| Name: | |
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| Panther ID: | |

Lab Assignment 3

Directions: Below there are two example problems solved and explained. After the examples there are exercises that need to be completed using SPSS. For each problem make sure that you print out and label your SPSS output. You may cut and paste the output into a word document if you prefer, but make sure that every question answered includes the relevant SPSS output.

Before we begin the examples, we should open SPSS.

Open SPSS by going to:

Start \rightarrow all programs \rightarrow SPSS for Windows \rightarrow SPSS 15.0 for Windows. After opening SPSS you will see a pop up box which will ask you, "What would you like to do?" Click Cancel.

At the bottom of the screen, you will see two tabs: Data View and Variable View. Click the 'Variable View' Tab

Congratulations! You are now ready to begin using SPSS.

Example 1: Use SPSS to analyze the following data from a CRD experiment, and use a multiple comparison procedure to compare the different treatment means:

Bread dough was stored at three different temperatures to determine which temperature produced the largest volume. The identical mounds of bread dough were allowed to sit and rise for four hours each. The data is given below:

| Temperatures: | 65 | 70 | 75 |
|----------------------|------|------|------|
| | 3300 | 3540 | 3775 |
| S | 3320 | 3560 | 3765 |
| Ime | 3290 | 3575 | 3780 |
| olu | 3285 | 3565 | 3795 |
| > | 3305 | 3550 | 3785 |
| Totals | | | |

Step 1: Under the 'Variable View' tab in SPSS, we need to enter a name for two variables. In the first row we will enter the name 'Temps' and in the second row we will enter the name 'Volumes.'

Step 2: After entering each name we can press the tab key. In this box next to each name select 'Numeric' (since our data is numerical in nature).

Step 3: By hitting tab again you have the option of selecting the width of your data values (If you have very long numbers you may need to increase the width). If you press tab again, you can specify the number of decimal places in your data values. For 'Temps,' I have entered zero as the number of decimal places because this is just a grouping variable.

| Nar | ne: | | | | | | | | | | STA 312 | 3L |
|-----------|--------------|----------------|-------------|------------------|--------------|--------|---------|---------|-------------|----------|---------|------------|
| Pan | ther l | ID: | | | | | | | | | Date: | |
| | | | | | | | | | | | | |
| 🗰 Untit | led - SPSS D | ata Editor | | | | | | | | | | - X |
| File Edit | View Data | Transform An | alyze Grapi | hs Utilities Add | d-ons Window | Help | | | | | | |
| 2 | a 🔍 🖌 | o 🗠 🔚 🗗 | 两庸 | <u>т = 4</u> Г | . %@ | | | | | | | |
| | Name | Туре | Width | Decimals | Label | Values | Missing | Columns | Align | Measure | | <u> </u> |
| 1 | Temps | Numeric | 8 | 0 | | None | None | 8 | Right | Scale | | |
| 2 | Volumes | Numeric | 8 | 2 | | None | None | 8 | Right | Scale | | |
| 3 | <u> </u> | | _ | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | ĺ | | | | | | | | | | | |
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| 10 | | | | | | | | | | | | |
| 11 | | | _ | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | 1 | | | | | | | | | | | |
| 16 |] | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | 1 | | | | | | | | | | | - |
| <u> </u> | ata View λV | ariable View / | | | | • | | press | | | | • |
| | | - | 1 | - | | mer | | SPS | S Processor | is ready | | |

Step 4: Click the 'Data View' tab. The first column should be labeled 'Temps' and the second should be labeled 'Volumes'

Step 5: In the 'Temps' column we will enter 1 in the first five rows, 2 in the next five rows, and 3 in the next five rows. The number 1 will represent the 65 degree temp, the number 2 will represent the 70 degree temp, and 3 will represent the 75 degree temp. Then list the volumes next to the corresponding temperature values.

