

1. Austin and Clarke (1991 *Journal of Dairy Research* 58:219-229) investigated the calcium ion activity in cooled and aged reconstituted and recombined milks. They measured calcium ion activity and pH for 5 samples taken in each of 18 categories resulting from 3 categories of milk composition and 6 categories of heat treatment. Does calcium ion activity depend on pH, composition, and heat treatment? Assign symbols to variables. Assuming no interaction terms, write a general linear model to address this question.

Name	Symbol
_____	_____
_____	_____
_____	_____
_____	_____

Source	df

GLM _____ = _____

Complete the first two columns of the ANOVA table (above).

2. For a 2 allele locus we let p = frequency of one allele in the parental generation, and $q = 1 - p$ = the frequency of the other allele. At Hardy Weinberg equilibrium, the expected proportion of homozygous and heterozygous offspring is given by

$$\hat{p} = (p+q)^2 = (p^2 + q^2) + 2pq$$

where $(p^2 + q^2)$ is the expected frequency of homozygous offspring
 $2pq$ is the expected frequency of heterozygous offspring.

For 1000 offspring, compute the expected proportion (\hat{p}) of homozygous and heterozygous offspring at Hardy-Weinberg equilibrium, when $p = 0.2$ in the parents.

Compute the expected frequency $\hat{f} = 1000 \hat{p}$.

$\hat{p} =$	_____ homozygous	$\hat{f} =$	_____
	_____ heterozygous		_____

3. Compute the goodness of fit G for the following frequencies of offspring relative to Hardy -Weinberg equilibrium with $p = 0.7$ in the parents.

$G = 2 \sum f \ln(f/\hat{f})$ where \hat{f} is the value expected from theory.

Expected \hat{f}	Observed f	
<u>420</u>	<u>480</u>	heterozygous
<u>580</u>	<u>520</u>	homozygous