

# 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 ...
## $ Comments : chr "" "" "" "" ...
## $ CRmonth : Ord.factor w/ 12 levels "Jan"<"Feb"<"Mar"<...: 10 10 10 11 11 12 12 12 1 1 ...
```

```
## $ CYear      : 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 ...
## $ IYear      : 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 both the CR and I&E dates. This selection is used as a master dataframe. Two additional dataframes are produced the first of the approval of the CR in the month and the second for the approval of the I&E in the month.

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

### Counts

#### Data Changes (CR) Request Approved

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

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

#### Data Change Request Disapproved

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

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

#### Implementation and Effectivity (IE) Approved

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

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

#### IE Disapproved

```
nrow(subset(workIE,
             subset = (CRAproved == "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
##          WVLIMS
##          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 and 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)
```

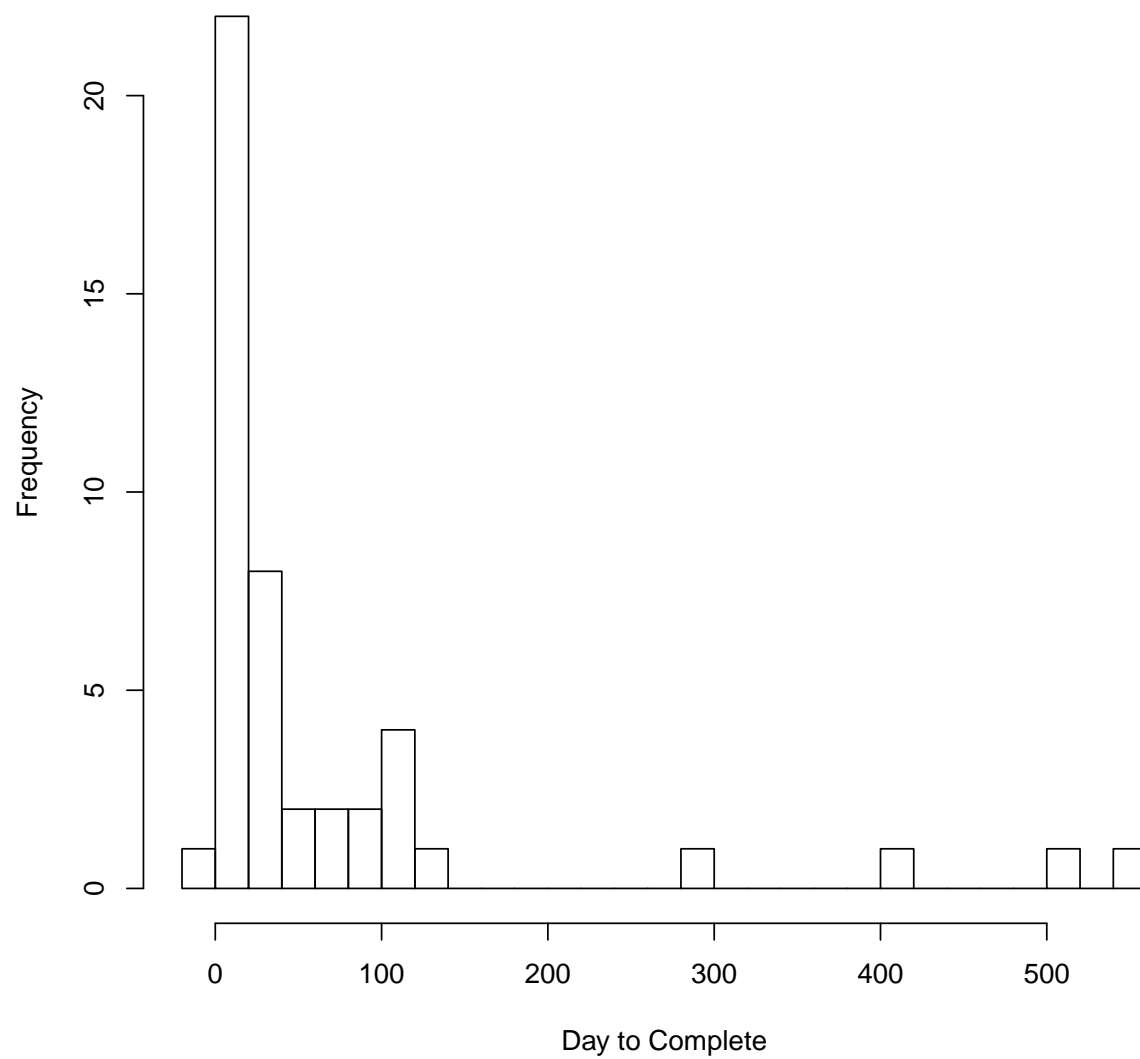
```
##
##  -2   1   2   5   6   8   9  11  12  13  16  17  19  20  22  23  26  28
##   1   3   1   1   3   4   2   1   1   2   1   1   1   1   1   2   1   2
##  29  51  74  79  82  91 104 110 121 294 406 518 548
##   2   2   1   1   1   1   3   1   1   1   1   1   1
```

```
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")
```

