

Exam 2

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Summary Statistics

```
# Read in datasets
internal <- read.table('Internal+Research+--WCtY+Time+Data.txt', header = T)
state <- read.delim("C:/Users/Frank/Desktop/STAT 3480/Exam II/State+Test+Data.txt", header=T)

# Summary statistics and plots for state data
state.comb <- c(state[1:11,1], state[1:12,2], state[1:9,3], state[1:11,4], state[1:12,5], state[1:11,6])
summary(state.comb)
```

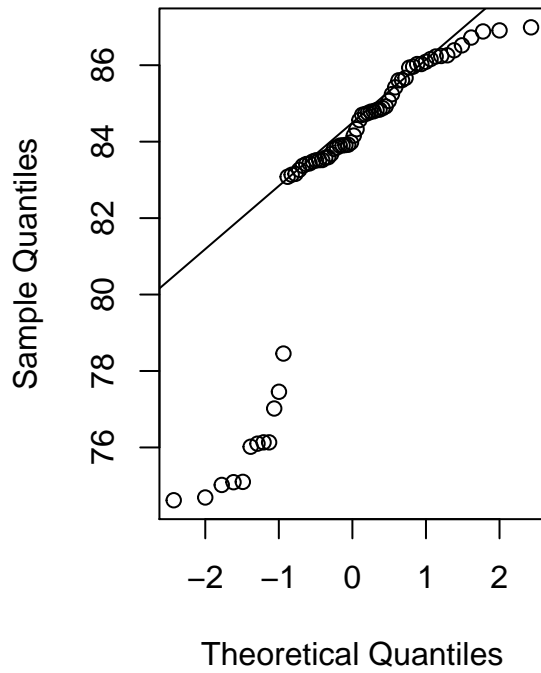
```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 74.62   83.38   84.07   83.20   85.61   86.99
```

```
summary(state)
```

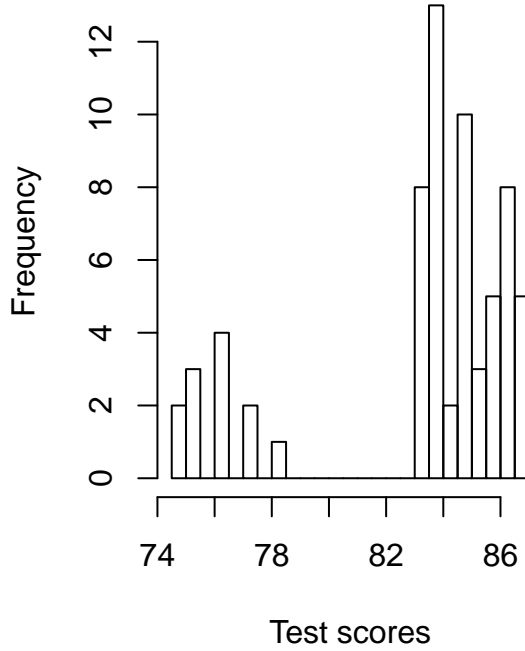
```
##      Ourstate      State1      State2      State3
## Min.   :83.08  Min.   :83.16  Min.   :83.37  Min.   :83.48
## 1st Qu.:83.90  1st Qu.:83.52  1st Qu.:84.72  1st Qu.:83.79
## Median :84.70  Median :84.81  Median :84.88  Median :84.79
## Mean   :84.78  Mean   :84.69  Mean   :85.09  Mean   :84.90
## 3rd Qu.:86.00  3rd Qu.:85.69  3rd Qu.:86.09  3rd Qu.:85.91
## Max.   :86.24  Max.   :86.91  Max.   :86.72  Max.   :86.99
## NA's    :1      NA's    :3      NA's    :1
##      State4      State5
## Min.   :74.62  Min.   :83.41
## 1st Qu.:75.07  1st Qu.:83.71
## Median :76.06  Median :84.33
## Mean   :75.99  Mean   :84.61
## 3rd Qu.:76.35  3rd Qu.:85.18
## Max.   :78.46  Max.   :86.88
##      NA's    :1
```

```
par(mfrow=c(1,2))
qqnorm(state.comb, main = "Q-Q Plot of State Test Data")
qqline(state.comb)
hist(state.comb, breaks = 30,
     main = "Histogram of State Test Data",
     xlab = "Test scores")
```

