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# R code for Beetles example, Categorical explanatory variables
beetles=read.table("C:/Users/Mihinda/Desktop/beetle.txt",
header=1) #the data file
beetles
fit <- lm(y ~ b + g + l, data=beetles)
summary(fit)
anova(fit)
confint(fit, level=0.95) # CIs for model parameters
grp.means <- with(beetles, tapply(y,Colour,mean))
grp.means
```

R output

```
> # R code for Beetles example, Categorical explanatory
variables
> beetles=read.table("C:/Users/Mihinda/Desktop/beetle.txt",
header=1) #the data file
> beetles
```

	Row	Colour	y	b	g	l
1	1	Lemon	45	0	0	1
2	2	Lemon	59	0	0	1
3	3	Lemon	48	0	0	1
4	4	Lemon	46	0	0	1
5	5	Lemon	38	0	0	1
6	6	Lemon	47	0	0	1
7	7	White	21	0	0	0
8	8	White	12	0	0	0
9	9	White	14	0	0	0
10	10	White	17	0	0	0
11	11	White	13	0	0	0
12	12	White	17	0	0	0
13	13	Green	37	0	1	0
14	14	Green	32	0	1	0
15	15	Green	15	0	1	0
16	16	Green	25	0	1	0
17	17	Green	39	0	1	0
18	18	Green	41	0	1	0
19	19	Blue	16	1	0	0
20	20	Blue	11	1	0	0
21	21	Blue	20	1	0	0
22	22	Blue	21	1	0	0
23	23	Blue	14	1	0	0
24	24	Blue	7	1	0	0

```

> fit <- lm(y ~ b + g + l, data=beetles)
> summary(fit)

Call:
lm(formula = y ~ b + g + l, data = beetles)

Residuals:
    Min       1Q   Median       3Q      Max
-16.5000  -2.9167   0.1667   5.2083  11.8333

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  15.6667    2.7696   5.657 1.55e-05 ***
b           -0.8333    3.9168  -0.213 0.833671
g            15.8333    3.9168   4.042 0.000637 ***
l            31.5000    3.9168   8.042 1.07e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.784 on 20 degrees of freedom
Multiple R-squared:  0.8209,    Adjusted R-squared: 0.794
F-statistic: 30.55 on 3 and 20 DF,  p-value: 1.151e-07

> anova(fit)
Analysis of Variance Table

Response: y
      Df Sum Sq Mean Sq F value    Pr(>F)
b       1 1241.68  1241.68  26.9784 4.407e-05 ***
g       1    0.03    0.03   0.0006  0.9806
l       1 2976.75  2976.75  64.6768 1.075e-07 ***
Residuals 20  920.50   46.03
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

> confint(fit, level=0.95) # CIs for model parameters
            2.5 %    97.5 %
(Intercept)  9.889326 21.44401
b          -9.003727  7.33706
g           7.662940 24.00373
l          23.329607 39.67039

> grp.means <- with(beetles, tapply(y, Colour, mean))

> grp.means
    Blue    Green    Lemon    White
14.83333 31.50000 47.16667 15.66667

```

State whether the following statements are true or false.

- a) The value of the F-statistic for testing any differences among the colours is 30.55.
- b) We have evidence at $p < 0.01$ that the means for green and white are different.
- c) We have evidence at $p < 0.01$ that means for blue and white are different.
- d) A 95% confidence interval for the difference between means for lemon yellow and white is (23.3, 39.7)
- e) We may say that 82.09% of the variation in the number of insects trapped has been accounted for by the above model.