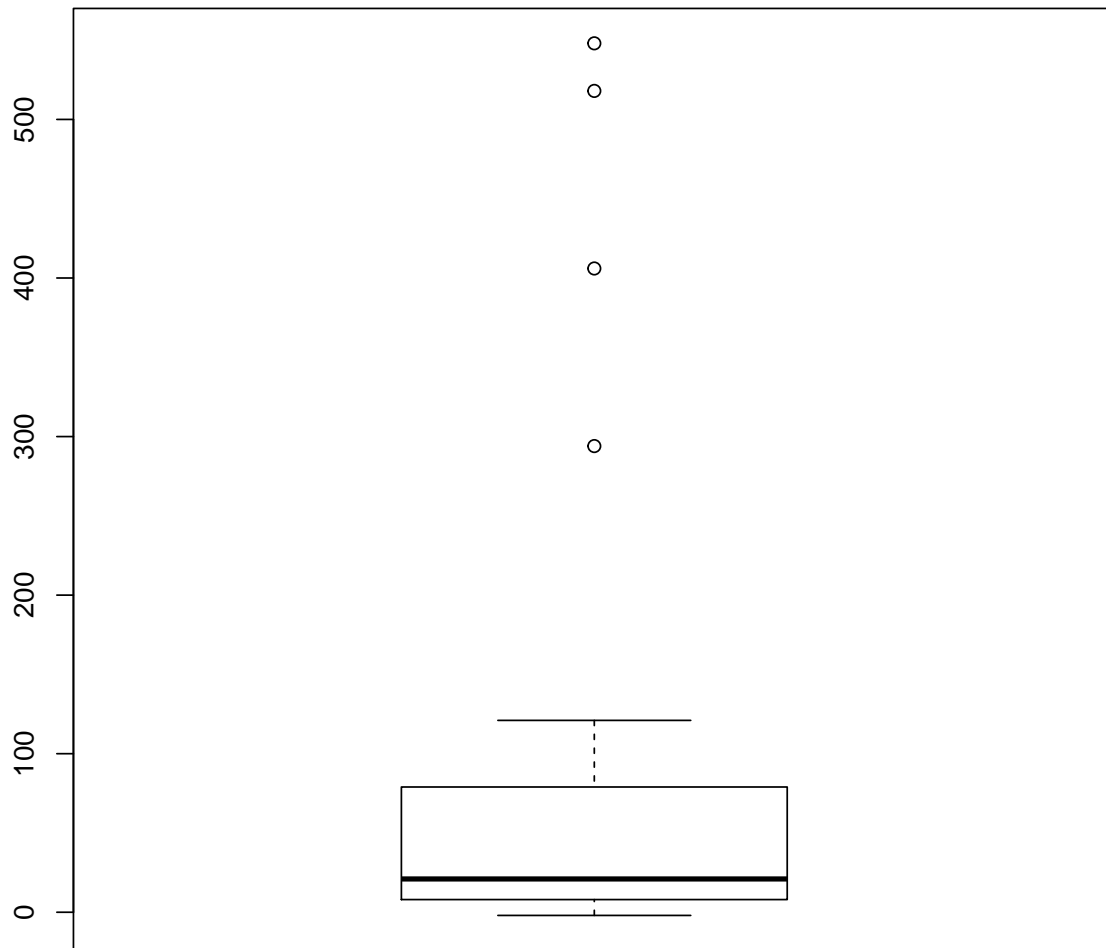
**Histogram of Days to Complete A Change Request**



