

statistics

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Some instances we wish to observe the dissemination of a particular definite objects in a treatment. In order to determine whether the theorized distribution is valid, we use hi-square goodness test.

Chi-square test for homogeneity is applied to test if the dissemination of a definite object distribution is different for binary or more population. We will arrange our facts into a mutual arrangement.

It's probable to apply the facts in the mutual arrangements to determine the association between binary definite objects. In order define whether there is a degree of connotation amid the variable in treatments at broad we use chi-square test for independence.

Mars Incorporated is used to make milk chocolate sweeties; M&Ms. The user affairs section gave us the following facts about the dissemination of paint in M&Ms chocolate Candies made from milk. On normal, the fresh mixture of color will be as follows, thirteen out of a hundred red, thirteen out of a hundred brown, fourteen out of a hundred yellow, sixteen out of a hundred green, twenty out of a hundred orange and twenty-four out of a hundred blue.

We purchase a bag of M&Ms to test their claim. We find the following number information:

Color	Blue	Orange	Green	Yellow	Red	Brown	Total
Count	9	8	12	15	10	6	60
$\hat{p}$	0.15	0.133	0.2	0.25	0.167	0.1	

Due to the organization believe that twenty-four percent of total M&Ms are blue in color, we suspect there is fishy deals accepted on.

Here we can use single sample Z-test to experiment the hypothesis for the proportion:

Ho: $q = 0.24$ and

H1: $q \neq 0.24$

Where q represents the original population percentage of M&Ms of blue color.

We can also determine significance tests for the remaining colors of each. Determining Z-test for each remaining color proportion will not be efficient and will create multi-comparison problems.

Examining a single object Z-tests for to each remaining pigment, will direct you on the way to get a random Acting single-sample Z assessments for to each pigment wouldn't explain to you how possible you can compute random illustration of sixty chocolates that is different from the one that the company proposed as this one claims.

For that reason, we need to apply new type of significant experiment known as Chi-square golly of appropriate experiment.

The H_0 assumption of a chi-square golly of appropriate assessment must always list and explain about the dissemination of a particular definite object in the populace of importance.

H_0 : The company's stated color distribution for M&Ms is correct.

This substitute assumption of a chi-square golly of appropriate examination, the definite object lacks a specific distribution.

H_a : The company's state color distribution for M&Ms is not correct.

The assumption can also be written in symbol;

$H_0: \rho_{blue} = 0.24, \rho_{orange} = 0.20, \rho_{green} = 0.16, \rho_{yellow} = 0.14,$
 $\rho_{brown} = 0.13, \rho_{red} = 0.13$
 H_a : At least one of the ρ 's is incorrect

where ρ_{color} = the true population proportion of M&Ms of that color.

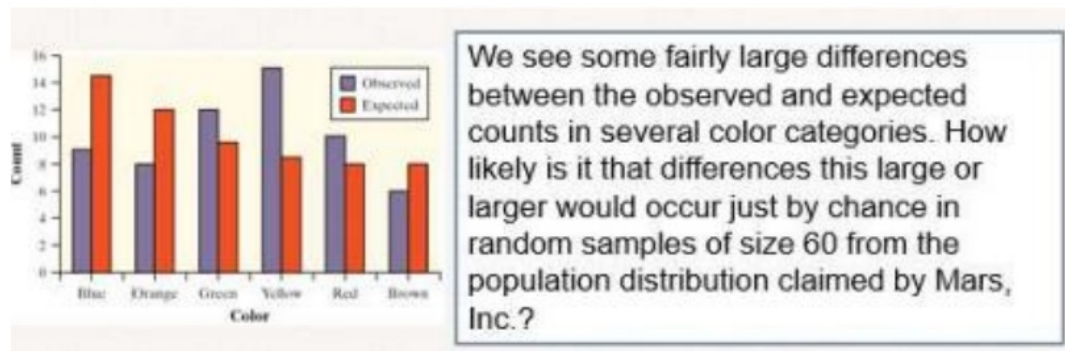
The idea of applying Chi-square golly experiment, is to try to compare experiential counts from our tester with counts from those expected from H_0 whether are true

When we experience more experiential counts than from anticipated counts, the extra facts we have contrary to H_0 .

