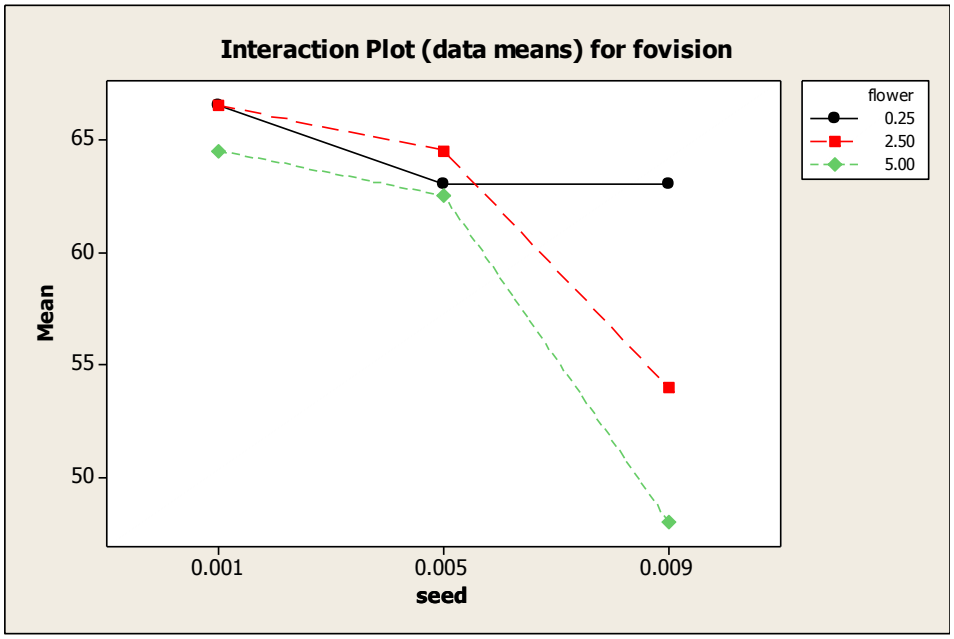
STAT436 **Homework 5** **Due Thursday January 30th at 2.30pm**

Directions: Answer the following single exercise, showing all relevant work. Conclusions and justifications are to be given in clear detailed English. Please type up your solutions or write ***very*** neatly.

The female flower and the seed of two African plants are widely used in traditional medicine for the treatment of people with certain diseases. It has been claimed, however, that use of these traditional remedies in combination can temporarily impair vision by reducing the patient's field of vision. The measurements provided in the following table were collected from 18 subjects randomly assigned in groups of two to different combinations of flower and seed concentrations. The goal here is to *thoroughly* answer the question: how do the plants appear to affect field of vision? Report all necessary assumptions, (exact) test statistics and p-values, the results of relevant diagnostics, along with a thorough analysis of the data, and be sure to identify the type of design and the appropriate analysis in your analysis.

