

1. The energy content (in kilocalories) of breadfruit (*Arctocarpus artilis*) was measured in a total of 48 specimens representing four varieties (12 X 4 = 48).

Define response and explanatory variables, with symbols.

Energy Content E Response
 Variety [4 levels] V Explanatory [4]

Using your symbols, write a general linear model to analyze whether energy content depends on variety, then use the general linear model you wrote to complete the first two columns of an ANOVA table.

[4] glm: $E = \beta_0 + \beta_V \cdot V + \text{normal error}$

Source	df
V	3
residual	44
total	47

[6]

2. For each of the following two named tests, write a general linear model, then use the model to partition the degrees of freedom and fill in the first two columns in the ANOVA table. The list of sources of variance should match the model that you write. Assume that the response variable has 32 values (samples size = 32).

Q = response variable

X1, X2 = regression (explanatory) variable or variables

F1, F2 = factor (categorical explanatory) variable or variables

Regression

[4] glm: $Q = \beta_0 + \beta_{X1} \cdot X1 + \text{normal error}$

Source	df
X1	1
residual	30
total	31

[6]

Two-way ANOVA with 3 categories (levels) in each factor

[6] glm: $Q = \beta_0 + \beta_{F1} \cdot F1 + \beta_{F2} \cdot F2 + \beta_{F1F2} \cdot F1F2 + \text{normal error}$

Source	df
F1	2
F2	2
F1 x F2	4
residual	23
total	31

[10]