| 🛅 Untit | led - SPSS D | ata Editor | | | | | | | | | | | | | | | |
|-----------|--------------|-------------|--------------|----------------|--------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| File Edit | View Data | Transform A | nalyze Grapi | ns Utilities A | Add-ons Wind | ow Help | | | | | | | | | | | |
| B | | | | | | | | | | | | | | | | | |
| 1: | | | | | | | | | | | | | | | | | |
| Í | Temps | Volumes | var | var | var | var | var | var | var | var | var | var | var | var | var | var | var 🔺 |
| 1 | 1 | 3300.00 | | | | | | | | | | | | | | | |
| 2 | 1 | 3320.00 | | | | | | | | | | | | | | | |
| 3 | 1 | 3290.00 | | | | | | | | | | | | | | | |
| 4 | 1 | 3285.00 | | | | | | | | | | | | | | | |
| 5 | 1 | 3305.00 | | | | | | | | | | | | | | | |
| 6 | 2 | 3540.00 | | | | | | | | | | | | | | | |
| 7 | 2 | 3560.00 | | | | | | | | | | | | | | | |
| 8 | 2 | 3575.00 | | | | | | | | | | | | | | | |
| 9 | 2 | 3565.00 | | | | | | | | | | | | | | | |
| 10 | 2 | 3550.00 | | | | | | | | | | | | | | | |
| 11 | 3 | 3775.00 | | | | | | | | | | | | | | | |
| 12 | 3 | 3765.00 | | | | | | | | | | | | | | | |
| 13 | 3 | 3780.00 | | | | | | | | | | | | | | | |
| 14 | 3 | 3795.00 | | | | | | | | | | | | | | | |
| 15 | 3 | 3785.00 | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | |

| Step 6: At the top of the 'Data View' | screen click Analyze - | \rightarrow General Linear | Model \rightarrow |
|---------------------------------------|------------------------|------------------------------|---------------------|
| Univariate | | | |

| 💼 Untitle | ed - SPSS D | ata Editor | | | | | | | | | | | | | | X |
|--------------------|--|---------------|---|-------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| File Edit | File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help | | | | | | | | | | | | | | | |
| ⊯ € 1: | ∌ ¤ ∽ | <u> ~ </u> | Reports Descriptive Statistics Tables |))) | <u>, </u> | | | | | | | | | | | |
| | Temps | Volumes | Compare Means | • | var var | var | var | var | var | var | var | var | var | var | var | var 🔺 |
| 1 | 1 | 3300.0 | General Linear Model | • | Univariate | | | | | | | | | | | |
| 2 | 1 | 3320.0 | Mixed Models | | Multivariate | | | | | | | | | | | |
| 3 | 1 | 3290.0 | Regression | | Repeated measures | _ | | | | | | | | | | |
| 4 | 1 | 3285.0 | Loginear | j, | Variance Components | | | | | | | | | | | |
| 5 | 1 | 3305.0 | Classify | • | | _ | | | | | | | | | | |
| 6 | 2 | 3540.0 | Data Reduction | ۲ | | | | | | | | | | | | |
| 7 | 2 | 3560.0 | Scale | • | | | | | | | | | | | | |
| 8 | 2 | 3575.0 | Nonparametric Tests | • | | | | | | | | | | | | |
| 9 | 2 | 3565.0 | Time Series | ۲ | | | | | | | | | | | | |
| 10 | 2 | 3550.0 | Survival | | | | | | | | | | | | | |
| 11 | 3 | 3775.0 | Multiple Response | , | | | | | | | | | | | | |
| 12 | 3 | 3765.0 | Complex Sempler | ۰. | | | | | | | | | | | | |
| 13 | 3 | 3780.0 | Complex Dumples | | 1 | | | | | | | | | | | |
| 14 | 3 | 3795.00 |) | | | | | | | | | | | | | |

| Name: | STA 3123L |
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| Panther ID: | Date: |

Step 7: After clicking 'Univariate' from step 6 above, a box appears. Move your variable 'Temps' to the 'Fixed Factors' box and move 'Volumes' to the 'Dependent Variable' box.

| 🛅 Untitled | - SPSS Data Editor | | | | | | | | | | | | _ - X |
|--|---|---|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|
| File Edit Vie | ew Data Transform Analyze Gr | aphs Utilities Add-ons Windov | / Help | | | | | | | | | | |
| * - - - | 🖳 🗠 🗠 🔚 🕅 🛉 | It = 4 - 3 - 3 | | | | | | | | | | | |
| 1: | | | | | | | | | | | | | |
| | Univariate | | 🔀 ar | var 🔺 |
| 1 2 3 4 5 6 7 7 8 9 10 11 11 2 13 14 15 16 17 7 | Image: Control of the second secon | Dependent Variable: Image: Volumes Fixed Factor(s) Image: Temps Random Factor(s) Covariate(s): Usual Structure WLS Weight: Reset Cancel | Model Contrasts Plots Post Hoc Save Options | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |

