Fact Sheet – ANOVA (13.1)

This test is used to test for the equality of 3 or more population means.

Example: The mean number of hours spent studying each week is the same for freshmen, sophomores, juniors, and seniors.

Conditions

To perform this test, the following two conditions must be met.

- The data in each independent sample come from populations that are each normally distributed. (*You can construct all the QQ plots in StatCrunch at the same time.*)
- The largest sample standard deviation is no more than twice the smallest sample standard deviation. (*You can check this by computing all the sample standard deviations in StatCrunch at the same time.* ***Stat > Summary Stats > Columns***)

Hypothesis Test

Step 1

You must identify each population - #1, #2, #3, …

The null hypothesis will be $\mu_1 = \mu_2 = \mu_3 = \cdots$.

H_1 will always be "*At least one mean is different than the others.*"

Step 3

The test statistic is calculated by comparing the variance within each sample to the variance between the samples. If the sample means have greater dispersion than the values within each sample, this indicates that the population means are not all equal to each other.

Just write "ANOVA", rather than writing the test statistic.

Step 4

To compute the test statistic and P-value using StatCrunch …

Enter the data, one sample per column.
Stat > ANOVA > One Way
Select the columns containing the sample data.
Click Calculate.

Classroom Examples (13.1)

1) Here are the GPA's of five sorority members, six fraternity members and eight students that do not belong to either.

Sorority	Fraternity	Neither
2.85	2.92	3.55
2.93	3.31	3.22
3.06	3.05	3.15
3.04	3.17	3.32
2.89	3.25	3.06
	3.18	3.01
		3.03
		3.30

At the 0.05 level of significance, test the claim that the mean GPA's of the three populations are equal.

2) Hole selections for professional golf courses are changed each day of an LPGA tournament. Are any of the days set up to be more difficult or easier? Here are some randomly selected scores on the four days of a tournament.

Round 1	Round 2	Round 3	Round 4
65	75	70	71
67	77	77	64
74	73	71	68
70	80	69	70
70	77	74	69
71	74	72	74
73	74	76	69
76	75	70	
74		76	
69			

At the 0.01 level of significance, test the claim that the mean scores produced by the four different rounds are equal.

3) An onion farmer has three different locations, each planted by a different method. The farmer randomly selects 40 three-foot beds, and counts the number of plants in each bed. Here are the totals.

Farm A	Farm B	Farm C
57	55	52
66	59	49
62	55	55
57	65	54
68	66	70
52	52	59
61	52	67
54	71	64

At the 0.05 level of significance, test the claim that the three farms have the same mean number of plants per three-foot bed.