Explore ACR

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Libraries

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following object is masked from 'package:base':
##
##     date
```

Data

Read Data In

The data is a CSV file that is created by saving the ACR tab of the FPA Excel Workbook.

```
ACR.raw <- read.csv(file = "./data/ACR.csv",
                    stringsAsFactors = FALSE)
name <- c("SQA",
          "Application",
          "CRNumber",
          "CRDate",
          "CRApproved",
          "IENumber",
          "IEDate",
          "IEApproved",
          "Reason",
          "Comments")
names(ACR.raw) <- name
rm(name)
ACR <- ACR.raw
```

Format the Data

Convert to Factor

```
ACR$SQA <- as.factor(ACR$SQA)
ACR$Application <- as.factor(ACR$Application)
ACR$CRApproved <- as.factor(ACR$CRApproved)
ACR$IEApproved <- as.factor(ACR$IEApproved)
levels(ACR$IEApproved)[1] <- NA
ACR$Reason <- as.factor(ACR$Reason)
levels(ACR$Reason)[1] <- NA
```

Convert to Dates

```
ACR$CRDate <- as.Date(ACR$CRDate, format = "%d-%b-%y")
ACR$IEDate<- as.Date(ACR$IEDate, format = "%d-%b-%y")
ACR$CRmonth <- lubridate::month(ACR$CRDate, label = TRUE)
ACR$CRyear <- lubridate::year(ACR$CRDate)
ACR$IEmonth <- lubridate::month(ACR$IEDate, label = TRUE)
ACR$IEyear <- lubridate::year(ACR$IEDate)
```

Structure of The Data

```
str(ACR)
```

```
## 'data.frame':    272 obs. of  14 variables:
##  $ SQA        : Factor w/ 5 levels "Beilah","Liz",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ Application: Factor w/ 19 levels "","ADDCOM","AFMS",..: 16 18 18 16 19 4 4 12 12 13 ...
##  $ CRNumber   : chr  "18-33882" "18-34518" "18-36023" "18-38261" ...
##  $ CRDate     : Date, format: "2018-10-12" "2018-10-17" ...
##  $ CRApproved : Factor w/ 4 levels "","A","A-FP",..: 3 3 3 3 3 2 3 3 3 3 ...
##  $ IENumber   : chr  "18-33882" "" "19-1947" "" ...
##  $ IEDate     : Date, format: "2018-11-07" NA ...
##  $ IEApproved : Factor w/ 3 levels "A","A-FP","D": 2 NA 2 NA 2 NA NA 2 NA NA ...
##  $ Reason     : Factor w/ 6 levels "Inaccurate information",..: NA NA NA NA NA NA NA NA NA NA ...
##  $ Comments   : chr  "" "" "" "" ...
##  $ CRmonth    : Ord.factor w/ 12 levels "Jan"<"Feb"<"Mar"<..: 10 10 10 11 11 12 12 12 1 1 ...
```

```
##  $ CRyear     : num  2018 2018 2018 2018 2018 ...
##  $ IEmonth    : Ord.factor w/ 12 levels "Jan"<"Feb"<"Mar"<..: 11 NA 1 NA 11 NA NA 12 NA NA ...
##  $ IEyear     : num  2018 NA 2019 NA 2018 ...
```

Metrics

Select Data

Data is selected first for the Month and Year of interest. The selection is based on boththe CR and I&E dates. This seleletion is used as a master dataframe. Two additional dataframes are prduced the first of the approval of the CR inthe month and the second for the approval of the I&E in the month.

```
#create master dataframe
work <- subset(ACR,
               subset = (CRmonth == "Jan" & CRyear == 2019) |
                    (subset = IEmonth == "Jan" & IEyear == 2019))
# Create the CR data fram
workCR <- subset(ACR,
               subset = CRmonth == "Jan" & CRyear == 2019)
# create the IE data frame.
workIE <- subset(ACR,
               subset = IEmonth == "Jan" & IEyear == 2019)
```

Counts

Data Changes (CR) Request Approved

```
nrow(subset(workCR,
            subset = (CRApproved == "A" | CRApproved == "A-FP")))
```

