

Chapter 15

The Analysis of Variance

15.0 Introduction

The analysis of variance is supported only in a limited way by the TI-83. Single-factor analysis of variance can be performed through the hypothesis test for the equality of means, but the post-hoc procedures are not built in. For these calculations, support via Table or a computer program is necessary.

15.1 Single-factor ANOVA

Example 15.4: Musical Preferences and Reckless Behavior

Do adolescents who preferred certain types of music report higher rates of reckless behaviors, such as speeding, drug use, shoplifting, and unprotected sex? Independently chosen random samples were selected from each of four groups of students with different musical preferences at a large high school: (1) acoustic/ pop, (2) mainstream rock, (3) hard rock, and (4) heavy metal. Each student in these samples was asked how many times they had engaged in various reckless activities during the last year. The following table lists data on number of times driving over 80 mph that is consistent with summary quantities given in the article in POD.

	Musical Preference			
	Acoustic/Pop	Mainstream Rock	Hard Rock	Heavy Metal
	2	3	3	4
	3	2	4	3
	4	1	3	4
	1	2	1	3
	3	2	3	3
	3	4	1	3
	3	3	4	3
	3	2	2	3
	2	4	2	2
	2	4	2	4
	1	4	3	4
	3	4	3	5
	2	2	4	4
	2	3	3	5
	2	2	3	3
	3	2	2	4
	2	2	3	5
	2	3	4	4
	3	1	2	2
	4	3	4	3

The ANOVA procedure on the TI begins by entering the data. Since we have 4 samples, we will use Lists 1 – 4. Once these lists are entered, the familiar statistical test keystroke sequence is executed with a new option:

STAT > TESTS > ANOVA(L1, L2, L3, L4) > ENTER

```

One-way ANOVA
F=5.18995
P=.00258
Factor
df=3.00000
SS=13.05000
MS=4.35000
Error
Df=76.00000
SS=63.70000
MS=.83816
Sxp=.91551
  
```

Comparing this information with the ANOVA table from POD, we can see all the cells in the table accounted for. There is one quantity in the TI screen that is not in the ANOVA table, S_{xp} . This quantity is the standard deviation of the data, calculated by pooling the 4 separate samples. It is used for more advanced single-factor ANOVA calculations, and will not concern us here.

Table 15.2 General format for a single-factor ANOVA table

Source of Variation	df	Sum of Squares	Mean Square	F
Treatments	$k - 1$	SSTr	$MSTr = \frac{SSTr}{k - 1}$	$F = \frac{MSTr}{MSE}$
Error	$N - k$	SSE	$MSE = \frac{SSE}{N - k}$	
Total	$N - 1$	SSTo		

15.2 Afterword

The TI once again comes through in a significant statistical calculation, but ANOVA is edge of this calculator's capability. If you are planning on doing a significant amount of ANOVA, get a computer program!