

# BIOS 600 · Quiz 10.3: Categorical Data

Fall 2011

1. **Honor Pledge:** I have neither given nor received unauthorized aid on this assignment.  
(Sign and print your name.)

2. The model of Mendelian inheritance suggests that certain genetic traits are either dominant or recessive. Because humans have two sets of chromosomes, an individual may be double dominant (DD), double recessive (DR), or heterozygous (H). Heterozygous means one dominant gene and one recessive gene.

If Mendel's model is correct, then two heterozygous parents can expect their offspring to be DD, DR, or H with the following probabilities.

DD	DR	H
.25	.25	.5

A researcher suspects a certain trait follows Mendelian inheritance. To test her theory, she breeds mice known to be heterozygous. The following is the data she observed.

DD	DR	H
19	23	58

Our goal is to investigate the Mendelian inheritance model with a goodness-of-fit test.

- (a) State of the null and alternative hypothesis.
- (b) State the reference distribution of the test statistic.
- (c) Calculate the value of the test statistic.
- (d) Find the p-value. ( $\chi^2$  table on back.)
- (e) What is test result at an  $\alpha = 0.01$  significance level?
- (f) White a short interpretation of the test results.

$\chi^2$ -Table

	(left) (right)	p=0.005 p=0.995	0.01 0.99	0.025 0.975	0.05 0.95	0.1 0.9	0.9 0.1	0.95 0.05	0.975 0.025	0.99 0.01	0.995 0.005
df=1		0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2		0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3		0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4		0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5		0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6		0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7		0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8		1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9		1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10		2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188