

Name: _____

M&Ms claims that the distribution of color in their candy is:

color	red	green	blue	brown	yellow	orange
p	0.2	0.1	0.1	0.3	0.2	0.1

You get 14 red, 5 green 5 blue, 13 brown, 8 yellow, and 10 orange in a Halloween bag of 55 M&Ms. Test the company's claim.

Solution

Our hypotheses are:

H_0 : color distribution is according to M&Ms claim

H_1 : color distribution is not according to M&Ms claim

$$\begin{aligned}\chi^2 &= \frac{(14 - 0.2 \cdot 55)^2}{(0.2 \cdot 55)} + \frac{(5 - 0.1 \cdot 55)^2}{(0.1 \cdot 55)} + \frac{(5 - 0.1 \cdot 55)^2}{(0.1 \cdot 55)} + \frac{(13 - 0.3 \cdot 55)^2}{(0.3 \cdot 55)} + \\ &\quad \frac{(8 - 0.2 \cdot 55)^2}{(0.2 \cdot 55)} + \frac{(10 - 0.1 \cdot 55)^2}{(0.1 \cdot 55)} \\ &= 6.15 \\ \text{df} &= 6 - 1 = 5 \\ \text{p-value} &= P(\chi_5^2 > 6.15) > 0.25\end{aligned}$$

Because our p-value is high, we cannot reject the null hypothesis. We have no evidence to reject the null hypothesis.

You could have also done this problem by directly calculating the loglikelihood statistic and comparing $2 \ln \Lambda$ to a χ_5^2 .