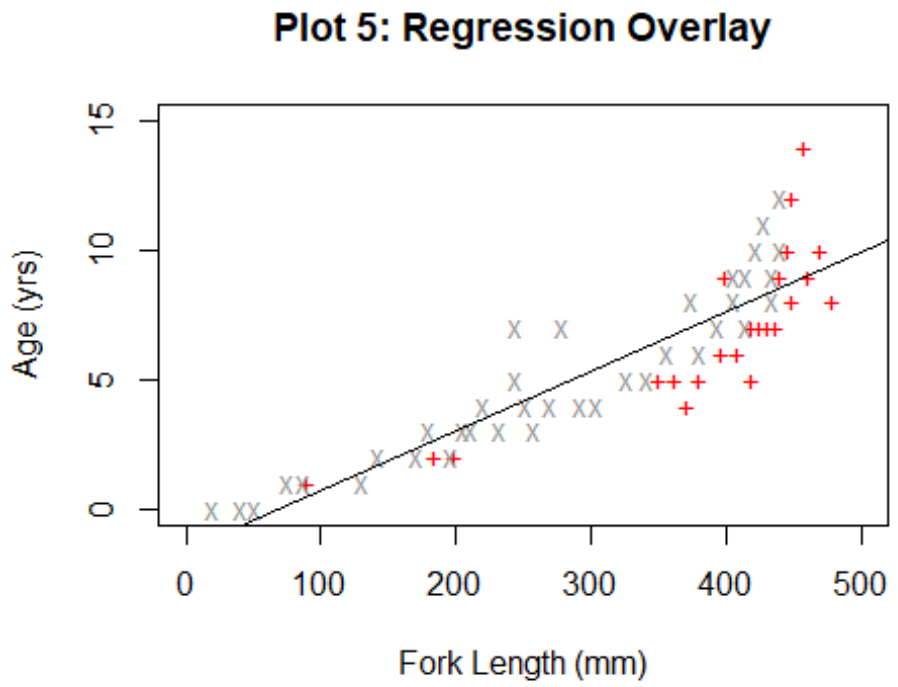
```
## [1] "+" "x"
```

```
#15. Create a cols vector with the two elements "red" and "gray60"
cols <- c("red","gray60")
cols
```

```
## [1] "red"    "gray60"

#16.Convert the tmp era values to numeric values.
conversion <- as.numeric(tmp$era)
conversion

## [1] 1 1 1 2 2 2

#17. Initialize the cols vector with the tmp era values\
tmp$era <- cols
tmp$era

## [1] "red"    "gray60" "red"    "gray60" "red"    "gray60"

#18. Create a plot of "Age (yrs)" (y variable) versus "Fork Length (mm)" (x v
ariable) with the following specifications:
#Title of graph is "Plot 4: Symbol & Color by Era"
#Limit of x axis is (0,500)
#Limit of y axis is (0,15)
#X axis label is "Age (yrs)"
#Y axis label is "Fork Length (mm)"
#Set pch equal to pchs era values
#Set col equal to cols era values
plot(age~fl, data= harrison_data_new, main = "Plot 4: Symbol & Color by Era",
     ylab = "Age (yrs)", ylim = c(0,15), xlab ="Fork Length (mm)",xlim = c(0,
500),
     pch=pchs[harrison_data_new$era] , col=cols[harrison_data_new$era])
```

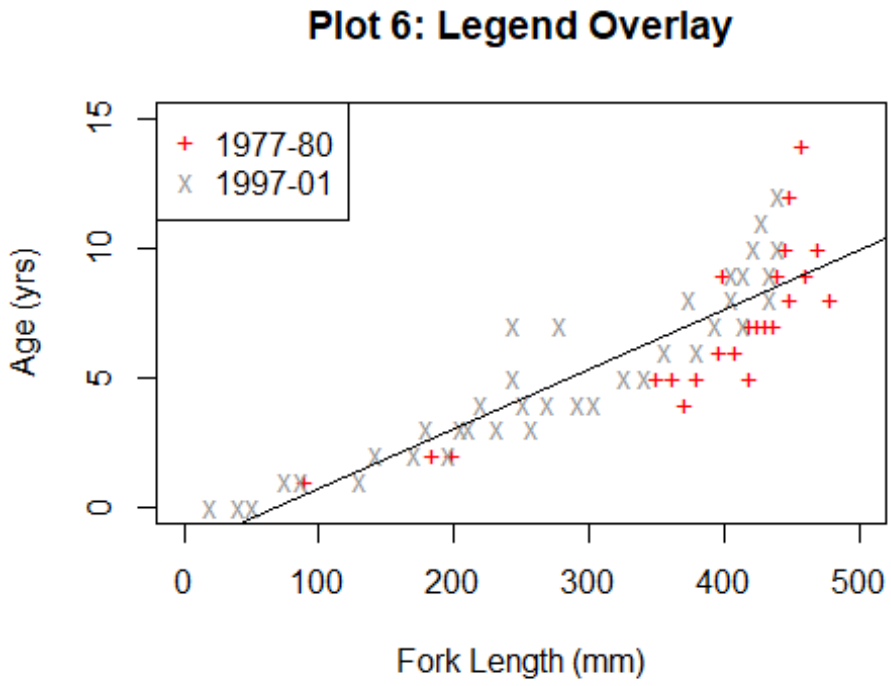


```
#19.Plot a regression line overlay on Plot 4 and title the new graph "Plot 5: Regression Overlay".
plot(age~fl, data= harrison_data_new, main = "Plot 5: Regression Overlay",
     ylab = "Age (yrs)", ylim = c(0,15), xlab ="Fork Length (mm)",xlim = c(0, 500),
     pch=pchs[harrison_data_new$era] , col=cols[harrison_data_new$era])
rl <- lm(age~fl,data = harrison_data_new)
abline(rl)
```




```
#20. Place a legend of on Plot 5 and call the new graph "Plot 6: :Legend Over lay"
plot(age~fl, data= harrison_data_new, main = "Plot 6: Legend Overlay",
     ylab = "Age (yrs)", ylim = c(0,15), xlab ="Fork Length (mm)",xlim = c(0, 500),
     pch=pchs[harrison_data_new$era] , col=cols[harrison_data_new$era])
rl <- lm(age~fl,data = harrison_data_new)
abline(rl)
?legend
harrison_data_new$era #to find the levels.

##  [1] 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80
## [10] 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80 1977-80
## [19] 1977-80 1977-80 1977-80 1977-80 1977-80 1997-01 1997-01 1997-01 1997-01
## [28] 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-
```

```
01
## [37] 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-
01
## [46] 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-
01
## [55] 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01 1997-01
## Levels: 1977-80 1997-01

legend("topleft",legend = c("1977-80","1997-01"), pch = pchs, col = cols)
```




```
#21. Commit your code into your github/gitlab repo.
```

https://github.com/SanjanaMohile/ALY6000_Module2.git