Step 8: Then click 'Post Hoc' and move 'Temps' to the 'Post Hoc Test for:' box. Then check the 'Tukey' box.

| | | 🗙 ar | var |
|---|--|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | | | | | | | | | | | | |
| 2 | Univariate: Post Hoc Multiple Comparisons for Observe | ed Means 🛛 🔀 . | | | | | | | | | | |
| 3 4 5 6 7 8 | Factor(s): Post Hoc Tests for: Temps Temps | Continue Cancel Help | | | | | | | | | | |
| 9 10 11 12 13 14 15 16 17 18 | Equal Variances Assumed ISD SHK Water-Duncan Softenoni ⊽ Tukey's-b Softenic Tukey's-b Softenic Dunces R-E-G-WQ Gabriel Equal Variances Not Assumed Tambane's 12 Dunnett's 13 Games-Howell D | etio: 100 Last V trol C > Control | | | | | | | | | | |



Step 10: Click Ok

Tests of Between-Subjects Effects

| Dependent Variable: Volumes | | | | | | | | | | |
|-----------------------------|----------------------------|----|-------------|----------|------|--|--|--|--|--|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | | | | | |
| Corrected Model | 577080.000 ^a | 2 | 288540.000 | 1748.727 | .000 | | | | | |
| Intercept | 188611740 | 1 | 188611740.0 | 1143101 | .000 | | | | | |
| Temps | 577080.000 | 2 | 288540.000 | 1748.727 | .000 | | | | | |
| Error | 1980.000 | 12 | 165.000 | | | | | | | |
| Total | 189190800 | 15 | | | | | | | | |
| Corrected Total | 579060.000 | 14 | | | | | | | | |

a. R Squared = .997 (Adjusted R Squared = .996)

| Name: | |
|-------------|------|
| Panther ID: | |

Date:_____

Multiple Comparisons

Dependent Variable: Volumes

Tukey HSD

| | | Mean Difference | | | 95% Confidence Interval | | |
|-----------|-----------|--------------------|------------|------|-------------------------|-------------|--|
| (I) Temps | (J) Temps | (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound | |
| 1 | 2 | -258.0000* | 8.12404 | .000 | -279.6738 | -236.3262 | |
| | 3 | -480.0000* | 8.12404 | .000 | -501.6738 | -458.3262 | |
| 2 | 1 | 258.0000* | 8.12404 | .000 | 236.3262 | 279.6738 | |
| | 3 | -222.0000* | 8.12404 | .000 | -243.6738 | -200.3262 | |
| 3 | 1 | 480.0000* | 8.12404 | .000 | 458.3262 | 501.6738 | |
| | 2 | 222.0000* | 8.12404 | .000 | 200.3262 | 243.6738 | |

Based on observed means.

*. The mean difference is significant at the .05 level.

Volumes

| Tukey HS | SD ^{a,b} | | | |
|----------|-------------------|-----------|-----------|-----------|
| | | | Subset | |
| Temps | N | 1 | 2 | 3 |
| 1 | 5 | 3300.0000 | | |
| 2 | 5 | | 3558.0000 | |
| 3 | 5 | | | 3780.0000 |
| Sig. | | 1.000 | 1.000 | 1.000 |

Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares

The error term is Mean Square(Error) = 165.000.

a. Uses Harmonic Mean Sample Size = 5.000.

b. Alpha = .05.

Example 2: Use SPSS to analyze the following data from a RBD experiment, and use a multiple comparison procedure to compare the different treatment means:

Four methods of manufacturing penicillin were compared. The blocks are blends of the raw material (corn steep liquor) which are known to be quite variable.

| Pland | Method | | | | | | | | | |
|--------|--------|----|----|----|--|--|--|--|--|--|
| Dieliu | А | В | С | D | | | | | | |
| 1 | 89 | 88 | 97 | 94 | | | | | | |
| 2 | 84 | 77 | 92 | 79 | | | | | | |
| 3 | 81 | 87 | 87 | 85 | | | | | | |
| 4 | 87 | 92 | 89 | 84 | | | | | | |
| 5 | 79 | 81 | 80 | 88 | | | | | | |

| Name: | |
|-------------|--|
| Panther ID: | |

Step 1: Under the 'Variable View' tab in SPSS, we need to enter a name for three variables. In the first row we will enter the name 'Method,' in the second row we will enter the name 'Blend,' and in the third row we will enter the name 'Yield.'

