Practice Set 18 Analysis of Variance

I. Darin wants to know whether the variance of 30-mg parts has increased. The standard deviation from a recent sample of 16 parts was .067 milligrams. The standard deviation from an earlier study of 14 parts was .062 milligrams. Test at the .01 level whether the population variance has increased.

1. These are the null hypothesis and alternate hypothesis.

$H_0 : \sigma_1^2 \leq \sigma_2^2$ and $H_1 : \sigma_1^2 > \sigma_2^2$

2. The level of significance will be .01.
3. The test statistic is F.
4. H_0 will be rejected when F from the test statistic is greater than F's critical value.
   a. df for the numerator is 16 - 1 = 15
   b. df for the denominator is 14 - 1 = 13
   c. From Table 5A, F = 3.82.

5. Apply the decision rule.

$$F = \frac{s_1^2}{s_2^2} = \frac{67^2}{62^2} = \frac{4{,}489}{3{,}844} = 1.17$$

Accept H_0 because 1.17 <3.82. Variance has not increased.

II. Time passed and the wonders of miniaturization have reduced the 30-mg parts to a weight of only 9 mg. Darin randomly selected samples of 9-mg parts from 3 departments with the following results. **People using statistics software should skip to part D.**

A. Complete this chart to begin an ANOVA study of the mean weight of parts produced by these 3 departments.

	Weight Analysis of 9-mg Parts Produced by 3 Departments						Row Totals Required for Calculations
	Parts Sample 1 is T_1		Parts Sample 2 is T_2		Parts Sample 3 is T_3		
	X_1	X_1^2	X_2	X_2^2	X_3	X_3^2	
	8.95	80.1025	9.05	81.9025	9.05	81.9025	
	8.90	79.2100	9.05	81.9025	9.15	83.7225	
	8.90	79.2100	9.10	82.8100	9.10	82.8100	
Σx_T	26.75		27.20		27.30		$\Sigma x = 81.25$
$(\Sigma x_T)^2$	715.5625		739.84		745.29		
n	3		3		3		N = 9
$\frac{(\Sigma x_T)^2}{n}$	238.521		246.613		248.43		$\Sigma[\frac{(\Sigma x_T)^2}{n}] = 733.564$
Σx_T^2		238.5225		246.6150		248.4350	$\Sigma x^2 = 733.5725$