Q-Q Plot of State Test Data

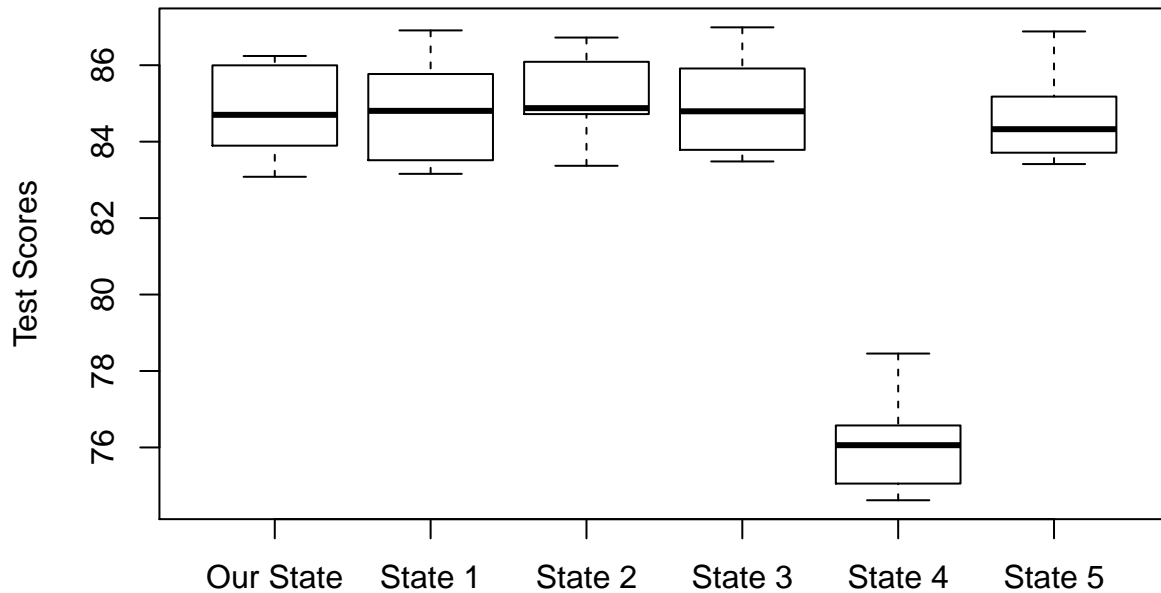


Histogram of State Test Data



```
par(mfrow=c(1,1))
boxplot(state, names = c("Our State", "State 1", "State 2", "State 3", "State 4", "State 5"),
        ylab = "Test Scores",
        main = "Boxplot of State Testing Data")
```

Boxplot of State Testing Data



```
# Summary statistics and plots for internal time data
```

```
internal.comb <- c(internal[1:10,1], internal[1:10,2], internal[1:10,3], internal[1:10,4], internal[1:10,5])
summary(internal.comb)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 80.05  81.15   82.15   82.11  83.06   83.98
```

```
summary(internal)
```