Assuming provided information given by Mars company is factual that twenty-four percent of total produced candies are blue in color. For a normal tester of sixty sweeties, the total sum of azure candies would be $24/100 \cdot 60 = 14.4$. Mars Inc. remains true, 24% of all M&Ms manufactured are azure. In an unplanned sample of sixty chocolates, the ordinary amount of azure M&Ms must be $(24/100) \cdot 60 = 14.4$. using the same process, we can determine the estimated counts for each of the reaming colors

	Color	Observed	Expected
Orange:			
	Blue	9	14.40
Green:	Orange	8	12.00
	Green	12	9.60
Yellow:	Yellow	15	8.40
	Red	10	7.80
Red:	Brown	6	7.80
Brown:			

To test whether the given evidence against null assumption, we try to relate the estimated tallies since our tester from that of expected tally presumptuous that H_0 is factual. This is if the estimated counts are much greater then expected tally, this is the fact we are interested in.



To find the solution this problem, we compute an indicator that determine the variation amid the experiential tally and anticipated tally. We apply chi-square test to determine this.

The **chi-square statistic** is a measure of how far the observed counts are from the expected counts. The formula for the statistic is

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

where the sum is over all possible values of the categorical variable.

The table bellows shows the total counts for both expected and observed counts of our tester of sixty M&Ms. Let's calculate the chi-squared statistic.

Color	Observed	Expected
Blue	9	14.40
Orange	8	12.00
Green	12	9.60
Yellow	15	8.40
Red	10	7.80
Brown	6	7.80

$$\chi^2 = \frac{(9-14.40)^2}{14.40} + \frac{(8-12.00)^2}{12.00} + \frac{(12-9.60)^2}{9.60} + \frac{(15-8.40)^2}{8.40} + \frac{(10-7.80)^2}{7.80} + \frac{(6-7.80)^2}{7.80}$$

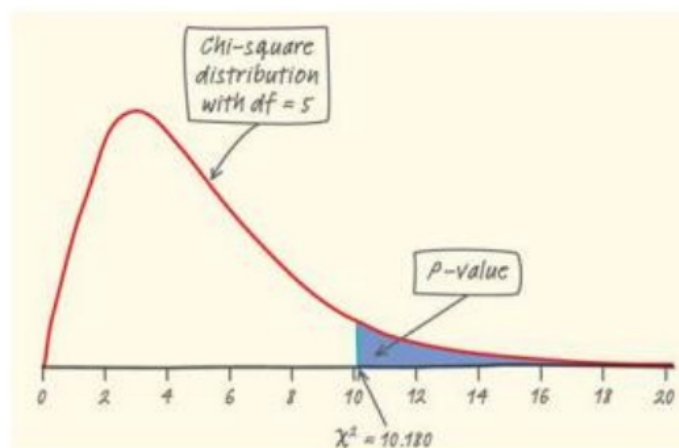
$$\chi^2 = 2.025 + 1.333 + 0.600 + 5.186 + 0.621 + 0.415 = 10.180$$

χ^2 estimate the distance between the observed tally and expected tally. Big figures of χ^2 are stouter proof against H_0 , this because observed tally are much further from expected tally if H_0 was correct. Minor figures of χ^2 propose that the facts are reliable with the H_0 .

The specimen dissemination of a chi-square indicator cannot be an Ordinary dissemination, but rather a Right-skewed dispersal which permits merely progressive figure for the reason being χ^2 will certainly not be negative.

Anticipated tallies are expected to be five at minimum, this specimen of dissemination of χ^2 measurement will be adjacent to a chi-square dissemination having a gradations of independence that is equivalent to the sum of groups less 1.

We will compute a chi-square measurement for our tester of sixty M&Ms, $\chi^2 = 10.18$. Since sum of total probable tallies are five at least, the χ^2 measurement will come second after a chi-square dissemination having degree of freedom = 6 - 1 = 5 practically when H_0 is accurate.



Using our calculator, we discover the P-figure to be 0.0703. Thus, we can't afford to reject H_0 if $\alpha = 0.05$. we lack enough facts to make conclusion that what the company claimed is correct.

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