```
## [1] 57
```

Data Change Request Disapproved

```
nrow(subset(workCR,
            subset = (CRApproved == "D")))
```

```
## [1] 6
```

Implementation and Effectivity (IE) Approved

```
nrow(subset(workIE,
            subset = (IEApproved == "A" | IEApproved == "A-FP")))
```

```
## [1] 46
```

IE Disapproved

```
nrow(subset(workIE,
            subset = (CRApproved == "D")))
```

```
## [1] 0
```

First pass acceptance

CR

```
nrow(subset(workCR,
            subset = CRApproved == "A-FP")) /
     nrow(workCR) * 100
```

```
## [1] 79.6875
```

IE

```
nrow(subset(workIE,
            subset = IEApproved == "A-FP")) /
     nrow(workIE) * 100
```

```
## [1] 90
```

Total Process

This is the number of data changes that had both the CR and IE approved on first pass.

```
nrow(subset(work,
            subset = (CRApproved == "A-FP" & IEApproved == "A-FP"))) /
     nrow(work) * 100
```

```
## [1] 49.46237
```

Number by Application

Opened

```
table(subset(workCR,
             subset = CRApproved != "D")$Application)
```

```
##
##
##                                     0
##                                ADDCOM
##                                     1
##                                  AFMS
##                                     1
##                                  ALMS
##                                    14
##                                  APLM
##                                     3
##                               CMSNext
##                                    25
##                               DaVinci
##                                     0
## E-labeling Web Package Insert Retrieval
##                                     0
##                               eNovator
##                                     2
##                               GDSN/GS1
##                                     3
```

```
##                                     iQ
##                                      5
##                          Metrics Library
##                                      1
##                                    MSS
##                                      2
##                                    NPV
##                                      0
##                                PCN/SCN
##                                      0
##                                   PEAR
##                                      0
##                                    QPI
##                                      0
##                                  RSLMS
##                                      1
##                                 WWLIMS
##                                      0
```

Completed

```
table(subset(workIE,
             subset = IEApproved != "D")$Application)
```

```
##
##
##                                      1
##                                 ADDCOM
##                                      0
##                                   AFMS
##                                      1
##                                   ALMS
##                                      9
##                                   APLM
##                                      0
##                                CMSNext
##                                     16
##                                DaVinci
##                                      0
## E-labeling Web Package Insert Retrieval
##                                      2
##                                eNovator
##                                      7
##                                GDSN/GS1
##                                      4
##                                     iQ
##                                      2
##                          Metrics Library
##                                      1
##                                    MSS
##                                      1
##                                    NPV
##                                      0
##                                PCN/SCN
```

```
##                                     0
##                                  PEAR
##                                     0
##                                   QPI
##                                     0
##                                 RSLMS
##                                     2
##                                WWLIMS
##                                     0
```

Total

```
table(subset(workCR,
             subset = CRApproved != "D")$Application) +
    table(subset(workIE,
             subset = IEApproved != "D")$Application)
```

```
##
##
##                                     1
##                                ADDCOM
##                                     1
##                                  AFMS
##                                     2
##                                  ALMS
##                                    23
##                                  APLM
##                                     3
##                               CMSNext
##                                    41
##                               DaVinci
##                                     0
## E-labeling Web Package Insert Retrieval
##                                     2
##                               eNovator
##                                     9
##                               GDSN/GS1
##                                     7
##                                    iQ
##                                     7
##                         Metrics Library
##                                     2
##                                   MSS
##                                     3
##                                   NPV
##                                     0
##                                PCN/SCN
##                                     0
##                                  PEAR
##                                     0
##                                   QPI
##                                     0
##                                 RSLMS
##                                     3
```

```
##                                   WWLIMS
##                                        0
```

Time to Complete A Data Change

This is the interval between CR approval and IE approval

```
# select records that have been approved (both CR adn IE)
work.all <- subset(ACR,
                   subset = ((CRApproved == "A" | CRApproved == "A-FP") &
                                (IEApproved == "A" | IEApproved == "A-FP")))
# now further select records from above that were completed in the correct month
work.all <- subset(work.all,
                   subset = (IEmonth == "Jan" & IEyear == 2019))
# compute interval
work.all$Interval <- as.numeric(work.all$IEDate - work.all$CRDate)
# results
nrow(work.all)
```