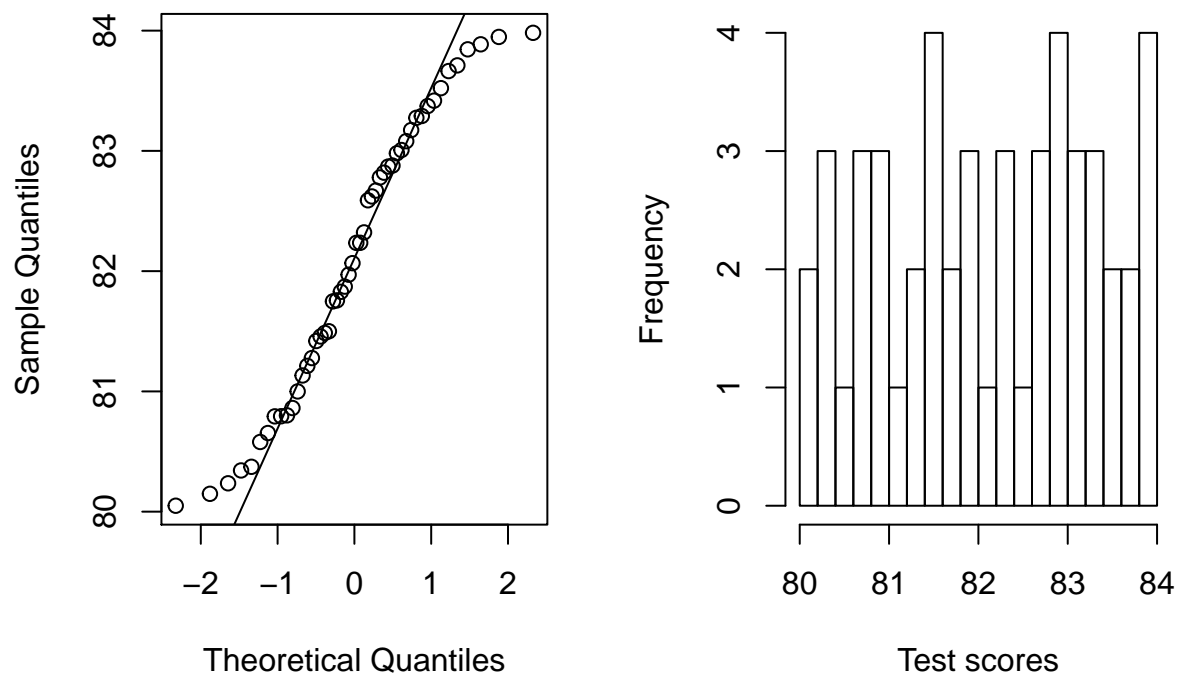
```
##  Lessthan30min   Approx60min   Approx90min   Approx120min
##  Min.    :81.00   Min.    :80.05   Min.    :80.24   Min.    :80.15
##  1st Qu.:82.34   1st Qu.:80.79   1st Qu.:81.58   1st Qu.:80.80
##  Median :82.93   Median :81.45   Median :82.19   Median :81.00
##  Mean   :82.82   Mean   :81.76   Mean   :82.16   Mean   :81.50
##  3rd Qu.:83.59   3rd Qu.:82.92   3rd Qu.:82.77   3rd Qu.:82.38
##  Max.   :83.98   Max.   :83.84   Max.   :83.89   Max.   :83.29
##  Approx180min
##  Min.    :80.37
##  1st Qu.:81.80
##  Median :82.51
##  Mean   :82.32
##  3rd Qu.:83.03
##  Max.   :83.71
```

```

par(mfrow=c(1,2))
qqnorm(internal.comb, main = "Q-Q Plot of Internal Research Time Data")
qqline(internal.comb)
hist(internal.comb, breaks = 15,
      main = "Histogram Internal Research Time Data",
      xlab = "Test scores")

```

Q-Q Plot of Internal Research Time Histogram Internal Research Time I

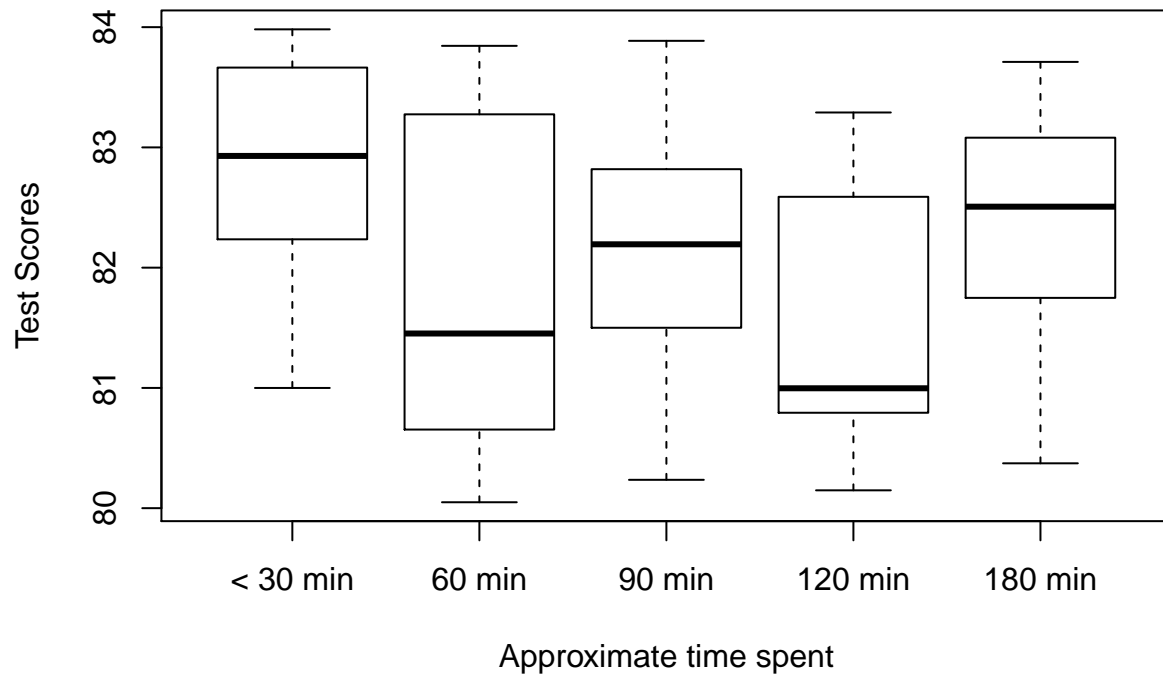


```

par(mfrow=c(1,1))
boxplot(internal, names = c("< 30 min","60 min", "90 min", "120 min", "180 min"),
        ylab = "Test Scores",
        xlab = "Approximate time spent",
        main = "Boxplot of Internal Research Time Data")

