**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

**Solution:**

Sample means (x¯) for the groups: = 48.2, 35.4, 69.8

Intermediate steps in calculating the group variances:

Group1:

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

Group2:

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

Group3:

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

Var1=612.85−1=153.2

Var2=515.25−1=128.8

Var3=732.85−1=183.2

MSerror=153.2+128.8+183.23=155.07

Note: this is just the average within-group variance; it is not sensitive to group mean differences!

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

dferror=15−3=12

SSerror=(155.07)(15−3)=1860.8

Intermediate steps in calculating the variance of the sample means:

Grand mean (x¯grand) = 48.2+35.4+69.83=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

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=3022.94883.7=0.62

**APA writeup**

F(2, 12)=9.75, p <0.05, η2

=0.62.