Step 2: After entering each name we can press the tab key. In this box next to each name select 'Numeric' (since our data is numerical in nature).

Step 3: By hitting tab again you have the option of selecting the width of your data values (If you have very long numbers you may need to increase the width). If you press tab again, you can specify the number of decimal places in your data values.

| 🔳 Untitl | ed - SPSS Di | ata Editor | | | | | | | | | 🗖 🗖 🗖 |
|-----------|--------------|----------------|-----------|------------------|----------------|--------|---------|---------|-------|---------|----------|
| File Edit | View Data | Transform Anal | yze Grapł | ns Utilities Ado | d-ons Window H | Help | | | | | |
| - | s 🔍 🗠 | a 🔚 🕅 | 商用 | 1 = 1 | \$ | | | | | | |
| | Name | Туре | Width | Decimals | Label | Values | Missing | Columns | Align | Measure | <u>*</u> |
| 1 | Method | Numeric | 8 | 2 | | None | None | 8 | Right | Scale | |
| 2 | Blend | Numeric | 8 | 2 | | None | None | 8 | Right | Scale | |
| 3 | Yield | Numeric | 8 | 2 | | None | None | 8 | Right | Scale | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| | | | | | | | | | | | |

Step 4: Click the 'Data View' tab.

Step 5: In the 'Method' column we will enter 1 in the first five rows, 2 in the next five rows, and 3 in the next five rows... In the 'Blend' column repeat the pattern 1, 2, 3, 4, and 5 until you have four sets of the pattern. Then cut and paste the table columns into the 'Yield' column in SPSS.

| | Method | Blend | Yield | var | var | var | var | var | var | var | var | var | var | var | var | var | var | - |
|-------------------|----------------|---------------|-------|-----|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 1 | 1.00 | 1.00 | 89.00 | | | | | | | | | | | | | | | |
| 2 | 1.00 | 2.00 | 84.00 | | | | | | | | | | | | | | | |
| 3 | 1.00 | 3.00 | 81.00 | | | | | | | | | | | | | | | |
| 4 | 1.00 | 4.00 | 87.00 | | | | | | | | | | | | | | | |
| 5 | 1.00 | 5.00 | 79.00 | | | | | | | | | | | | | | | |
| 6 | 2.00 | 1.00 | 88.00 | | | | | | | | | | | | | | | |
| 7 | 2.00 | 2.00 | 77.00 | | | | | | | | | | | | | | | |
| 8 | 2.00 | 3.00 | 87.00 | | | | | | | | | | | | | | | - |
| 9 | 2.00 | 4.00 | 92.00 | | | | | | | | | | | | | | | |
| 10 | 2.00 | 5.00 | 81.00 | | | | | | | | | | | | | | | |
| 11 | 3.00 | 1.00 | 97.00 | | | | | | | | | | | | | | | |
| 12 | 3.00 | 2.00 | 92.00 | | | | | | | | | | | | | | | |
| 13 | 3.00 | 3.00 | 87.00 | | | | | | | | | | | | | | | |
| 14 | 3.00 | 4.00 | 89.00 | | | | | | | | | | | | | | | |
| 15 | 3.00 | 5.00 | 80.00 | | | | | | | | | | | | | | | |
| 16 | 4.00 | 1.00 | 94.00 | | | | | | | | | | | | | | | |
| 17 | 4.00 | 2.00 | 79.00 | | | | | | | | | | | | | | | |
| 18 | 4.00 | 3.00 | 85.00 | | | | | | | | | | | | | | | |
| 19 | 4.00 | 4.00 | 84.00 | | | | | | | | | | | | | | | |
| 20 | 4.00 | 5.00 | 88.00 | | | | | | | | | | | | | | | |
| 21 | | [| | | | | | | | | | | | | | | | |
| 22 ∢ [⊁ [\ Da | nta View .á ∨a | riable View 🖌 | (| | | | • | | | | | | | | | | • | -1 |

