

## Practice Set 19 Two-Factor Analysis of Variance

- I. Practice Set 18 will be expanded by assuming the data was randomly collected at hourly intervals. Page 110 data has been arranged accordingly. Darin wants to determine whether samples taken later in a shift are less likely to pass inspection. **People using statistics software should skip to part D.**

A. Complete this chart to begin an ANOVA study of the production process producing these parts.

Weight Analysis of 9-mg Parts Produced by 3 Departments							Row Totals Required for Calculations		
Time	Parts Sample 1 is T <sub>1</sub>		Parts Sample 2 is T <sub>2</sub>		Parts Sample 3 is T <sub>3</sub>		$\Sigma X_B$	$(\Sigma X_B)^2$	$\frac{(\Sigma X_B)^2}{t}$
	$X_1$	$X_1^2$	$X_2$	$X_2^2$	$X_3$	$X_3^2$			
9:15 AM	8.90	79.2100	9.05	81.9025	9.05	81.9025			
10:20 AM	8.90	79.2100	9.05	81.9025	9.10	82.8100			
11:10 AM	<u>8.95</u>	<u>80.1025</u>	<u>9.10</u>	<u>82.8100</u>	<u>9.15</u>	<u>83.7225</u>			
$\Sigma X_T$	26.75		27.20		27.30		$\Sigma X =$	$\Sigma \left[ \frac{(\Sigma X_B)^2}{t} \right] =$	
$(\Sigma X_T)^2$	715.5625		739.84		745.29		$\Sigma X = 81.25$		
$b$	3		3		3		$N = 9$		
$\frac{(\Sigma X_T)^2}{b}$	238.521		246.613		248.430		$\Sigma \left[ \frac{(\Sigma X_T)^2}{b} \right] = 733.564$		
$\Sigma X_T^2$		238.5225		246.6150		248.4350	$\Sigma X^2 = 733.5725$		

B. Using the above data, calculate the following values.

$$\begin{aligned}
 SS_T &= \Sigma \left[ \frac{(\Sigma X_T)^2}{b} \right] - \frac{(\Sigma X)^2}{N} \\
 &= 733.564 - \frac{81.25^2}{9} \\
 &= 733.564 - 733.507 = .057
 \end{aligned}$$

$$SS_B = \Sigma \left[ \frac{(\Sigma X_B)^2}{t} \right] - \frac{(\Sigma X)^2}{N}$$

$$SS_{TOTAL} = \Sigma X^2 - \frac{(\Sigma X)^2}{N}$$

$$SS_E = SS_{TOTAL} - (SS_T + SS_B)$$