**DSM\_Statistics4\_Assignment19.2**

**Problem Statement 1:**

**Using the following data, perform a one-way 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]

**Solution Explanation:**

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

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

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

**Sample means (x¯x¯) for the groups: = 48.2, 35.4, 69.8, Group1, Group2 and Group3 respectively.**

[[1]]

value mean deviations sq deviations

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

[[2]]

value mean deviations sq deviations

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

[[3]]

value mean deviations sq deviations

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 from the mean (SS) for the groups:**

**612.8, 515.2, 732.8** for Group1, Group2 and Group3 respectively.

Var1=612.8 / (5−1) =153.2

Var2=515.2 / (5−1) =128.8

Var3=732.8 / (5−1) =183.2

MSerror =153.2+128.8+183.2 / 3=155

**Calculating the remaining error (or within) terms for the ANOVA table:**

dferror=15−3=12dferror=15−3=12

SSerror=(155.07)(15−3)=1860.8

**Intermediate steps in calculating the variance of the sample means:**

Grand mean (x¯grandx¯grand) = 48.2+35.4+69.8 / 3 =51.13

**group mean grand mean deviations sq deviations**

**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 (SSmeans)=604.58

Varmeans=604.583−1=302.29

MSbetween=(302.29)(5)=1511.45 Note: This method of estimating the variance IS sensitive to group mean differences!

Calculating the remaining between (or group) terms of the ANOVA table:

dfgroups=3−1=2

SSgroup=(1511.45)(3−1)=3022.9

**Test statistic and critical value**

**F=1511.45155.07=9.75**

**Fcritical (2,12) =3.89**

**Decision: reject H0**

**ANOVA table**

**source SS df MS F**

**group 3022.9 2 1511.45 9.75**

**error 1860.8 12 155.07**

**total 4883.7**

**Effect size**

**η2=3022.9 / 4883.7=0.62**

**APA writeup**

**F(2, 12)=9.75, p <0.05, η2=0.62.**

**Python Code**