Step 6: At the top of the 'Data View' screen click Analyze \rightarrow General Linear Model \rightarrow Univariate

| 🛅 Untit | led - SPSS Da | ta Editor | | | | | | | | | | | | | | | × |
|-----------|---------------|------------|---|-------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| File Edit | View Data | Transform | Analyze Graphs Utilities | Ac | dd-ons Window Help | | | | | | | | | | | | |
| 21 : Yi | 🞒 🔍 🗠 eld | ~ 1 | Reports Descriptive Statistics Tables | * * * | 5 9 0 | | | | | | | | | | | | |
| | Method | Blend | Compare Means | - | war war | var | - |
| 1 | 1.00 | 1.0 | General Linear Model | • | Univariate | | | | | | | | | | | | |
| 2 | 1.00 | 2.0 | Mixed Models | • | Multivariate | | | | | | | | | | | | 1 |
| 3 | 1.00 | 3.0 | Correlate | 2 | Repeated Measures | _ | | | | | | | | | | | 1 |
| 4 | 1.00 | 4.0 | Loginear | ; | Variance Components | | | | | | | | | | | | 1 |
| 5 | 1.00 | 5.0 | Classify | • | | | | | | | | | | | | | |
| 6 | 2.00 | 1.0 | Data Reduction | • | | | | | | | | | | | | | 1 |
| 7 | 2.00 | 2.0 | Scale | ۲ | | | | | | | | | | | | | 1 |
| 8 | 2.00 | 3.0 | Nonparametric Tests | • | | | | | | | | | | | | | _ |
| 9 | 2.00 | 4.0 | Time Series | • | | | | | | | | | | | | | |
| 10 | 2.00 | 5.0 | Survival | | | | | | | | | | | | | | |
| 11 | 3.00 | 1.0 | Multiple Response | , | | | | | | | | | | | | | |
| 12 | 3.00 | 2.0 | Missing value Analysis | | | | | | | | | | | | | | |
| 13 | 3.00 | 3.0 | Complex Jamples | - | 1 | | | | | | | | | | | | |
| 14 | 3.00 | 4.00 | 89.00 | | | | | | | | | | | | | | |

| Name: | STA 3123L |
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| Panther ID: | Date: |

Step 7: After clicking 'Univariate' from step 6 above, a box appears. Move your variables 'Method' and 'Blend' to the 'Fixed Factor(s)' box and move 'Yield' to the 'Dependent Variable' box.

| 21 : Yield | | | | | | | | | | | | | |
|---|--|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| N Univariate | | ar | var | |
| 1 Dependent Vaiible 2 Image: Control of the second secon | Model Contrasts Plotz Post Hoc Save Options | | | | | | | | | | | | |

Step 8: Then click 'Post Hoc' and move 'Method' to the 'Post Hoc Test for:' box. Then check the 'Tukey' box.

| and an other states of the sta | | | | | | | | | | | | | |
|--|----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| 21: Yield | _ | | | | | | | | | | | | |
| N N | Ξι | Univariate 🛛 🗙 ar | var | |
| 1 | _ | | | | | | | | | | | | 1 |
| 2 | | Univariate: Post Hoc Multiple Comparisons for Observed Means | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | Factor(s): Post Hoc Tests for: Continue | | | | | | | | | | | |
| 5 | | Method Method | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | Help | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | - |
| 9 | | Equal Variances Assumed | | | | | | | | | | | |
| 10 | | SNK Water-Duncan | | | | | | | | | | | |
| 11 | | Sidak Tukey Type 7 ype 17 ype | | | | | | | | | | | |
| 12 | | Scheffe Duncan Control Category Last | | | | | | | | | | | |
| 13 | | R-E-G-W F Hochberg's GT2 Test | | | | | | | | | | | |
| 14 | | R-E-G-W Q Gabriel G 2-sided C < Control C > Control | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | 1 | E qual Variances Not Assumed | | | | | | | | | | | |
| 17 | | Tamhane's T2 Dunnett's T3 Games-Howell Dunnett's C | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | 4 | 4.00 4.00 84.00 | | | | | | | | | | | |

Step 9: Click Continue

Step 10: Click Model \rightarrow Custom, Then select 'Main Effects' from the drop down box under the 'Build Terms' button, and move 'Method' and 'Blend' to the 'Model' box.

