Joshua Main-Smith
R 6
joshuamainsmith@ufl.edu
UFID: 7160-7655
April 19, 2020

Exercise 19.1

Consider the following data:

Site I	Site II	Site III	Site IV
93	85	100	96
120	45	75	58
65	80	65	95
105	28	40	90
115	75	73	65
82	70	65	80
99	65	50	85
87	55	30	95
100	50	45	82
90	40	50	
78		45	
95		55	
93			
88			
110			

These figures provide the depths (in centimeters) at which important archaeological finds were made at four sites in New Mexico (see Woosley and Mcintyre, 1996). Store these data in your R workspace, with one vector containing depth and the other vector containing the site of each observation.

a. Produce side-by-side boxplots of the depths split by group, and use additional points to mark the locations of the sample means.

b. Assuming independence, execute diagnostic checks for normality and equality of variances.

c. Perform and conclude a one-way ANOVA test for evidence of a difference between the means.

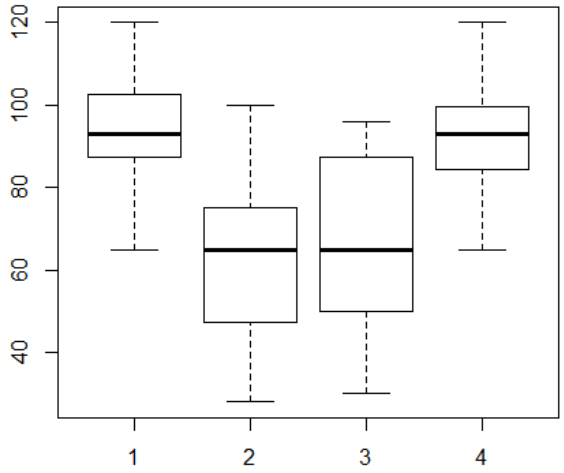
In Section 14.4, you looked at the data set providing measurements on petal and sepal sizes for three species of iris flowers. This is available in R as `iris`.

d. Based on diagnostic checks for normality and equality of variances, decide which of the four outcome measurements (sepal length/width and petal length/width) would be suitable for ANOVA (using the species as the group variable).

e. Carry out one-way ANOVA for any suitable measurement variables.

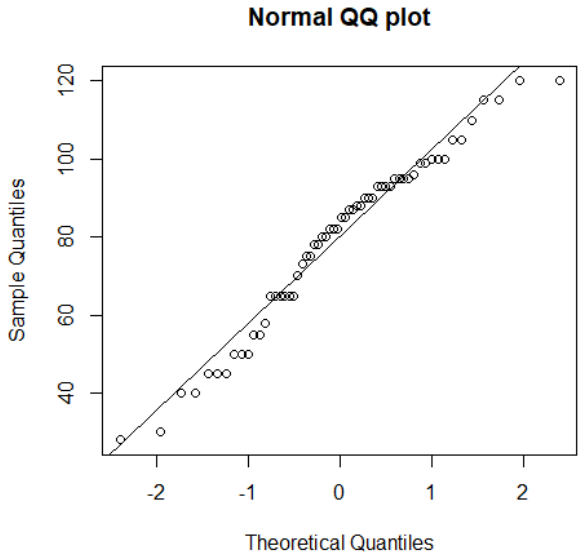
a

```
> s1 <- c(93, 120, 65, 105, 115, 82, 99, 87, 100, 90, 78, 95, 93, 88, 110)
> s2 <- c(85, 45, 80, 28, 75, 70, 65, 55, 50, 40)
> s3 <- c(100, 75, 65, 40, 73, 65, 50, 30, 45, 50, 45, 55)
> s4 <- c(96, 58, 95, 90, 65, 80, 85, 95, 82)
>
>
>
> arr <- array(c(s1,s2,s3,s4), dim = c(15,4))
> boxplot(arr)
```



b

```
> qqnorm(arr, main = "Normal QQ plot")
> qqline(arr)
```



c

```
> s5 <- append(s1, append(s2, append(s3, s4)))
>
> summary(s5)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  28.00   55.75   79.00   75.04   93.00  120.00
```