```
## [1] 46
```

```
summary(work.all$Interval)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   -2.00    8.00   21.00   68.30   77.75  548.00
```

```
sd(work.all$Interval)
```

```
## [1] 125.1079
```

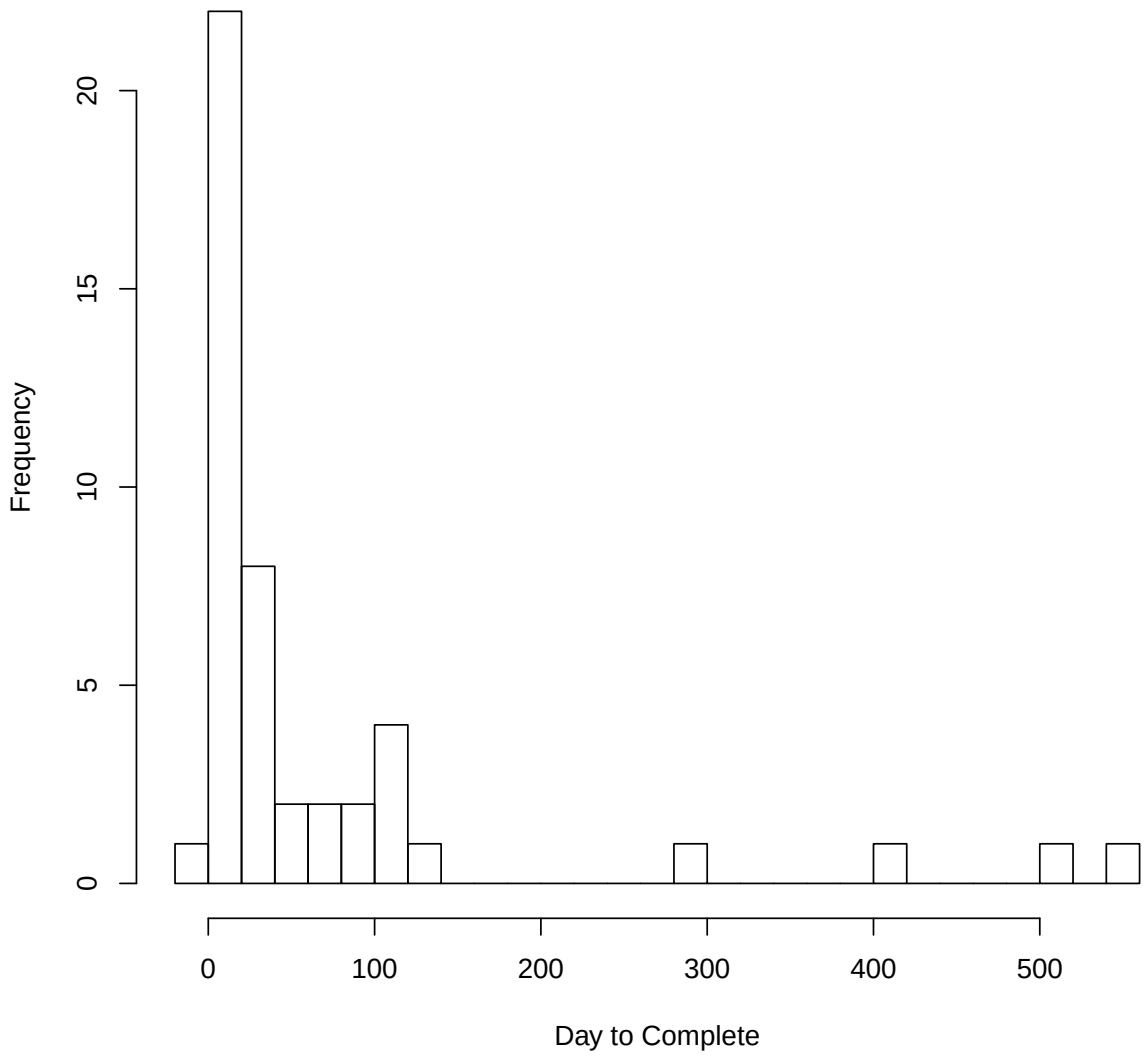
```
table(work.all$Interval)
```