| | N 🗖 Univariate 🛛 🔀 ar | var | var | var | var | var | var | var | var | var | var |
|----|---|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | | | | | | | | | | | |
| 2 | Univariate: Model | | | | | | | | | | |
| 3 | C Specify Model | | | | | | | | | | |
| 4 | C Full factorial C Sustom | | | | | | | | | | |
| 5 | Factors & Covariates: Model | | | | | | | | | | |
| 6 | Method F) | _ | | | | | | | | | |
| 7 | Blend(F) Blend | | | | | | | | | | |
| 8 | Build Term(s) | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | Main effects 💌 | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | Sum of squares: Type III 💌 🔽 Include intercept in model | | | | | | | | | | |
| 18 | Continue Cancel He | elp | | | | | | | | | |
| 19 | | <u> </u> | | | | | | | | | |
| 20 | 4.00 5.00 88.00 | | | | | | | | | | |

Step 11: Click Continue

Step 12: Click Ok

| Name: | | |
|-------------|------|--|
| Panther ID: | | |

Tests of Between-Subjects Effects

| Dependent Variab | le: Yield | | | | |
|------------------|----------------------|----|-------------|----------|------|
| | Type III Sum | | | | |
| Source | of Squares | df | Mean Square | F | Sig. |
| Corrected Model | 334.000 ^a | 7 | 47.714 | 2.534 | .075 |
| Intercept | 147920.000 | 1 | 147920.000 | 7854.159 | .000 |
| Method | 70.000 | 3 | 23.333 | 1.239 | .339 |
| Blend | 264.000 | 4 | 66.000 | 3.504 | .041 |
| Error | 226.000 | 12 | 18.833 | | |
| Total | 148480.000 | 20 | | | |
| Corrected Total | 560.000 | 19 | | | |

a. R Squared = .596 (Adjusted R Squared = .361)

Multiple Comparisons

Dependent Variable: Yield Tukey HSD

| | | Mean Difference | | | 95% Confide | ence Interval |
|------------|------------|--------------------|------------|------|-------------|---------------|
| (I) Method | (J) Method | (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| 1.00 | 2.00 | -1.0000 | 2.74469 | .983 | -9.1487 | 7.1487 |
| | 3.00 | -5.0000 | 2.74469 | .311 | -13.1487 | 3.1487 |
| | 4.00 | -2.0000 | 2.74469 | .884 | -10.1487 | 6.1487 |
| 2.00 | 1.00 | 1.0000 | 2.74469 | .983 | -7.1487 | 9.1487 |
| | 3.00 | -4.0000 | 2.74469 | .491 | -12.1487 | 4.1487 |
| | 4.00 | -1.0000 | 2.74469 | .983 | -9.1487 | 7.1487 |
| 3.00 | 1.00 | 5.0000 | 2.74469 | .311 | -3.1487 | 13.1487 |
| | 2.00 | 4.0000 | 2.74469 | .491 | -4.1487 | 12.1487 |
| | 4.00 | 3.0000 | 2.74469 | .700 | -5.1487 | 11.1487 |
| 4.00 | 1.00 | 2.0000 | 2.74469 | .884 | -6.1487 | 10.1487 |
| | 2.00 | 1.0000 | 2.74469 | .983 | -7.1487 | 9.1487 |
| | 3.00 | -3.0000 | 2.74469 | .700 | -11.1487 | 5.1487 |

Based on observed means.

Yield

Tukey HSD ^{a,b}

| | | Subset |
|--------|---|---------|
| Method | Ν | 1 |
| 1.00 | 5 | 84.0000 |
| 2.00 | 5 | 85.0000 |
| 4.00 | 5 | 86.0000 |
| 3.00 | 5 | 89.0000 |
| Sig. | | .311 |

Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares

The error term is Mean Square(Error) = 18.833.

a. Uses Harmonic Mean Sample Size = 5.000.

b. Alpha = .05.

| Name: | |
|-------------|--|
| Panther ID: | |

Exercise 1: Work problem 10.25 on p. 533 using SPSS (p47 of the pdf practice problems exam 2).

Exercise 2: Work problem 10.59 on p. 555 parts a – d using SPSS (p57 of the pdf practice problems exam 2).