One Way ANOVA - Worked Example

1. A trial is undertaken to investigate the effect on fuel economy of 3 fuel additives A, B and C, where A and B are new and C is the current standard additive. The same driver drives the same car on a fixed test route during 20 working days. The additive used on each day is randomly assigned so that A and B are each used for 5 days and C is used for 10 days. The response variable measured each day is Y, the number of miles per gallon (mpg) achieved.

   The results are shown in the following table.

Additive	y	Total
A	39, 35, 37, 36, 38	$\sum y_A = 185$
B	36, 41, 39, 40, 39	$\sum y_B = 195$
C	37, 33, 30, 34, 36, 34, 31, 36, 34, 35	$\sum y_C = 340$

   You are given that the sum of squares of the observations is 26078.

   (i) (a) Carry out an analysis of variance to test for differences between the effects on Y of the additives. State clearly your null and alternative hypotheses and present your conclusions.

   (11)

You are given the additional piece of information , sufficient to construct ANOVA table

	A	B	C	Total
mean	37	39	34	36
std. deviation	1.5811	1.8708	2.2111	2.8837

Solution to One Way ANOVA Table

- Additives: Between Groups
- Residuals : Within Groups

Hence the analysis of variance table is as follows.

SOURCE	DF	SS	MS	F value
Additives	2	90	45	11.25 Compare $F_{2,17}$
Residual	17	68	4	$= \hat{\sigma}^2$
TOTAL	19	158		