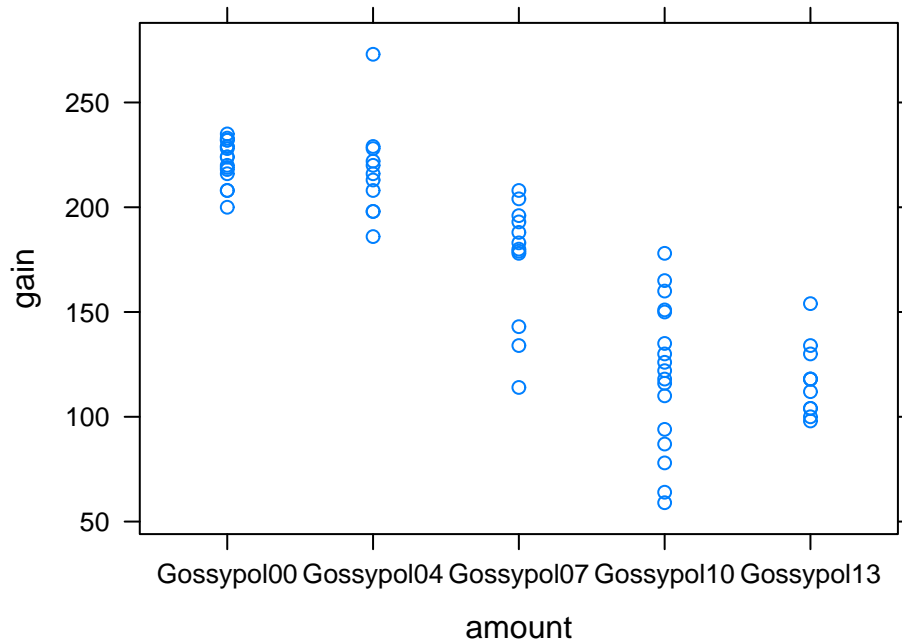


STAT310 - HWK Solution 14

```
1. (a) > rat<-read.table('rat.txt',header=T)
> library(lattice)
> xyplot(gain~amount, data=rat)
```



```
(b) > rat.mean = with(rat, tapply(gain,amount,mean))
> rat.sd = with(rat, tapply(gain,amount,sd))
> print(cbind(rat.mean, rat.sd))
      rat.mean  rat.sd
Gossypol00 222.1875 10.23861
Gossypol04 217.3636 22.83538
Gossypol07 175.0000 29.23883
Gossypol10 120.1765 35.10740
Gossypol13 117.2727 16.85877
```

```
(c) > rat.fit <- lm(gain~amount, data=rat)
> summary(rat.fit)
```

```
Call: lm(formula = gain ~ amount, data = rat)
```

Residuals:

Min	1Q	Median	3Q	Max
-61.176	-13.273	1.813	11.224	57.824

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	222.188	6.250	35.548	< 2e-16 ***
amountGossypol04	-4.824	9.792	-0.493	0.624
amountGossypol07	-47.187	9.547	-4.942	6.17e-06 ***
amountGossypol10	-102.011	8.708	-11.714	< 2e-16 ***
amountGossypol13	-104.915	9.792	-10.714	9.71e-16 ***

Signif. codes: 0 *** 0.001 ** 0.01 * 0.05 . 0.1 1

Residual standard error: 25 on 62 degrees of freedom
 Multiple R-squared: 0.7848, Adjusted R-squared: 0.7709
 F-statistic: 56.53 on 4 and 62 DF, p-value: < 2.2e-16

Estimated intercept is the mean of group Gossypol00 (group with 0.00% Gossypol). Estimates of other four groups are the differences between mean of corresponding group and mean of group Gossypol00, respectively. For example, the estimate of group Gossypol07 is -47.187, which is just the difference between the mean of Gossypol00 (222.1875) and the mean of Gossypol07 (175.0000). The corresponding p-value is 6.17e-06, which indicates that there is significant difference between mean of Gossypol00 and Gossypol07.

(d) > anova(rat.fit)

Analysis of Variance Table

Response: gain

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
amount	4	141334	35333	56.528	< 2.2e-16 ***
Residuals	62	38754	625		

Signif. codes: 0 *** 0.001 ** 0.01 * 0.05 . 0.1 1

$H_0 : \mu_0 = \mu_4 = \mu_7 = \mu_{10} = \mu_{13}$, there is no significant difference between the means of the 5 groups

P-value of the F-test is < 2.2e - 16 as given in the output. There is strong evidence against the null hypothesis. H_0 is rejected.