**AP Statistics Name:
“The Candy Man Can”**

**Background**: Mars, Incorporated, makes milk chocolate candies including M&M’S Milk Chocolate Candies. They claim that, “*On average, the new mix of M&M’S Milk Chocolate Candies will contain 13% of each of browns and reds, 14% yellows, 16% greens, 20% oranges, and 24% blues.*”

**Activity**: The purpose of this activity is to compare the color distribution of M&M’S in your individual bag with the advertised distribution. We want to see if there is enough evidence to dispute the company’s claim. For the time being, assume that your bag is a random sample of M&M’S Milk Chocolate Candies from the population of candies produced in a particular batch.

1. Open your bag and carefully count the number of M&M’S of each color as well as the total number of M&M’S in the bag. Complete the observed column in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Color** | **Observed** | **Expected** | **Observed -****Expected** | **(Observed - Expected)2** | $$\frac{\left(Observed-Expected\right)^{2}}{Expected}$$ |
| Blue |  |  |  |  |  |
| Orange |  |  |  |  |  |
| Green |  |  |  |  |  |
| Yellow |  |  |  |  |  |
| Red |  |  |  |  |  |
| Brown |  |  |  |  |  |
| Total |  |  |  |  |  |

2. Assuming that the company’s claim is true, how many of each color would you expect in *your* bag? These are called the *expected counts*. Compute your expected counts (to two decimal places) and record your results in the expected column. Check that the sum is equal to the sum of M&M’S in your bag.

3. How close are your observed counts to the expected counts? To answer this, compute Observed - Expected for each color. Record these differences in your table. Find the sum of the values in this column. What do you notice about this sum?

4. In step 3, the sum of the differences should be 0. You get a total difference of 0 because the positive and negative values cancel each other out. We can fix this by squaring the differences. Compute the values of (Observed - Expected)2 and fill in this column in the table. Compare your results with other teams.

5. In the last column of the table, divide the values of (Observed - Expected)2 by the corresponding Expected values then find the sum. This final value is called the *chi-square statistic* and is denoted by $χ^{2}$.

6. Do you think the results of your sample reflect the distribution claimed by Mars, Inc.? Why or why not?

