

## 5J Statistical Modelling

The output  $X$  of a process depends on the levels of two adjustable variables:  $A$ , a factor with four levels, and  $B$ , a factor with two levels. For each combination of a level of  $A$  and a level of  $B$ , nine independent values of  $X$  are observed.

Explain and interpret the R commands and (abbreviated) output below. In particular, describe the model being fitted, and describe and comment on the hypothesis tests performed under the `summary` and `anova` commands.

```
> fit1 <- lm(x~a+b)
> summary(fit1)
```

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	0.86967	0.13400	6.490	5.46e-09	***
a2	0.76176	0.24464	3.114	0.00252	**
a3	-1.89518	0.30945	-6.124	2.73e-08	***
a4	0.02628	0.30945	0.085	0.93252	
b2	2.86961	0.24464	11.730	< 2e-16	***

```
> anova(fit1)
```

Response: x

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
a	3	116.565	38.855	49.94	< 2.2e-16 ***
b	1	107.050	107.050	137.59	< 2.2e-16 ***
Residuals	85	66.133	0.778		