```
##
##  -2   1   2   5   6   8   9  11  12  13  16  17  19  20  22  23  26  28
##   1   3   1   1   3   4   2   1   1   2   1   1   1   1   1   2   1   2
##  29  51  74  79  82  91 104 110 121 294 406 518 548
##   2   2   1   1   1   1   3   1   1   1   1   1   1
```

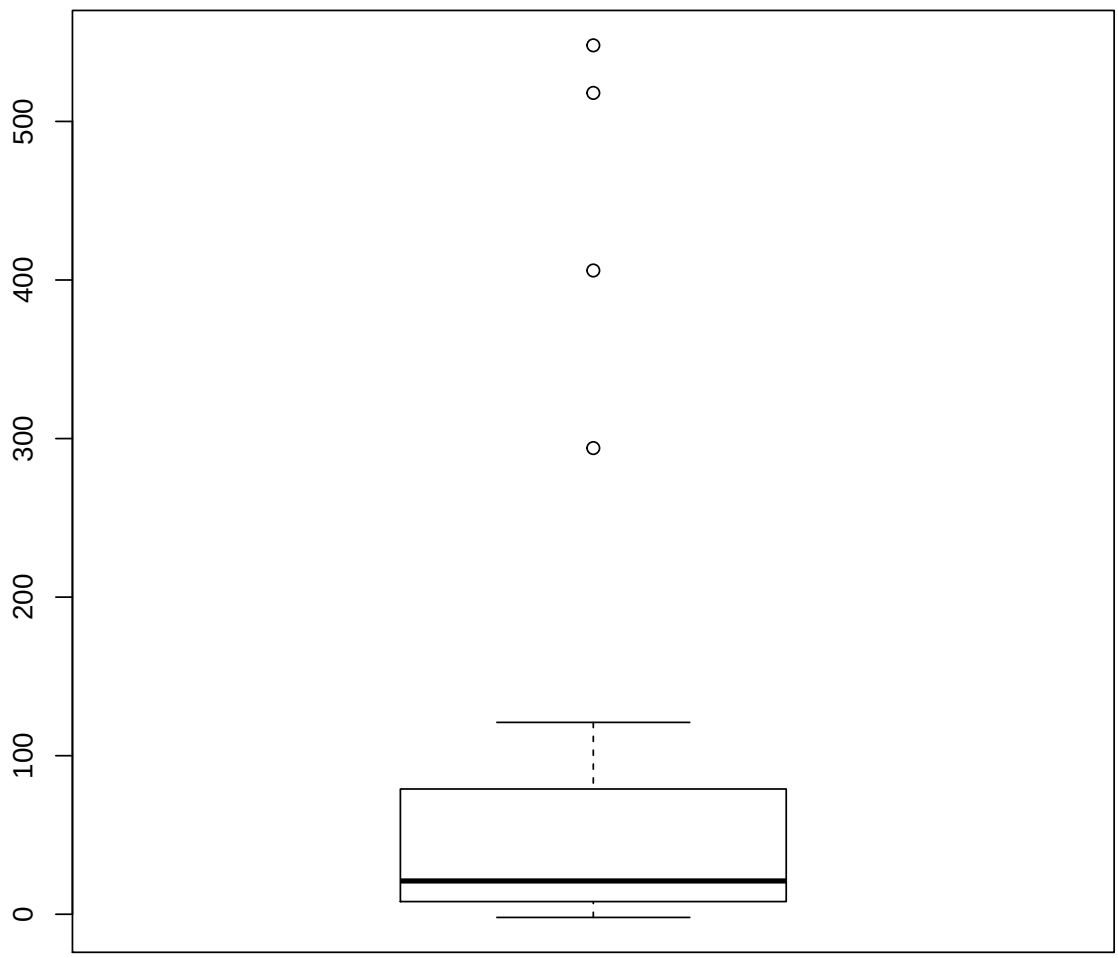
```
quantile(work.all$Interval)
```

