ECE 341 - Homework #15

F-Test and ANOVA. Due Friday, June 12th

Please make the subject "ECE 341 HW#15" if submitting homework electronically to Jacob_Glower@yahoo.com (or on blackboard)

Test of a 3+ Populations

1) Use Matlab to generate 3 sets of random numbers:

```
A = 50 + 5 * randn(5,1);
B = 55 + 3 * randn(5,1);
C = 57 + 4 * randn(5,1);
```

Determine if the means are the same using an ANOVA test.

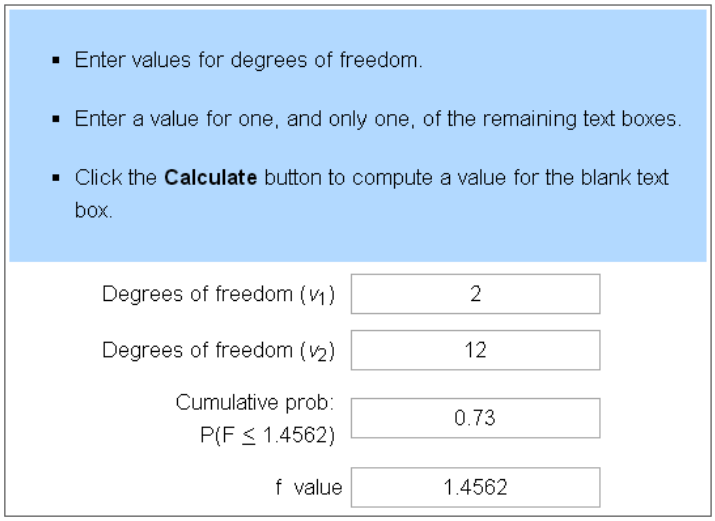
```
>> A = 50 + 5 * randn(5,1)

   48.9752
   49.3793
   57.4485
   57.0452
   57.0860

>> B = 55 + 3 * randn(5,1)

   57.0145
   51.3775
   57.1517
   59.8907
   56.4667

>> C = 57 + 4 * randn(5,1)

   61.1388
   59.9075
   55.7862
   58.1755
   53.8509

>> Na = length(A);
>> Nb = length(B);
>> Nc = length(C);
>> N = Na + Nb + Nc

N =    15

k = 3;
>> G = mean([A;B;C])

G =   56.0463

>> MSSb = ( Na*(mean(A)-G)^2 + Nb*(mean(B)-G)^2 + Nc*(mean(C)-G)^2 ) / (k-1)

MSSb =   18.3257

>> MSSw = ( (Na-1)*var(A) + (Nb-1)*var(B) + (Nc-1)*var(C) ) / (N - k)

MSSw =   12.5850

>> F = MSSb / MSSw

F =    1.4562
```

From StatTrek,

- m (numerator) has 2 degrees of freedom (k-1)
- n (denominator) has 12 degrees of freedom (N-k)

There is a 73% chance that the populations have a different mean

- meaning you probably shouldn't lump these together and treat them as a single population with a sample size of 15



2) Have three different people take the reaction-time test

or, use the following data from homework #13:

- A: { 211, 220, 196, 201, 212 } ms
- B: { 301, 313, 287, 368, 281 } ms
- C: { 268, 298, 297, 304, 377 } ms

Determine if the means are the same using an ANOVA test.

Using Matlab

```
>> A = [211, 220, 196, 201, 212]';
>> B = [301, 313, 287, 368, 281]';
>> C = [268, 298, 297, 304, 377]';
>> Na = length(A);
>> Nb = length(B);
>> Nc = length(C);
>> N = Na + Nb + Nc

N =    15

>> k = 3;
>> G = mean([A;B;C])

G =  275.6000

>> MSSb = ( Na*(mean(A)-G)^2 + Nb*(mean(B)-G)^2 + Nc*(mean(C)-G)^2 ) / (k-1)

MSSb =  1.7138e+004

>> MSSw = ( (Na-1)*var(A) + (Nb-1)*var(B) + (Nc-1)*var(C) ) / (N - k)

MSSw =  981.7333

>> F = MSSb / MSSw

F =   17.4573
```

From StatTrek, I'm 99.97% certain that the populations have different means

- meaning you shouldn't lump these together and treat them as a single population with a sample size of 15