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Using χ^2 to test for Goodness of Fit

Suppose that the M&M/Mars Company claims that the distribution of colors in M&M candies is 30% brown, 20% each of yellow and red, and 10% each of orange, green, and blue. Suppose further that a class of Statistics students examines a sample of 100 M&M candies and gathers the following data:

	Brown	Yellow	Red	Orange	Green	Blue	Total
Observed	38	25	15	12	8	2	100
Expected							100

Complete the table by calculating the number of each color that would be expected if the distribution of candies matched the manufacturer's claims, and the total for that row.

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Before we can conduct a test for goodness of fit, we need to state the
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H ₀ : The actual proportion of each color the manufacturer's claims. (30% brown, 20% each of yellow and red, and 10% each of orange, green, and blue.)
H _a : The actual proportion of each color what the manufacturer claims.
The number of $n-1$, or $6-1$, which is 5.
We must assume that these 100 M&M candies represent an of all M&M candies. We must check that all of the expected values in the table are at least 1, which they are, and that no more than 20% are less than 5. Since they are all at least 5, we have verified the technical conditions.
The test statistic is $\chi^2 = \sum \frac{(O-E)^2}{E}$. Filling in the appropriate values, we get
$\chi^2 = \frac{(38-30)^2}{30} + \frac{(25-20)^2}{20} + \frac{(15-20)^2}{20} + \frac{(15-20)^2}{10} + \frac{(2-10)^2}{10}$
= 2.13 + 1.25 + 1.25 + 0.4 + 0.4 + 6.4
$\chi^2 = 11.83$
Using the χ^2 table and the appropriate degrees of freedom (), we determine that $0.025 . This represents enough evidence to at the 0.05 level, so the actual proportion of each color for M&M candies may be .$