Test if any with the significance level 0.05 in doing the problems below:

11.1.4 A balanced experimental design has a sample size of $n = 12$ observations at each of $k = 7$ factor levels. The total sum of squares is SST = 133.18, and the sample averages are $\bar{x}_{1\cdot} = 7.75$, $\bar{x}_{2\cdot} = 8.41$, $\bar{x}_{3\cdot} = 8.07$, $\bar{x}_{4\cdot} = 8.30$, $\bar{x}_{5\cdot} = 8.17$, $\bar{x}_{6\cdot} = 8.81$, and $\bar{x}_{7\cdot} = 8.32$. Compute the analysis of variance table. (*Hint*: Calculate SSTr and then subtract it from SST to obtain SSE.) What is the p-value?

11.1.8 A balanced experimental design has a sample size of $n = 11$ observations at each of $k = 3$ factor levels. The sample averages are $\bar{x}_{1\cdot} = 48.05$, $\bar{x}_{2\cdot} = 44.74$, and $\bar{x}_{3\cdot} = 49.11$, and MSE = 4.96.

(a) Calculate pairwise confidence intervals for the factor level means with an overall confidence level of 95%.

(b) Make a diagram showing which factor level means are known to be different and which ones are indistinguishable.

(c) What additional sampling would you recommend to reduce the lengths of the pairwise confidence intervals to no more than 2.0 ?

11.1.16 **Keyboard Layout Designs**

DS 11.1.4 gives the times taken to perform a numerical task using three different kinds of keyboard layouts for the numerical keys. Perform hand calculations to investigate how the different layouts affect the time taken to perform the task.

11.1.20 The data set in DS 11.1.7 is a one-way layout to compare the quality scores of a product made from five different treatment methods.

(a) Construct the ANOVA table.

(b) Construct pairwise comparisons of the treatment effects and make a graphical presentation of what you find. Which treatment mean is largest? Which treatment mean is smallest?

11.1.24 **E. Coli Colonies in Riverwater**

Four samples of water were taken at five different locations along a river and measurements were obtained of the amount of E. Coli colonies within the water as given in DS 11.1.9. Investigate whether there is any evidence that the E. Coli pollution levels are different at the five locations. Location 5 is the highest point upstream, and location 1 is the furthest point downstream. There is a polluting source between locations 4 and 5. Make a graphical presentation that illustrates the differences between the E. Coli levels at the five locations. Which location has the highest E. Coli level? Which location has the smallest E. Coli level?