```
##     0%    25%    50%    75%   100%
##  -2.00   8.00  21.00  77.75 548.00
```

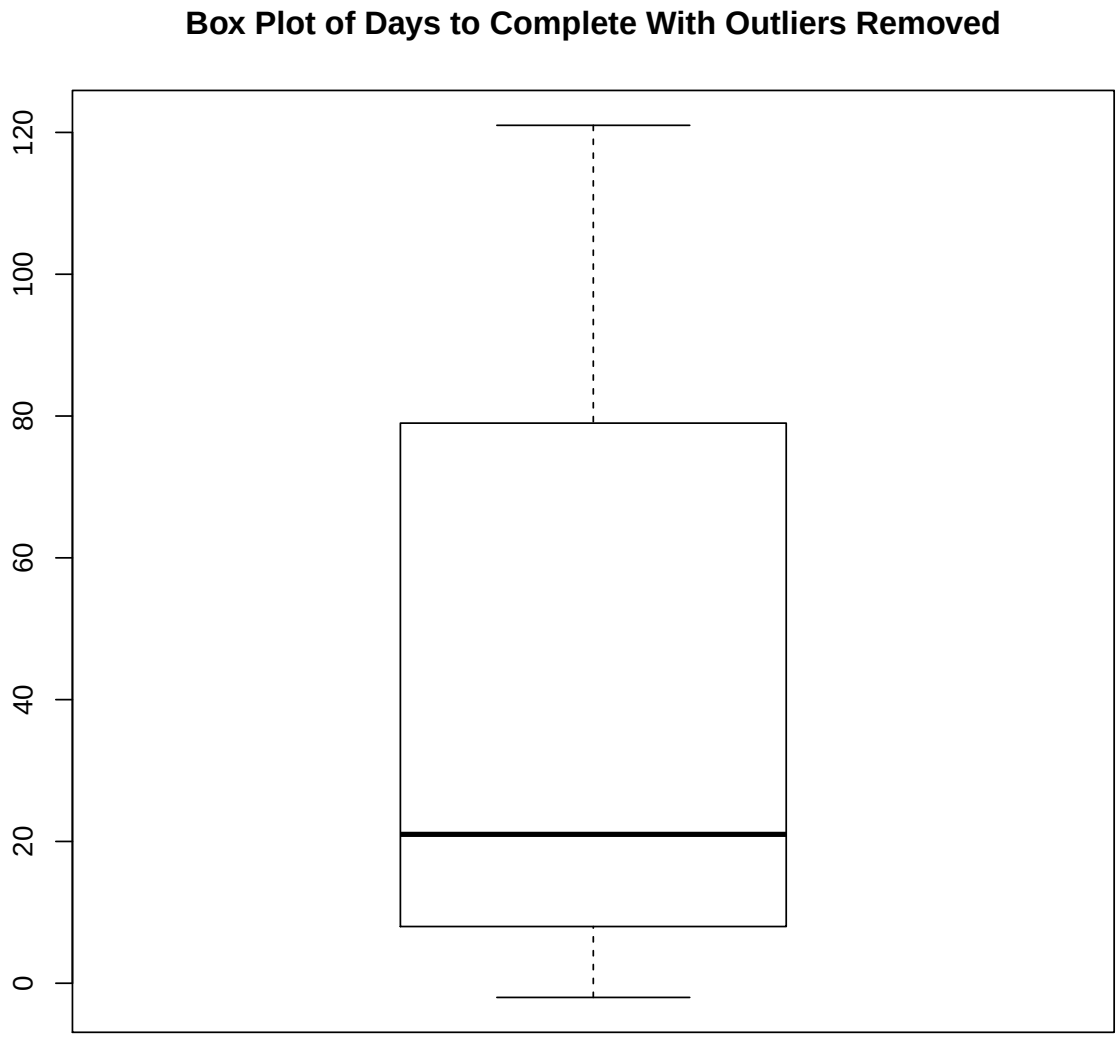
```
hist(work.all$Interval,
     breaks = 20,
     main = "Histogram of Days to Complete A Change Request",
     xlab = "Day to Complete")
```




```
boxplot(work.all$Interval,
        main = "Box Plot of Days to Complete")
```




```
boxplot(work.all$Interval,
        main = "Box Plot of Days to Complete With Outliers Removed",
        outline = FALSE)
```



Number of Days That Currently Open CR Have Been Pending

