## Chapter 12 - Question 1 ... One way ANOVA

Does bread lose it's vitamins when stored? Two loaves were stored for one, three, five and seven days and then their Vitamin C content was measured. The units are mg/100 g of flour. Here is the data.

Condition	Vitamin C	(mg/100g)
Immediately after baking	47.62	49.79
One day after baking	40.45	43.46
Three days after	21.25	22.34
Five days after	13.18	11.65
Seven days after	8.51	8.13

a) Give a table with sample size, mean, standard deviation, and standard error for each condition.

b) Perform a one-way ANOVA for these data. Be sure to state your hypothesis, the test statistic with degrees of freedom, and the P-value.

c) Summarize the data and the means with a plot. Use the plot and the ANOVA results to write a short summary of your conclusions.

Answers:

a)

Descriptives

VITAMINC

	Ν	Mean	Std. Deviation	Std. Error
.00	2	48.7050	1.5344	1.0850
1.00	2	41.9550	2.1284	1.5050
3.00	2	21.7950	.7707	.5450
5.00	2	12.4150	1.0819	.7650
7.00	2	8.3200	.2687	.1900
Total	10	26.6380	16.9130	5.3484

**(b)** 

H<sub>0</sub>:  $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ 

## ANOVA

VITAMINC		
	Sum of	
	Squares	

	Sum of				
	Squares	df	Mean Square	F	Sig.
Between Groups	2565.721	4	641.430	367.742	.000
Within Groups	8.721	5	1.744		
Total	2574.442	9			

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Not all  $\mu$  are equal. F = 367.743 with 4 and 5 degrees of freedom; P< .0005, so we reject the null hypothesis.

(c)

**Means Plots** 



We conclude that vitamin C content decreases over time.