Homework 12 **Name:** _____
Biostatistics (STAT:3510; Bognar)

Print this pdf file (do not use notebook paper), show your work in the provided space, use a scanning app to scan pages (in order) into a single pdf file, submit in Gradescope. Be sure to get entire page in each shot — lay each page flat when scanning. You can use an iPad/tablet too. The Gradescope app works well for submitting too. Make sure the pages upload in order.

1. Textbook 9.4.1
   Note that $H_0 : P(W) = \frac{12}{16},\ P(Y) = \frac{3}{16},\ P(G) = \frac{1}{16}$

   (a) Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.

   (b) Find the $p-$value for the test.

   (c) Based upon your answer in part (b), does the genetic ratio significantly differ from the 12:3:1 model? Why?

2. Textbook 9.4.13
   Note that $H_0 : P(R) = \frac{1}{4},\ P(P) = \frac{1}{2},\ P(W) = \frac{1}{4}$

   (a) Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.

   (b) Find the $p-$value for the test.

   (c) Based upon your answer in part (b), do the colors significantly differ from the 1:2:1 ratio? Why?

3. The manufacturer of M&M's claims the following color breakdown: 24% blue, 20% orange, 16% green, 14% yellow, 13% red, and 13% brown. A randomly selected bag of M&M's had 103 candies and yielded the following colors.

	blue	orange	green	yellow	red	brown
o_i :	25	22	19	17	7	13
e_i :	24.72	20.60				

Test

H_0 : the manufacturers color breakdown is correct

H_a : the color breakdown is different than the manufacturers claim

at the $\alpha = 0.05$ significance level. Under H_0 (i.e. under the manufacturers claimed color proportions), the number of blues that we expect is $e_1 = 103 \times 0.24 = 24.72$, the expected number of oranges is $103 \times 0.20 = 20.60$, etc.

(a) Determine the rest of the expected counts, $e_3, \ldots, e_6$.

(b) Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.

(c) Approximate the $p-$value for the test using the chi-square table.

(d) Use the χ^2-Probability Applet at

`http://www.stat.uiowa.edu/~mbognar/applets/chisq.html`

to precisely determine the $p-$value for the test.

(e) Based upon the $p-$value, do we have evidence that the color breakdown significantly differs from the manufactures claim? Why?