1-Way ANOVA

- Objective
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- Implementing 1-Way ANOVA

1-Way ANOVA: Objective

1-Way ANalysis Of VAriance (ANOVA) is used when we want to test the claim that three or more populations have the same mean.

$H_0 : \mu_1 = \mu_2 = \ldots \mu_n$

$H_1 :$ At least two of the means differ from each other

Requirements of 1-Way ANOVA

- All population distributions are approximately normal.
- All populations have the same standard deviations (or not too different if the sample sizes are nearly equal).
- Data collection uses the Simple Random Sample technique.
- The samples are independent of each other.
- The categorization of the sample is done in the same way.

Example

Are the mean driving speeds the same for Highway 50, Highway 89, and Pioneer Trail?

Hwy 50	58	52	51	47	49	60	56
Hwy 89	43	47	56	49	42	47	58
Pioneer Tr.	51	55	50	56	54	55	50

$H_0 : \mu_1 = \mu_2 = \mu_3$

STAT ->TESTS -> ANOVA,   ANOVA(L1,L2,L3)

$H_1 :$ At least one of the two mean speeds differ

$F = 1.924$

$P\text{-Value} = 0.175$

Fail to reject H_0. There is insufficient evidence to conclude that the mean speeds on the three roads are not the same

1-Way ANOVA

A study was done to see if the mean GPAs for in-state, out-of-state, and foreign students are different. What can be concluded at the 0.01 level of significance?

Analysis of Variance results:

Data stored in separate columns.

Column means

Column	n	Mean	Std. Error
California	47	2.6340425	0.10102511
Out of State	31	3.3741934	0.09638272
Foriegn	20	3.23	0.16608495

ANOVA table

Source	df	SS	MS	F-Stat	P-value
Treatments	2	11.682909	5.8414545	13.473661	<0.0001
Error	95	41.186886	0.4335462		
Total	97	52.869797			

Example

Are the mean life spans for dogs the same for different living conditions?

Fenced Yard	15	16	11	8	17	14	
Indoor Only	18	3	16	12	15	9	17
Indoor/Outdoor	12	16	3	11	10		
Stray	9	6	14	12	2	5	8

STAT ->TESTS -> ANOVA,   ANOVA(L1,L2,L3)