Q3:

One of the advantages that concrete structures have over steel structures is fire resistance (which is to say, steel becomes weak when heated). The time, 𝑇T, that it takes a steel girder to reach certain temperature (where its strength becomes too low to support its load) in a fire is, however, random. Suppose that for design code development, the following data has been gathered on the time T in hours:

0.7361.0110.8631.0640.8651.1090.9131.1320.9151.1400.9371.1530.9831.2531.0071.3940.7360.8630.8650.9130.9150.9370.9831.0071.0111.0641.1091.1321.1401.1531.2531.394

(a) Calculate the values of the following statistics: sample mean, sample median, sample standard deviation, sample range, the five-number summary and the interquartile range.

(b) Are there any outliers? Why?

(c) Construct a histogram, a stem-and-leaf diagram and a boxplot for these data.

(d) Based on the graphs in (c), what is the shape of the distribution: it is symmetric, skewed to the left or skewed to the right?

Answers:

a)

Text

Description automatically generated

Text, letter

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Diagram

Description automatically generated

A close - up of a notebook

Description automatically generated with low confidence

Code in R:

# question 3a)

timeForLowSupport = c(0.736, 1.011, 0.863, 1.064, 0.865, 1.109, 0.913, 1.132,

0.915, 1.140, 0.937, 1.153, 0.983, 1.253, 1.007, 1.394)

# giving the mean, 1st, 3rd quartiles, median, mean and max

timeSummarry = summary(timeForLowSupport)

timeSummarry

# getting the standard deviation

timeSTD = sd(timeForLowSupport)

timeSTD

# five number summary

timeFiveSummary = quantile(timeForLowSupport, type = 5)

timeFiveSummary

#interquatile range

timeIQR = IQR(timeForLowSupport, type = 5)

timeIQR

# 3c) construction for histogram

timeHist = hist(timeForLowSupport, main = "Steel Structures", xlab = "TIme in hrs", ylab = "Density")

# stemplot

timeStem = stem(timeForLowSupport, scale = 1)

# boxplot

timeBox = boxplot(timeForLowSupport, main = "Steel structures", ylab = "Time in hrs", horizontal = TRUE)

# getting the skewness

install.packages("moments")

library(moments)

timeSkewness = skewness(timeForLowSupport)

timeSkewness

Chart, box and whisker chart

Description automatically generatedChart, histogram

Description automatically generatedA picture containing text

Description automatically generated