```
# selected records that have approved CR but no IE
work.open <- subset(ACR,
                    subset = (CRApproved == "A-FP" | CRApproved == "A") &
                         is.na(IEApproved))
# compute days open
work.open$daysOpen <- as.numeric(as.Date("2-Jan-19", format = "%d-%b-%y") -
                                     work.open$CRDate)
# Results
nrow(work.open)
```

```
## [1] 62
```

```r
summary(work.open$daysOpen)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -30.00  -15.00    0.00   13.13   36.00   93.00
```

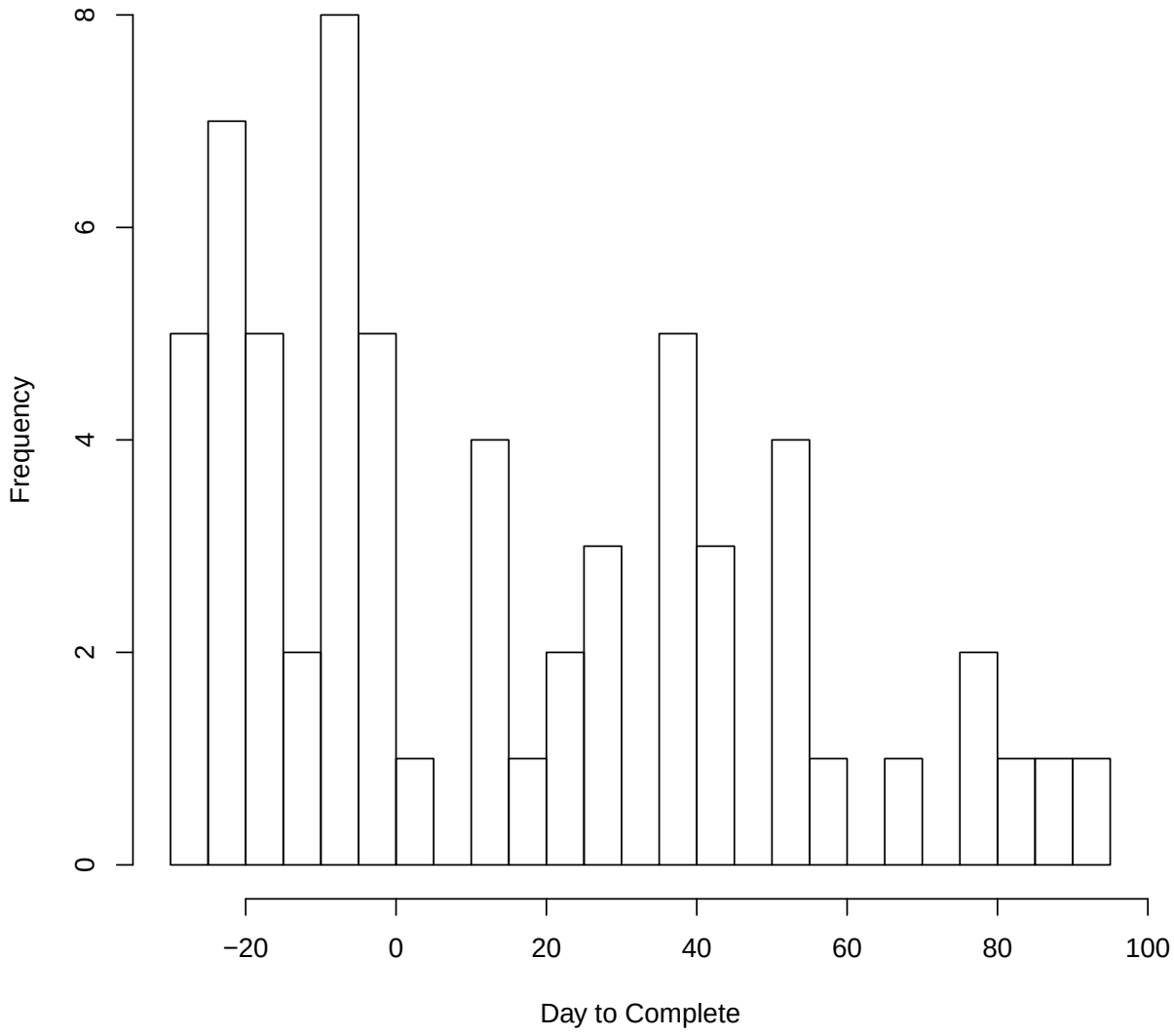
```r
sd(work.open$daysOpen)
```

