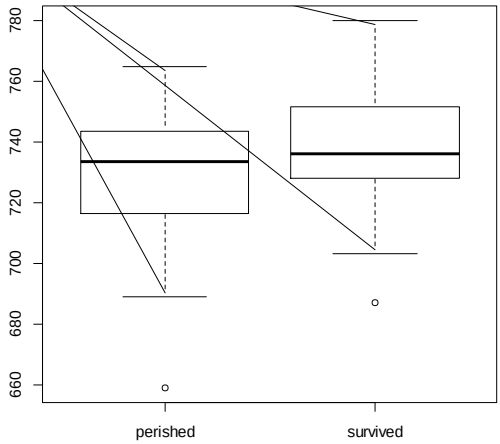
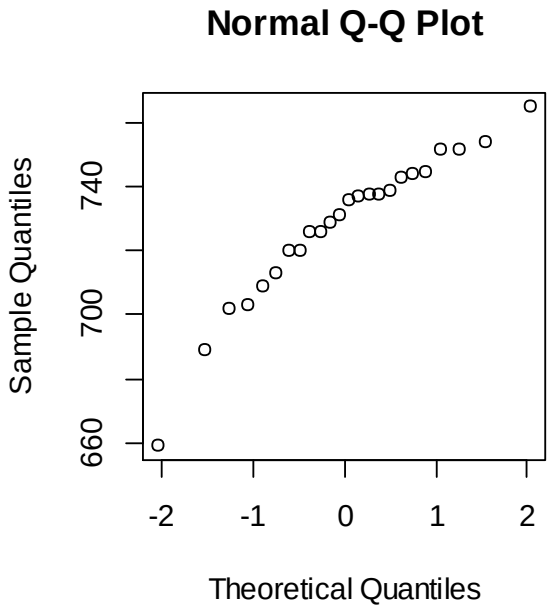
Homework 6 Draft Solutions

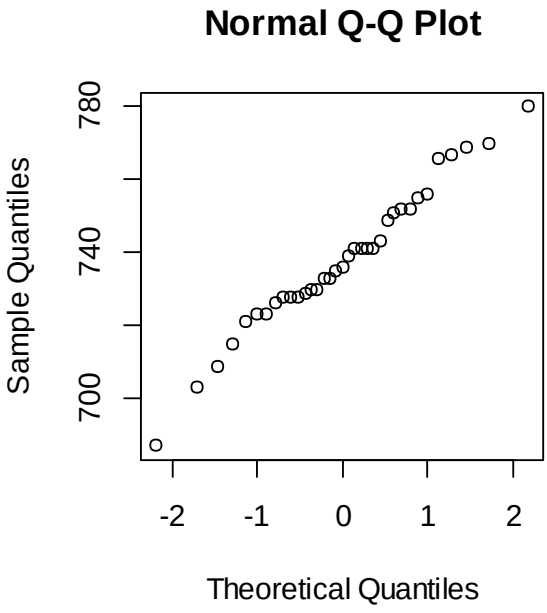
a) Here are the side-by-side boxplots in R.



From the side by side boxplots it looks as though the birds that survived may have had slightly longer humerus bones on average, although we will need to carry out a hypothesis test to decide if this difference is significant.

b) The normal probability plots are given by qqnorm(perished) and qqnorm(survived) in R.





The normal probability plots are approximate straight lines and so the humerus lengths in each group look approximately normally distributed. The assumptions required are that the data are random samples from independent normal populations (since one of the samples is not particularly large $n < 30$). Both samples seem normal and independence seems reasonable from a description of the problem.

c) The two populations are: 1) Humerus lengths of adult male birds that perished in the storm, and 2) humerus lengths of adult male birds that survived the storm. Mu_1 is the population mean humerus length of adult male birds that perished in the storm, and mu_2 the population mean humerus length of adult male birds that survived the storm.

d) In R we use the command: t.test(perished,survived) and part of the output is:

data: perished and survived

t = -1.7207, df = 43.824, p-value = 0.09236

We have no evidence against H_0 at the 5% level, because p-value > 0.05, i.e. we accept H_0.

e) From the same t.test command we have the 95 percent confidence interval:

(-21.894675 , 1.728008).

We are 95% confident that the true mean difference in wing length is between -21.89 and 1.73 thousands of an inch. We see that the 95% interval contains 0, and this is equivalent to accepting H_0 in the two-sided test at the 5% level, which is in agreement with part d).