1. 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

$$H_0 : \text{the manufacturers color breakdown is correct}$$
$$H_a : \text{the color breakdown is different than the manufacturers claim}$$

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 $\chi^2-$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?