STA 302 Summer 2001
Quiz Three

1. (4 Points) Let X_1, X_2 and X_3 be independent with respective means μ_1, μ_2 and μ_3, and common variance σ^2. What is the covariance of $Y_1 = X_1 + X_2 + X_3$ and $Y_2 = X_1 + X_2 - X_3$?

2. Referring to your printouts from the Airfreight Breakage example,

   (a) (1 Point) Estimate the expected number of broken ampules when no transfers are made. The answer is a number.

   (b) (5 Points) The next shipment will involve three transfers. Give a 95% prediction interval for the number of broken ampules. Show your work. Use one of these critical values:

   $t(.95;8) = 1.860$, $t(.95;9) = 1.833$, $t(.95;10) = 1.812$, $t(.975;8) = 2.306$, $t(.975;9) = 2.262$, $t(.975;10) = 2.228$.

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/*pr21.sas: Problem 2.1 etc. for Assignment 3, STA302 Summer 2001 */
options linesize=79 pagesize=35;

data break;
     infile 'pr21.dat';
     input ybreak xtrans;
proc means n mean std css; /* css = corrected sum of squares */
     var xtrans;
proc reg;
     model ybreak=xtrans;
```

========== pr21.lst ==========

The MEANS Procedure

Analysis Variable : xtrans

N	Mean	Std Dev	Corrected SS
10	1.0000000	1.0540926	10.0000000

The REG Procedure
Model: MODEL1
Dependent Variable: ybreak

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	160.00000	160.00000	72.73	<.0001
Error	8	17.60000	2.20000		
Corrected Total	9	177.60000			

Root MSE	1.48324	R-Square	0.9009
Dependent Mean	14.20000	Adj R-Sq	0.8885
Coeff Var	10.44535		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	10.20000	0.66332	15.38	<.0001
xtrans	1	4.00000	0.46904	8.53	<.0001

Jerry's Answers to Quiz 3

(1) $\sigma^2\{\underset{\sim}{Y}\} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & -1 \end{bmatrix} \sigma^2 I_3 \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ 1 & -1 \end{bmatrix} = \sigma^2 \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$,

And $cov(Y_1, Y_2) = \sigma^2$

(2) a. $b_0 = 10.2$

b. $\hat{Y}_{h(new)} = 10.2 + 4 * 3 = 22.2$,

$s^2\{\hat{Y}_{h(new)}\} = MSE\left(1 + \frac{1}{10} + \frac{(3-1)^2}{10}\right) = (2.5)(1.5)$

$\Rightarrow s\{\hat{Y}_{h(new)}\} = \sqrt{3.3} = 1.86$, and the 95% prediction interval is $22.2 \pm (2.306)(1.82)$

$= 22.2 \pm 4.2$, or

(18, 26.4)