```
## [1] 33.92977
```

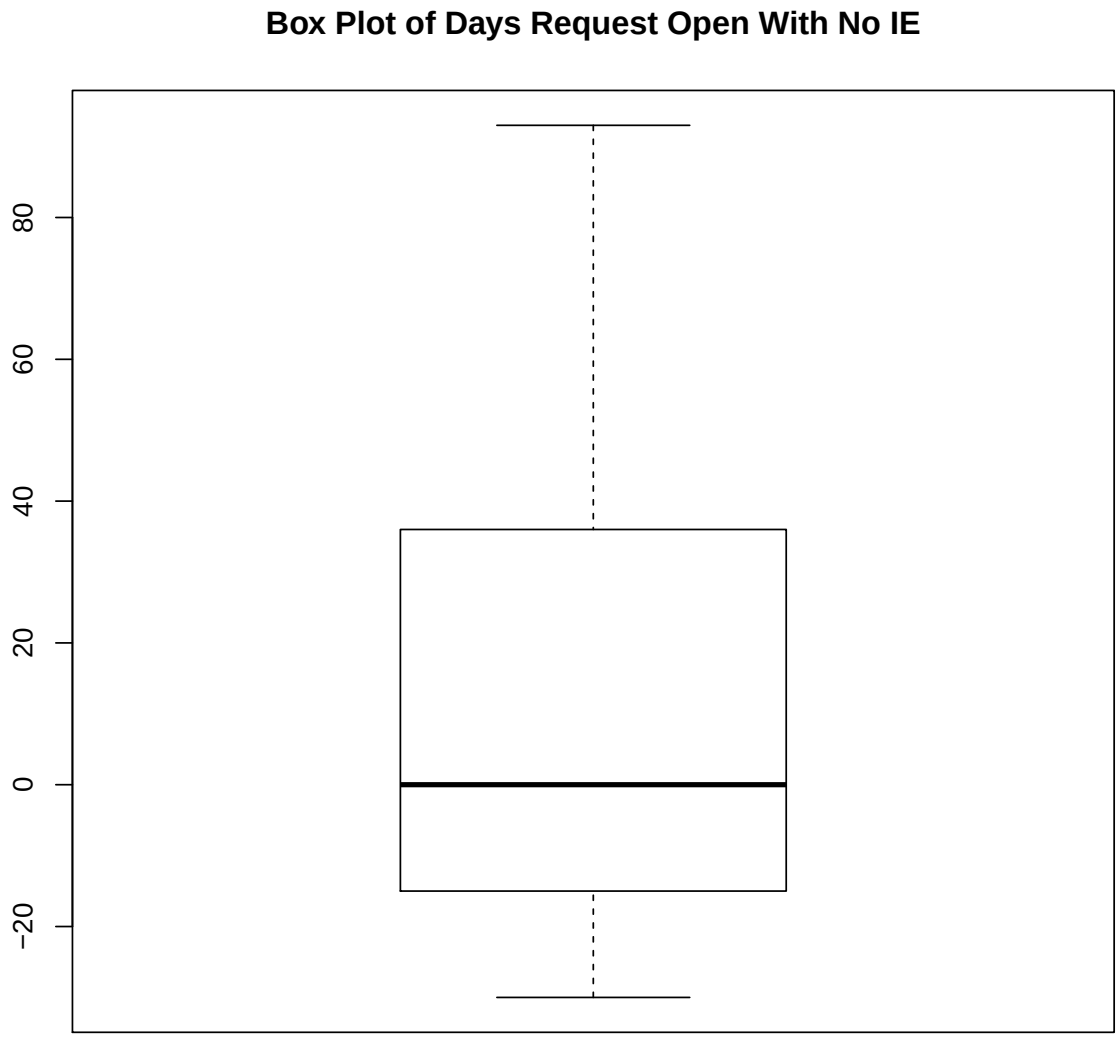
```r
quantile(work.open$daysOpen)
```