Flower	Seed	Field of Vision	
0.25 g	0.001 g	67	66
	0.005 g	65	61
	0.009 g	62	64
2.50 g	0.001 g	68	65
	0.005 g	68	61
	0.009 g	55	53
5.00 g	0.001 g	65	64
	0.005 g	62	63
	0.009 g	49	47




```
data one;
  do flower=0.25,2.5,5;
  do seed=0.001,0.005,0.009;
  do rep=1,2;
```

```
    input fovision @@; output;
  end; end; end; datalines;
67 66 65 61 62 64 68 65 68 61 55 53 65 64 62 63 49 47
;
proc glm;
  class flower seed;
  model fovision=flower seed flower*seed;
run;
```

```
                              The GLM Procedure

                          Class Level Information
                   Class         Levels    Values
                   flower             3    0.25 2.5 5
                   seed               3    0.001 0.005 0.009
                   Number of Observations Read          18
                   Number of Observations Used          18
Dependent Variable: fovision
                                      Sum of
Source                         DF         Squares     Mean Square    F Value    Pr > F
Model                           8     623.7777778      77.9722222      15.77    0.0002
Error                           9      44.5000000       4.9444444
Corrected Total                17     668.2777778

               R-Square     Coeff Var      Root MSE    fovision Mean
               0.933411      3.622171      2.223611         61.38889

Source                         DF       Type I SS     Mean Square    F Value    Pr > F
flower                          2     102.7777778      51.3888889      10.39    0.0046
seed                            2     386.1111111     193.0555556      39.04    <.0001
flower*seed                     4     134.8888889      33.7222222       6.82    0.0083

Source                         DF     Type III SS     Mean Square    F Value    Pr > F
flower                          2     102.7777778      51.3888889      10.39    0.0046
seed                            2     386.1111111     193.0555556      39.04    <.0001
flower*seed                     4     134.8888889      33.7222222       6.82    0.0083
```

```
data two;
  do trt=1 to 9;
  do rep=1,2;
    input fovision @@; output;
  end; end; datalines;
67 66 65 61 62 64 68 65 68 61 55 53 65 64 62 63 49 47
;
proc glm data=two;
  class trt;
  model fovision=trt;
  contrast '       in flower 0.25' trt 1  0 -1  0  0  0  0  0  0,
                                   trt 1 -2  1  0  0  0  0  0  0;
  contrast '       in flower 2.50' trt 0  0  0  1  0 -1  0  0  0,
                                   trt 0  0  0  1 -2  1  0  0  0;
  contrast '       in flower 5.00' trt 0  0  0  0  0  0  1  0 -1,
                                   trt 0  0  0  0  0  0  1 -2  1;
  contrast 'linear in flower 0.25' trt 1  0 -1  0  0  0  0  0  0;
  contrast '  quad in flower 0.25' trt 1 -2  1  0  0  0  0  0  0;
  contrast 'linear in flower 2.50' trt 0  0  0  1  0 -1  0  0  0;
  contrast '  quad in flower 2.50' trt 0  0  0  1 -2  1  0  0  0;
  contrast 'linear in flower 5.00' trt 0  0  0  0  0  0  1  0 -1;
```

```
  contrast '  quad in flower 5.00' trt 0  0  0  0  0  0  1 -2  1;
run;
```

```
                                The GLM Procedure

                                Class Level Information
                      Class         Levels    Values
                      trt                9    1 2 3 4 5 6 7 8 9
                      Number of Observations Read          18
                      Number of Observations Used          18
Dependent Variable: fovision
                                          Sum of
Source                          DF       Squares     Mean Square    F Value    Pr > F
Model                            8     623.7777778      77.9722222      15.77    0.0002
Error                            9      44.5000000       4.9444444
Corrected Total                 17     668.2777778

                R-Square     Coeff Var      Root MSE    fovision Mean
                0.933411      3.622171      2.223611         61.38889

Source                          DF       Type I SS     Mean Square    F Value    Pr > F
trt                              8     623.7777778      77.9722222      15.77    0.0002

Source                          DF     Type III SS     Mean Square    F Value    Pr > F
trt                              8     623.7777778      77.9722222      15.77    0.0002

Contrast                        DF     Contrast SS     Mean Square    F Value    Pr > F
       in flower 0.25            2      16.3333333       8.1666667       1.65    0.2449
       in flower 2.50            2     180.3333333      90.1666667      18.24    0.0007
       in flower 5.00            2     324.3333333     162.1666667      32.80    <.0001
linear in flower 0.25            1      12.2500000      12.2500000       2.48    0.1499
  quad in flower 0.25            1       4.0833333       4.0833333       0.83    0.3872
linear in flower 2.50            1     156.2500000     156.2500000      31.60    0.0003
  quad in flower 2.50            1      24.0833333      24.0833333       4.87    0.0547
linear in flower 5.00            1     272.2500000     272.2500000      55.06    <.0001
  quad in flower 5.00            1      52.0833333      52.0833333      10.53    0.0101
```