Q1

# Working expression:

**F =** 𝑴𝑺𝑻

**T**

𝑴𝑺𝑬

**MST =** 𝑺𝑺𝑻

𝒂 −𝟏

**MSB =** 𝑺𝑺𝑩

𝒃−𝟏

**MSE=** 𝑺𝑺𝑬 (𝒂−𝟏)(𝒃−𝟏)

# Working procedure:

# Define treatments (values A, B, C, D) and values in variable view → Assign type as numeric → Assign values 1 for A, 2 for B, 3 for C, 4 for D → Assign measure in nominal for treatment and scale for values→ Insert data in data view → Analyze → compare means → one way ANOVA → Put value in dependent list → Put treatment in factor→ post HOC→ LSD → continue → OK.

# SPSS Output :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ANOVA** | | | | | |
| values | | | | | |
|  | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 4265689.961 | 3 | 1421896.654 | 11.253 | .001 |
| Within Groups | 1768941.150 | 14 | 126352.939 |  |  |
| Total | 6034631.111 | 17 |  |  |  |

**Testing procedure:**

# Setting up Hypothesis:

**H0:** There is no significance difference between treatments

**H1:** There is significance difference between treatments

# Level of significance:

**α = 0.05**

# Decision:

# For treatment, p = 0.001 < α = 0.05, Hence we accept H1 and H0 is rejected

# Conclusion:

Hence, we conclude that there is significant difference between treatments.

Q2)

Working Expression:

The regression line of Y on X1 and X2 is Y = a + b1x1 + b2x2

Where, Y= dependent variable A = y-intercept

B1 and b2 are regression coefficients X1 and x2 are independent variable

Working Procedure:

Define variables Y, X1, X2 in variable view -> Put data in variable view ->Put measure as scale-> Analyze -> Regression -> Linear -> Put Y in dependent list -> Put X1 and X2 in independent list -> Goto statistics -> Level of confidence interval 95% -> continue -> ok

# SPSS OUTPUT:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Model Summary** | | | | | | Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | | 1 | .957a | .916 | .859 | 97.086 | | a. Predictors: (Constant), Distance from downtown, Room | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95.0% Confidence Interval for B | |
| B | Std. Error | Beta | Lower Bound | Upper Bound |
| 1 | (Constant) | 96.458 | 118.121 |  | .817 | .474 | -279.454 | 472.371 |
| Room | 136.485 | 26.864 | .943 | 5.081 | .015 | 50.991 | 221.978 |
| Distance from downtown | -2.403 | 14.171 | -.031 | -.170 | .876 | -47.502 | 42.695 |
| a. Dependent Variable: Rent(Constant) | | | | | | | | |

# Calculation:

Here, a = 96.458

b1 = 136.485

b2 = -2.403

The multiple models are

Y = a + b1x1 + b2x2

= 96.45 +136.485x1-2.4x2

b) When x1 =2, x2 = 2, Y =?

Y = 96.45+136.485\*2-2\*2.4

= 364.62

c) Multiple determination (R) = 0.916

= 91.6%

Which means that 91.6% of variation of dependent variable Y is explained by two independent variables X1 and X2.

c-ii) Standard error of estimation is 97.08

# Conclusion:

In general, in this way we can obtain the estimated value, coefficient of determination and

standard error from the given data.

**Working expression:**

= MSR =

= MSC =

= MST =

MSE=

**Working procedure:**

Define variable in Name (Row, Column, Treatment, Value) → Make Treatment to string and other Numeric→ Give decimal 1 for Values other 0→Make Label same as Name→ Make it all align to center→ Measure for all scale except put treatment in Nominal→ Analyze → General linear model → Univariate → Put values in the dependent variable → Put row, column and treatment in fixed factors → Click model → Go to custom → row, column and treatment in factor and covariates send to model → Type main effects → Sum of square type III → continue → click post Hoc → Send row, column and treatment in factors in Post Hoc tests for → click LSD → continue → ok → Copy only ANOVA table in word file

**SPSS Output:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tests of Between-Subjects Effects** | | | | | |
| Dependent Variable: values | | | | | |
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Corrected Model | 16.063a | 9 | 1.785 | .675 | .714 |
| Intercept | 5513.063 | 1 | 5513.063 | 2083.677 | .000 |
| Row | 1.188 | 3 | .396 | .150 | .926 |
| Column | 9.688 | 3 | 3.229 | 1.220 | .381 |
| Treatment | 5.188 | 3 | 1.729 | .654 | .609 |
| Error | 15.875 | 6 | 2.646 |  |  |
| Total | 5545.000 | 16 |  |  |  |
| Corrected Total | 31.938 | 15 |  |  |  |
| a. R Squared = .503 (Adjusted R Squared = -.243) | | | | | |

**Testing procedure:**

**Setting up Hypothesis**

H0: There is no significance difference between rows, columns, and treatments.

H1: There is significance difference between rows, columns, and treatments.

**Level of significance**

α=0.05

**Decision**

For row, p = 0.926 > α = 0.05, Hence we accept H0 and H1 is rejected

For column, p = 0.381> α = 0.05, Hence we accept H0 and H1 is rejected.

For treatment, p = 0.609 > α = 0.05, Hence we accept H0 and H1 is rejected.

**Conclusion:**

Hence, we conclude that there is no significant difference between rows, columns, and treatments.