AP Statistics **Name:** PODUNK MATH DEPARTMENT **Per:** ∞

Chi-Squared Goodness of Fit

M&M/Mars claims that the distribution of proportions of colors for their "plain" milk-chocolate M&M's candies follows the information in the table below. A class of AP Statistics students sifted through a large bag of plain M&M's (which we will assume qualifies as a random sample of plain M&M's) and recorded the colors that they observed, to see if the claimed proportions are accurate. The students expect that the observed proportions will be consistent with the company's claimed proportions.

Color	Blue	Orange	Green	Yellow	Red	Brown	Total
"True" Proportions for plain M&Ms (according to M&M / Mars company)	0.24	0.20	0.16	0.14	0.13	0.13	**1.00**
Number of observed M&M's	124	85	99	48	59	74	**489**

Expected counts: 117.36 97.8 78.24 68.46 63.57 63.57

↑ 489(0.24) ↑ 489(0.2) ...etc ↑ 489(0.13)

Based on the data collected by these students, is there evidence at the 10% level of significance to state that the distribution of proportions of colors of plain M&M's is not consistent with the company's claims? Test an appropriate hypothesis and give statistical evidence to support your conclusion. *(hint: in order to do this problem, you should start by calculating the expected number of M&M's in each color category)*

χ^2 goodness of fit test

H_0: the distribution of proportions of colors is the same as the company's claims.

H_A: ~~~~~ NOT the same ~~~~~.

$$\chi^2 = \sum \frac{(obs - exp)^2}{exp}$$ ← on the bottom-right of the formula chart!

$$= \frac{(124 - 117.36)^2}{117.36} + \cdots + \frac{(74 - 63.57)^2}{63.57}$$

CONDITIONS

- The students took a random sample of M&M's
- All expected counts are > 5.

$\chi^2 = 15.7138$ $df = 5$ ← 6 − 1

p-value = 0.00771

$\alpha = 0.10$

} since $p < \alpha$, we reject H_0.

We have evidence that the proportions of colors does NOT match the company's claims.