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

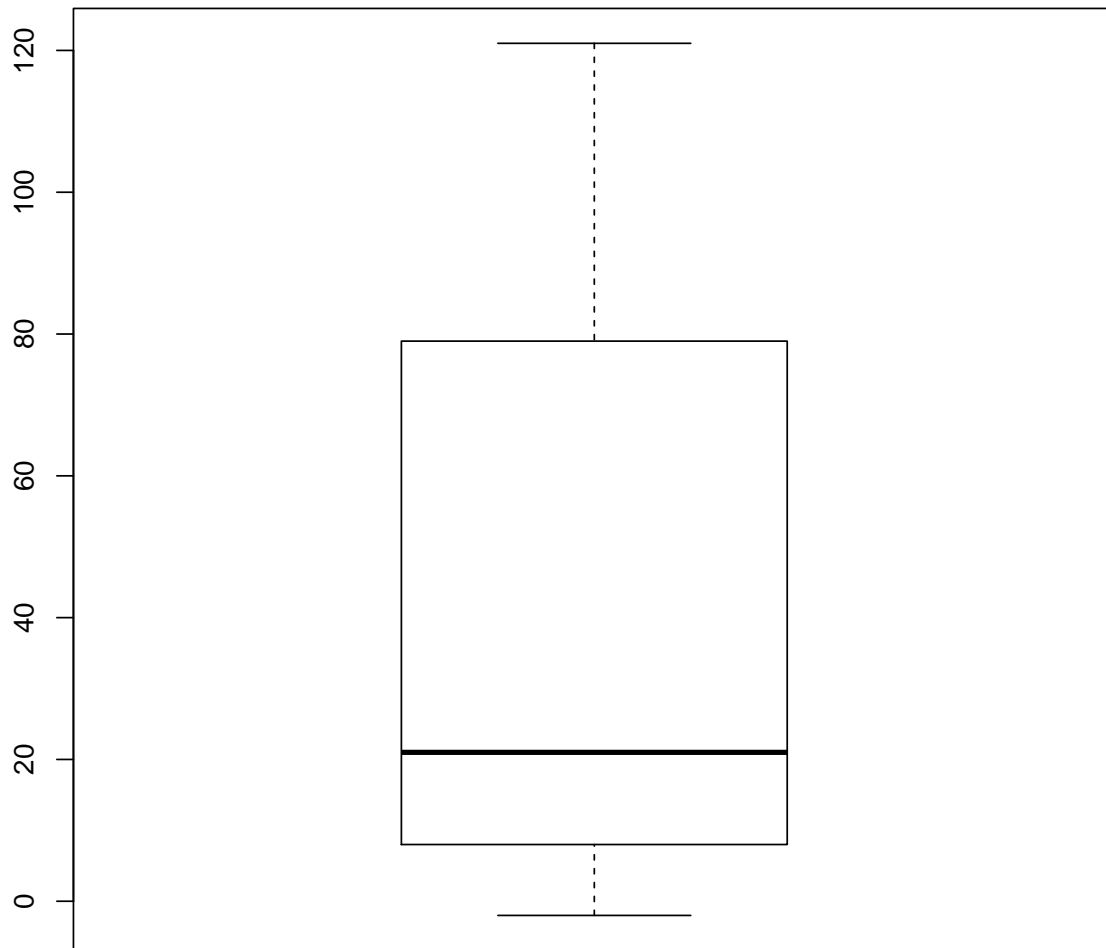


**Box Plot of Days to Complete**



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

## Box Plot of Days to Complete With Outliers Removed



## 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
```