```

Boxplot of Internal Research Time Data



RMD

```
# RMD
state.order <- state.comb
rmd.x <- state.order[12:23]
rmd.y <- state.order[1:11]

dev.x <- rmd.x - median(rmd.x)
dev.y <- rmd.y - median(rmd.y)
rmd.1 <- sum(abs(dev.x))/length(rmd.x)
rmd.2 <- sum(abs(dev.y))/length(rmd.y)
rmd.obs = rmd.1/rmd.2

rmd.comb <- c(rmd.x, rmd.y)
rmd.all <- rep(0, 100)

for(i in 1:100)
{
  rmd.samp <- sample(rmd.comb)
  dev.x <- rmd.samp[1:length(rmd.x)] - median(rmd.x)
  dev.y <- rmd.samp[1:length(rmd.y)] - median(rmd.y)
  rmd.1 <- sum(abs(dev.x))/length(rmd.x)
  rmd.2 <- sum(abs(dev.y))/length(rmd.y)
```

```

    rmd.all[i] = rmd.1/rmd.2
}

sum(rmd.all >= rmd.obs)/100

```

```
## [1] 0.76
```

Bonferroni and Kruskal-Wallis

```

# Bonferroni adjustment
state.adj = .05/((6*(5)/2))
state.adj

```

```
## [1] 0.003333333
```

```

internal.adj = .05/((5*(4)/2))
internal.adj

```

```
## [1] 0.005
```

```
kruskal.test(state)
```

```

##
## Kruskal-Wallis rank sum test
##
## data: state
## Kruskal-Wallis chi-squared = 29.858, df = 5, p-value = 1.573e-05

```

```

# Kruskal-Wallis rank sum test
#
# data: state
# Kruskal-Wallis chi-squared = 29.858, df = 5, p-value = 1.573e-05

```

```
kruskal.test(internal)
```

```

##
## Kruskal-Wallis rank sum test
##
## data: internal
## Kruskal-Wallis chi-squared = 7.5586, df = 4, p-value = 0.1092

```

```

# Kruskal-Wallis rank sum test
#
# data: internal
# Kruskal-Wallis chi-squared = 7.5586, df = 4, p-value = 0.1092

```

```

state.order <- read.csv("state_ordered.csv", header=T)
state.order.r1 <- state.order[,1]
names(state.order.r1) <- state.order[,2]

state.rank <- rank(state.order.r1)
state.rank

```

```

## Ourstate Ourstate Ourstate Ourstate Ourstate Ourstate Ourstate Ourstate
##      47.0      58.0      33.0      37.0      27.0      34.0      14.0      54.0
## Ourstate Ourstate Ourstate  State1  State1  State1  State1  State1
##      13.0      59.0      53.0      22.0      55.0      45.0      65.0      21.0
##   State1   State1   State1   State1   State1   State1   State1   State2
##      15.0      40.0      49.0      16.0      52.0      28.0      42.0      44.0
##   State2   State2   State2   State2   State2   State2   State2   State2
##      43.0      46.0      56.0      24.0      17.0      62.0      38.0      63.0
##   State3   State3   State3   State3   State3   State3   State3   State3
##      25.0      26.0      41.0      20.0      29.0      31.0      60.0      66.0
##   State3   State3   State3   State4   State4   State4   State4   State4
##      48.0      57.0      51.0       8.5       2.0       7.0       1.0      12.0
##   State4   State4   State4   State4   State4   State4   State4   State5
##      10.0       8.5       4.0       5.0       6.0      11.0       3.0      18.0
##   State5   State5   State5   State5   State5   State5   State5   State5
##      23.0      30.0      32.0      61.0      35.0      50.0      64.0      19.0
##   State5   State5
##      36.0      39.0

```