Math 10 - Homework Chapter 12

1. A clinical psychologist completed a study on hyperactivity in children using one-way ANOVA. The model was balanced with **5 replicates per treatment**. The factor was 3 types of school district (urban, rural and suburban). Unfortunately, hackers broke into the psychologist's computer and wiped out all the data. All that remained was a fragment of the ANOVA table:

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F statistic	Critical Value of F for α= .05	Decision
Factor	7000					
Error						
Total	9000					

   Fill in the table and conduct the hypotheses test that compares mean level of hyperactivity in the 3 types of districts. **Explain your results.**

2. A sociologist was interested in commute time for workers in the Bay Area. She categorized commuters by 4 regions (North Bay, South Bay, East Bay and Peninsula) and designed a balanced model with 8 replicates per region. Data is round trip commute time in minutes . The results and ANOVA output are shown on the next page:

   a. Test the Null Hypothesis that all regions have the same mean commute time at a significance level of 5%. State your decision in non-statistical language.

   b. Conduct **all** pairwise comparisons at an overall significance level of 5%.

   c. Explain the results of this experiment as if you were addressing a transportation committee. What would you recommend?
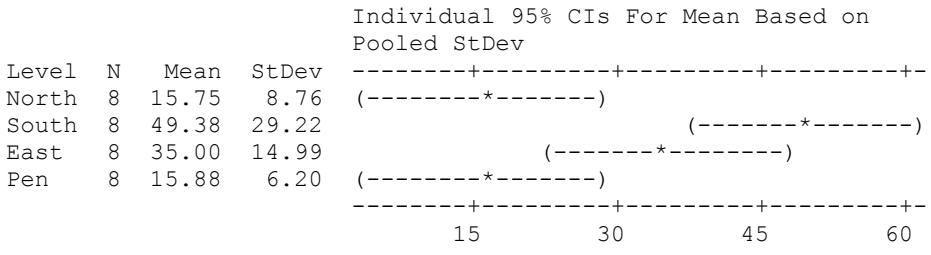
MINITAB OUTPUT

North	South	East	Pen
13	91	41	17
9	45	30	16
10	28	60	13
13	17	34	26
27	89	47	7
13	36	13	9
9	23	19	21
32	66	36	18

One-way ANOVA: North, South, East, Pen

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Source   DF      SS    MS      F      P
Factor    3    6392  2131   7.14  0.001
Error    28    8356   298
Total    31   14748

S = 17.28   R-Sq = 43.34%    R-Sq(adj) = 37.27%


                          Individual 95% CIs For Mean Based on
                          Pooled StDev
Level   N    Mean   StDev  --------+---------+---------+---------+-
North   8   15.75    8.76  (--------*-------)
South   8   49.38   29.22                      (-------*-------)
East    8   35.00   14.99            (-------*--------)
Pen     8   15.88    6.20  (--------*-------)
                          --------+---------+---------+---------+-
                              15        30        45        60


Pooled StDev = 17.28

Grouping Information Using Tukey Method

        N    Mean  Grouping
South   8   49.38  A
East    8   35.00  A B
Pen     8   15.88    B
North   8   15.75    B

Means that do not share a letter are significantly different.
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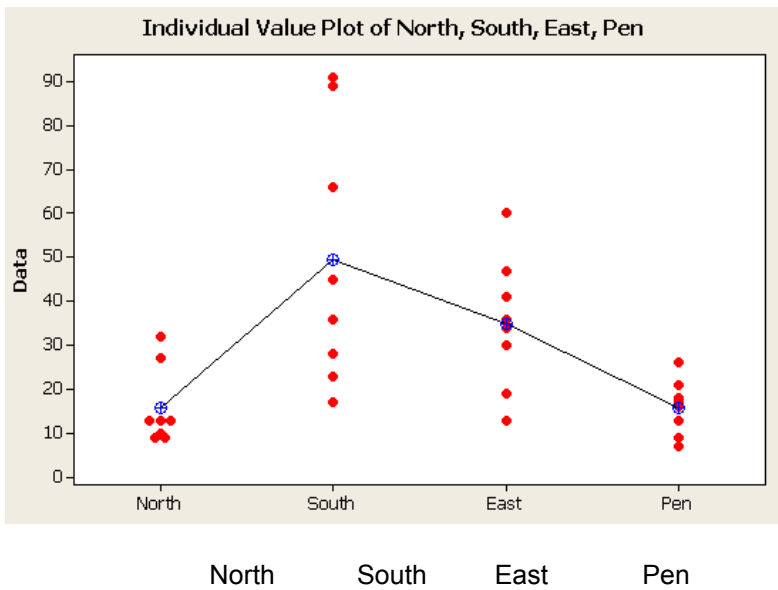

Individual Value Plot of North, South, East, Pen

3. People who are concerned about their health may prefer hot dogs that are low in salt and calories. The data contains data on the calories and sodium contained in each of 54 major hot dog brands. The hot dogs are classified by type: beef, poultry, and meat (mostly pork and beef, but up to 15% poultry meat). Minitab output is attached for two different hypothesis tests.

A test for a difference in **calories** due to hot dog type will be performed.

   i. Design the test.
   ii. Fill in the missing information in the ANOVA table on the next page.
   iii. Conduct the test with an overall confidence level of 5%, including pairwise comparisons.

One-way ANOVA: Calories versus Type

Source	DF	SS	MS	F	p-value
Type	___	17692	____	____	0.000
Error	___	28067	____		
Total	___	45759			

Grouping Information Using Tukey Method

Type	N	Mean	Grouping
Meat	17	158.71	A
Beef	20	156.85	A
Poultry	17	118.76	B

Means that do not share a letter are significantly different.

Individual Value Plot of Calories vs Type