

Problem 1

Homework-11

The Sheffield Foods Company markets a variety of dairy products, including milk, ice cream and yogurt. Recently the company received a complaint from a government agency that the actual levels of milk fat in its yogurt exceeded the labeled amount. Company personnel were concerned that the government's laboratory method for measuring fat content might be unreliable because it is primarily designed for use with milk and ice cream.

To study the reliability of Sheffield's and the government's laboratory methods a small inter-laboratory study was carried out. Four testing laboratories were randomly selected from the population of laboratories in the United States. Each laboratory was sent 8 samples of yogurt, with instructions to evaluate four of the samples using the government's method and four by the company's method. The yogurt had been mixed under carefully controlled conditions and the fat content of each sample was known to be 3.0 percent.

In this study, measurement method (A) is a factor with $a = 2$ levels ($i=1$, Government method; $i=2$: Sheffield method) and laboratories (B) is a factor with $b=4$ levels. The cell means table and part of ANOVA table are given below.

Means (%)	Lab			
	1	2	3	4
Government Method	5.11167	3.74833	4.45333	3.73333
Company Method	3.28	3.07167	2.92	2.95667

Source	DF	Sum of Squares	Mean Square
method	1	17.41	17.412
lab	3	5.39	1.798
method*lab	3	2.89	0.963
Error	24	8.96	0.373
Corrected Total	31	27.23	

- (1). Are the factors both random, both fixed, or mixed?
- (2). Write down the model including assumption, and interpret the symbols.
- (3). Is the interaction effect significant? Draw the interaction plot using the means table.
- (4). Estimate the variance component(s) in the full model.
- (5). Determine appropriate tests to detect the main effects, and make conclusions based on your findings.