```
##   0%  25%  50%  75% 100%
##  -30  -15    0   36   93
```

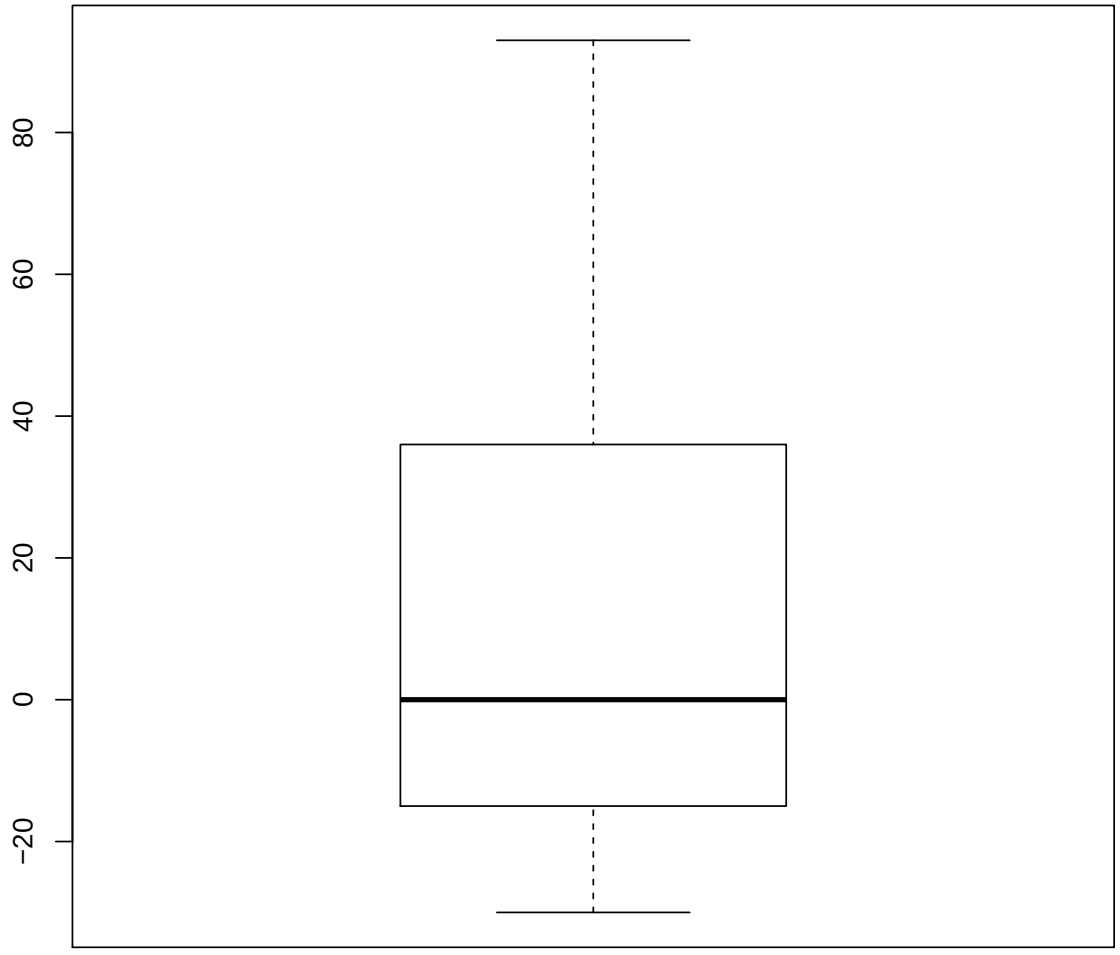
```r
hist(work.open$daysOpen,
     breaks = 20,
     main = "Histogram of Days Request Open With No IE",
     xlab = "Day to Complete")
```




```
boxplot(work.open$daysOpen,
        main = "Box Plot of Days Request Open With No IE")
```




```
boxplot(work.open$daysOpen,
        main = "Box Plot of Days Request Open With No IE With Outliers Removed",
        outline = FALSE)
```


Box Plot of Days Request Open With No IE With Outliers Removed
80
60
40
20
0
−20