***R Code***

library(tidyverse)

library(ggplot2)

library(gt)

exibble %>% gt()

options(scipen=10000)

#Election Data: Washoe and State

washoe <- read.csv("Election Results Washoe.csv"); View(washoe)

nevada <- read.csv("Election Results State.csv"); View(nevada)

#Election-by-candidate: Washoe and State

bidenElecW <- filter(washoe, Candidate == "BIDEN") #Washoe

bidenW <- sum(bidenElecW$Votes)

bidenElec <- filter(nevada, Candidate == "BIDEN") #State

biden <- sum(bidenElec$Votes)

blankElecW <- filter(washoe, Candidate == "BLANKENSHIP")

blankW <- sum(blankElecW$Votes)

blankElec <- filter(nevada, Candidate == "BLANKENSHIP")

blank <- sum(blankElec$Votes)

jorgElecW <- filter(washoe, Candidate == "JORGENSEN")

jorgW <- sum(jorgElecW$Votes)

jorgElec <- filter(nevada, Candidate == "JORGENSEN")

jorg <- sum(jorgElec$Votes)

noneElecW <- filter(washoe, Candidate == "None")

noneW <- sum(noneElecW$Votes)

noneElec <- filter(nevada, Candidate == "None")

none <- sum(noneElec$Votes)

trumpElecW <- filter(washoe, Candidate == "TRUMP")

trumpW <- sum(trumpElecW$Votes)

trumpElec <- filter(nevada, Candidate == "TRUMP")

trump <- sum(trumpElec$Votes)

#Candidate percentages of votes

candidate <- c("BIDEN", "BLANKENSHIP", "JORGENSEN", "NONE", "TRUMP")

votesTotalW <- bidenW+blankW+jorgW+noneW+trumpW

votesTotal <- biden+blank+jorg+none+trump

trumpTransf <- blank/votesTotal + jorg/votesTotal + none/votesTotal + trump/votesTotal

percentW <- data.frame(candidate, "Percent" = c(bidenW/votesTotalW, blankW/votesTotalW, jorgW/votesTotalW, noneW/votesTotalW, trumpW/votesTotalW))

percent <- data.frame("Candidate" = candidate, "Percent" = c(biden/votesTotal, blank/votesTotal, jorg/votesTotal, none/votesTotal, trump/votesTotal))

paste(round(100\*c(bidenW/votesTotalW, blankW/votesTotalW, jorgW/votesTotalW, noneW/votesTotalW, trumpW/votesTotalW), 2), "%", sep="")

percent %>% gt

#Graph of Election Results: Washoe

washoeElec <- data.frame(candidate,TotalVotes = c(bidenW, blankW, jorgW, noneW, trumpW))

washoeElecGraph <-

ggplot(washoeElec, aes(x=candidate, y=TotalVotes, fill= candidate))+

geom\_col()+

theme(legend.position = "none")+

scale\_y\_continuous(breaks = scales::pretty\_breaks(n = 6))+

scale\_x\_discrete(guide = guide\_axis(n.dodge = 2))+

scale\_fill\_manual(values = c("BIDEN" = "blue", "BLANKENSHIP" = "purple", "JORGENSEN" = "yellow", "NONE" = "black", "TRUMP" = "RED"))+

labs(title="2020 Presidential Election Results: Washoe County", x="Candidate", y="Votes")

#Graph of Election Results: Nevada

totalElecData <- data.frame(candidate,TotalVotes = c(biden, blank, jorg, none, trump))

totalElecGraph <-

ggplot(totalElecData, aes(x=candidate, y=TotalVotes, fill= candidate))+

geom\_col()+

theme(legend.position = "none")+

scale\_y\_continuous(breaks = scales::pretty\_breaks(n = 6))+

scale\_x\_discrete(guide = guide\_axis(n.dodge = 2))+

scale\_fill\_manual(values = c("BIDEN" = "blue", "BLANKENSHIP" = "purple", "JORGENSEN" = "yellow", "NONE" = "black", "TRUMP" = "RED"))+

labs(title="2020 Presidential Election Results: Nevada", x="Candidate", y="Votes")

#Benford's Law graph

benlaw <- function(d) log10(1 + 1 / d)

digits <- 1:9

bensData <- data.frame(Digits = digits, Percentage = benlaw(digits))

bensGraph <- ggplot(bensData, aes(x= Digits, y=Percentage)) +

geom\_line(color="red")+

geom\_point(color="red", size=3)+

scale\_x\_continuous(n.breaks = 9) +

scale\_y\_continuous(n.breaks = 8) +

labs(title = "Benford's Law", x = "Leading Digit", y= "Proportion of Occurrence")