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

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

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

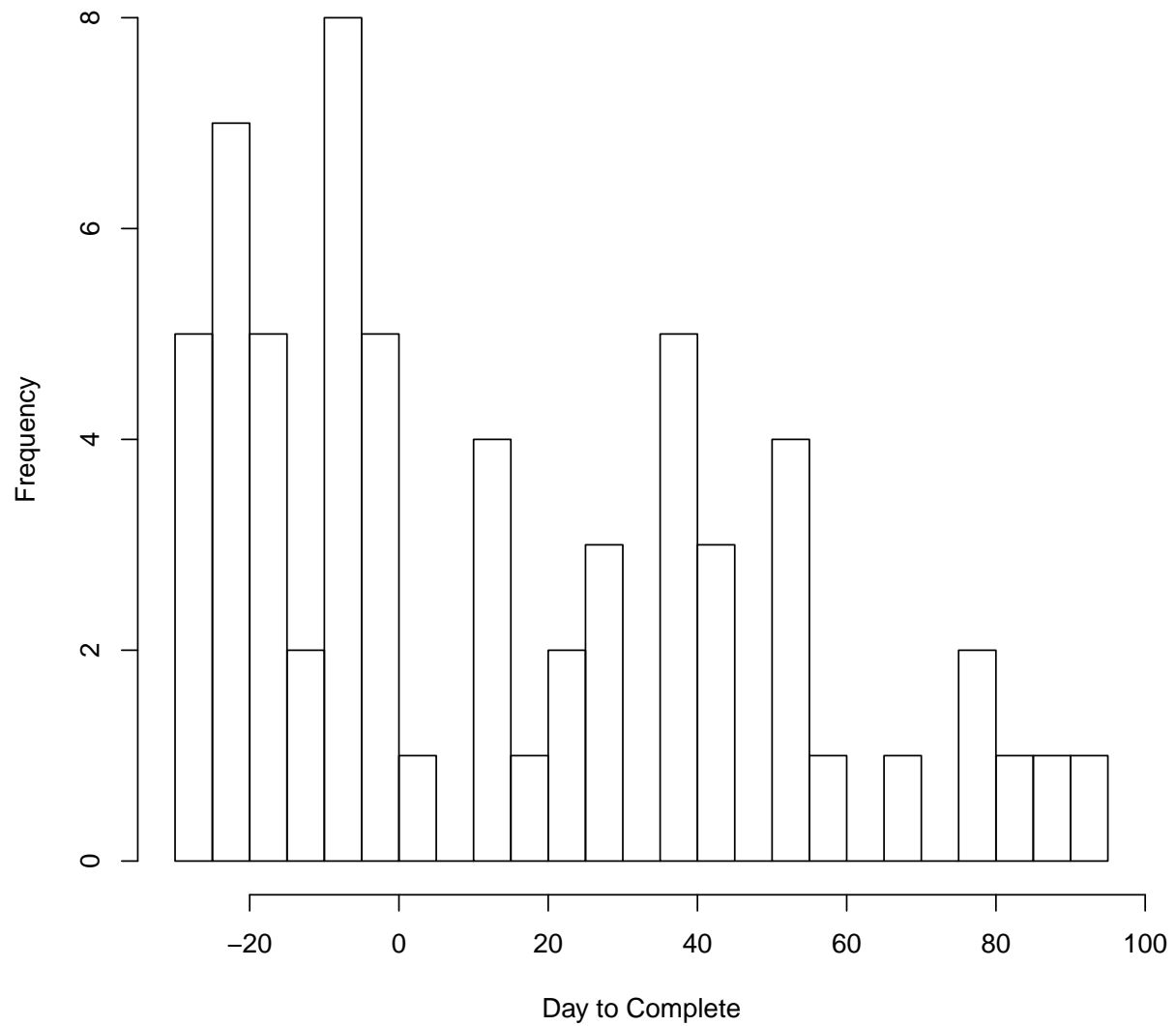
```
## [1] 33.92977
```

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

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

