*Session 5: Assignment 2*

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1. Introduction

This assignment will help you to consolidate the concepts learnt in the session.

1. Problem Statement

**Problem Statement 1:**

Using the following data, perform a oneway analysis of variance using α=.05. Write up

the results in APA format.

[Group1: 51, 45, 33, 45, 67]

[Group2: 23, 43, 23, 43, 45]

[Group3: 56, 76, 74, 87, 56]

**Note: Solution submitted via github must contain all the detailed steps.**

**3. Output:**

Step 1: Calculate **Sample Mean** for each Group:

SM-G1 = 51+45+33+45+67/5 = 48.2

SM-G2 = 23+43+23+43+45/5 = 35.4

SM-G3 = 56+76+74+87+56/5 = 69.8

**Sample Mean** for all groups are **48.2, 35.4, 69.8**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group2 | Value | Mean | Deviations | **Square Deviation** |
| 1 | 23 | 35.4 | -12.4 | **153.76** |
| 2 | 43 | 35.4 | 7.6 | **57.76** |
| 3 | 23 | 35.4 | -12.4 | **153.76** |
| 4 | 43 | 35.4 | 7.6 | **57.76** |
| 5 | 45 | 35.4 | 9.6 | **92.16** |
| Sum of Squared Deviations | | | | **515.20** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group1 | Value | Mean | Deviation | **Square Deviation** |
| 1 | 51 | 48.2 | 2.8 | **7.84** |
| 2 | 45 | 48.2 | -3.2 | **10.24** |
| 3 | 33 | 48.2 | -15.2 | **231.04** |
| 4 | 45 | 48.2 | -3.2 | **10.24** |
| 5 | 67 | 48.2 | 18.8 | **353.44** |
| Sum of Squared Deviations | | | | **612.80** |

Step 2: Calculate Square Deviation and Sum of Squared Deviationsof all the groups as shown in table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group3 | Value | Mean | Deviations | **Square Deviation** |
| 1 | 56 | 69.8 | -13.8 | **190.44** |
| 2 | 76 | 69.8 | 6.2 | **38.44** |
| 3 | 74 | 69.8 | 4.2 | **17.64** |
| 4 | 87 | 69.8 | 17.2 | **295.84** |
| 5 | 56 | 69.8 | -13.8 | **190.44** |
| Sum of Squared Deviations (SS) | | | | **732.80** |

Step 3: Calculate **Variance** of each group:

VG1 = 612.80/(5-1)=**153.20**

VG2 = 515.20/(5-1)= **128.80**

VG3 = 732.80/(5-1)=**183.20**

Step 4: Calculate **SS Error:**

**MsError**= (153.20+128.80+183.20)/3= **155.07**

Remaining error (or within) terms for the ANOVA table: **dferror**=>15-3=**12**

Therefore, **SSerror**=>(155.07)x(15-3)=**1860.80**

Step 5: Find Grand Mean -> 48.2+35.4+69.83=**51.13; Square Deviation; Sum of Squares; Variance and SS Error**:

|  |  |  |  |
| --- | --- | --- | --- |
| Group Mean | Grand Mean | Deviations | **Square Deviation** |
| 48.2 | 51.13 | -2.93 | **8.58** |
| 35.4 | 51.13 | -15.73 | **247.43** |
| 69.8 | 51.13 | 18.67 | **348.57** |

Sum of Squares **(SS)=**8.58 + 247.43 + 348.57 = **604.58**

**Variance=** 604.58/(3-1) = **302.29**

**MsBetween**=(302.29)x(5)=**1511.45**

Remaining between (or group) terms of the ANOVA table: **dfgroups**=> 3-1=**2**

Therefore, SSgroup=> (1511.45)x(3-1)=**3022.90**

Step 6: Test statistic and critical value:

F = 1511.45/155.07 = **9.75**

Fcritical (2,12) = 3.89

**Decision: Reject H0.**

Step 7: **Effect size=>** η2= 3022.9/4883.7 = **0.62**

Step 8: Oneway analysis of variance using α=.05, **APA writeup**:

**F(2, 12)=9.75, p <0.05, η2η2=0.62**