#Benford's Law graph: Washoe

ldOccurW <- c(sum(washoe$LeadDigit == 1), sum(washoe$LeadDigit == 2), sum(washoe$LeadDigit == 3), sum(washoe$LeadDigit == 4), sum(washoe$LeadDigit == 5), sum(washoe$LeadDigit == 6), sum(washoe$LeadDigit == 7), sum(washoe$LeadDigit == 8), sum(washoe$LeadDigit == 9));

ldTotalW <- sum(ldOccurW)

ldPercentW <- c(ldOccurW[1]/ldTotalW,

ldOccurW[2]/ldTotalW,

ldOccurW[3]/ldTotalW,

ldOccurW[4]/ldTotalW,

ldOccurW[5]/ldTotalW,

ldOccurW[6]/ldTotalW,

ldOccurW[7]/ldTotalW,

ldOccurW[8]/ldTotalW,

ldOccurW[9]/ldTotalW)

ldDataW <- data.frame(Digits = digits, Percentage = ldPercentW)

ldGraphW <- ggplot(ldDataW, aes(x=Digits, y=Percentage))+

geom\_line(color="blue")+

geom\_point(color="blue", size=3)+

scale\_x\_continuous(n.breaks = 9) +

scale\_y\_continuous(n.breaks = 8) +

labs(title = "Leading Digit of Total Votes\nin Washoe Presidential Election", x= "Leading Digit", y= "Proportion of Occurrence")

#Benford's Law graph: Nevada

ldOccur <- c(sum(nevada$LeadDigit == 1), sum(nevada$LeadDigit == 2), sum(nevada$LeadDigit == 3), sum(nevada$LeadDigit == 4), sum(nevada$LeadDigit == 5), sum(nevada$LeadDigit == 6), sum(nevada$LeadDigit == 7), sum(nevada$LeadDigit == 8), sum(nevada$LeadDigit == 9));

ldTotal <- sum(ldOccur)

ldPercent <- c(ldOccur[1]/ldTotal,

ldOccur[2]/ldTotal,

ldOccur[3]/ldTotal,

ldOccur[4]/ldTotal,

ldOccur[5]/ldTotal,

ldOccur[6]/ldTotal,

ldOccur[7]/ldTotal,

ldOccur[8]/ldTotal,

ldOccur[9]/ldTotal)

ldData <- data.frame(Digits = digits, Percentage = ldPercent)

ldGraph <- ggplot(ldData, aes(x=Digits, y=Percentage)) +

geom\_line(color="orange")+

geom\_point(color="orange", size=3)+

scale\_x\_continuous(n.breaks = 9) +

scale\_y\_continuous(n.breaks = 8) +

labs(title = "Leading Digit of Total Votes\nin Nevada Presidential Election", x= "Leading Digit", y= "Proportion of Occurrence")

#Benford's Law: Washoe v. Benford

dataWB <- data.frame(Digits=digits,

Percentage=c(benlaw(digits), ldPercentW),

Focus = c(rep("Benford",9), rep("Washoe",9)))

graphWB <- ggplot(dataWB, aes(x=Digits, y=Percentage, group=Focus)) +

geom\_line(aes(color=Focus))+

geom\_point(aes(color=Focus))+

scale\_x\_continuous(n.breaks = 9)+

scale\_y\_continuous(n.breaks = 8)+

scale\_color\_manual(values=c("red", "blue"))+

labs(title = "Leading Digits of Votes in Washoe v. Benford", x= "Leading Digit", y= "Proportion of Occurrence")

#Benford's Law: Nevada v. Benford

dataNB <- data.frame(Digits=digits,

Percentage=c(benlaw(digits), ldPercent),

Focus = c(rep("Benford",9), rep("Nevada",9)))

graphNB <- ggplot(dataNB, aes(x=Digits, y=Percentage, group=Focus)) +

geom\_line(aes(color=Focus))+

geom\_point(aes(color=Focus))+

scale\_x\_continuous(n.breaks = 9)+

scale\_y\_continuous(n.breaks = 8)+

scale\_color\_manual(values=c("red", "orange"))+

labs(title = "Leading Digits of Votes in Nevada v. Benford", x= "Leading Digit", y= "Proportion of Occurrence")

#Benford's Law: Combined Benford analyses

dataAll <- data.frame(Digits = digits,

Percentage = c(benlaw(digits), ldPercentW, ldPercent),

Focus = c(rep("Benford", 9), rep("Washoe", 9), rep("Nevada", 9)))

graphAll <- ggplot(dataAll, aes(x=Digits, y=Percentage, group=Focus)) +

geom\_line(aes(color=Focus))+

geom\_point(aes(color=Focus))+

scale\_x\_continuous(n.breaks = 9)+

scale\_y\_continuous(n.breaks = 8)+

scale\_color\_manual(values=c("red", "orange", "blue"))+

labs(title = "Washoe and Nevada v. Benford", x= "Leading Digit", y= "Proportion of Occurrence")