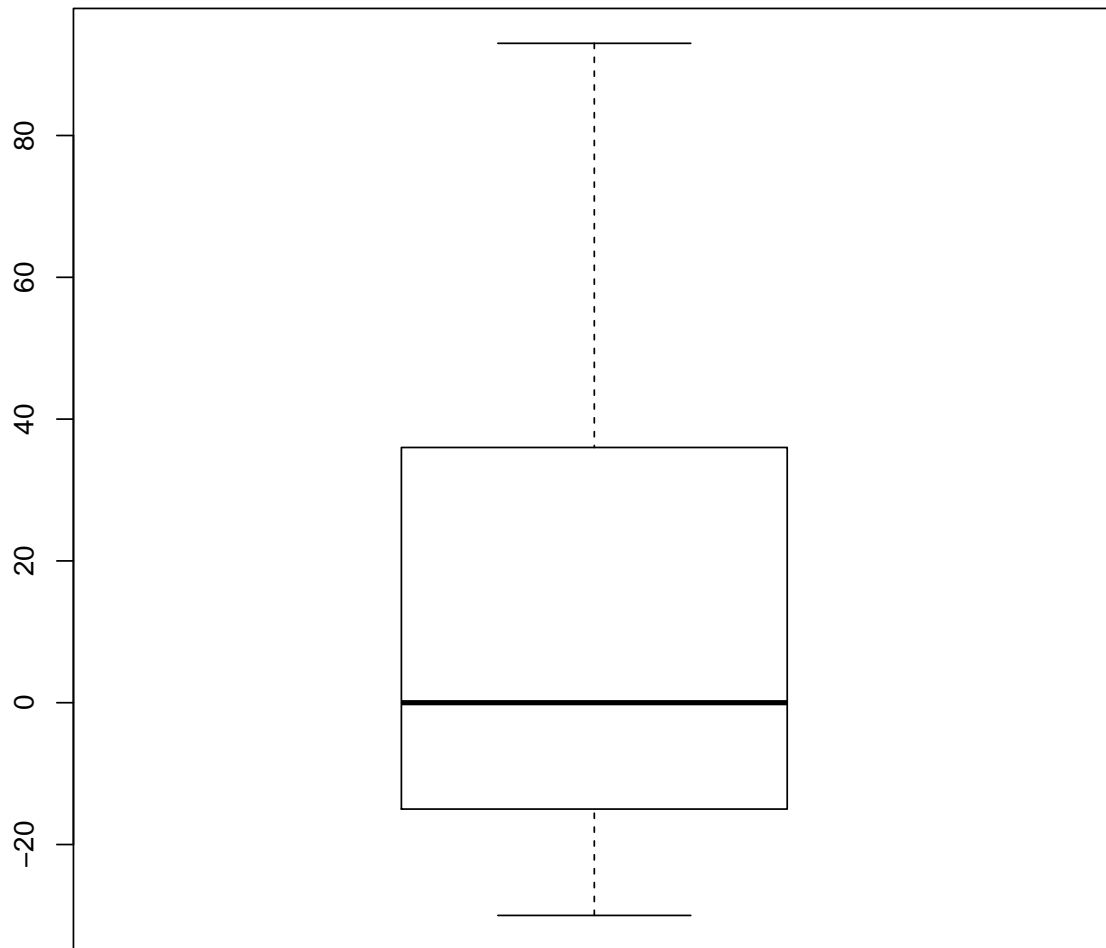
```
hist(work.open$daysOpen,
      breaks = 20,
      main = "Histogram of Days Request Open With No IE",
      xlab = "Day to Complete")
```

**Histogram of Days Request Open With No IE**



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

**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**

