

Estimating Color Proportions of Skittles in the Sonora Area

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Introduction:

The purpose of this project is to estimate the proportion of each color of Skittle found in regular, 2.17 oz. bags located in the City of Sonora.

To do this we took a random sample of 2.17 oz. Skittles bags from 20 different locations in Sonora (Cigarettes Cheaper, Joann's Fabric, Sierra Energy, Lower Savemart, Upper Savemart, Candy Vault, Big Lots, 99 Cent Store, CVS, Dollar Tree, Paul Oil Co. Inc., Gold Country Gas Station, Kwik Stop, Safeway, Price Co., Flyers, Walmart, Chevron, Rite Aid, and Grocery Outlet). All bags of Skittles were chosen as the first pack on top of the stack, in each location. This can further prove a simple random sample was selected. Once the sample was collected we sorted the Skittles by location and then by color, counting each one from each bag and carefully recording the data.

Definitions and Assumptions:

Our population is defined as all Skittles presented in 2.17 oz. bags in stores in Sonora, CA.

We assume:

1. Total number of Skittles in each bag will not have a difference of more than ten
2. Small, disfigured Skittles were not included as they were not considered a whole candy
3. This study will not give evidence for whether certain numbers of one color candy appear more frequently than another. It is simply correlational at most.

We originally hypothesized that more red Skittles would appear and there would be less green.

Sampling Design and Methodology:

Gathering the data for this project was fairly simple. Throughout the course of three weeks the two of us bought 10 bags each at different locations in Sonora. We communicated often as not to collect a sample from the same location twice. Once the sample had been collected we joined forces to sort and count Skittles. This only took approximately 30 minutes to complete.

When we encountered candies that were small and out of shape or broken, we did not count them. Instead, they were ingested for the purpose of science.

The data was recorded manually on paper. We first wrote the location the bag was from and made a list of possible colors that could appear. The total of each color for each store was recorded and the final total for each bag was recorded below that. After all Skittles had been processed, we took the totals of all colors and then the grand total of all candies counted.

Problems We Encountered:

Originally, we had intended on collecting a sample of thirty 2.17 oz. bags of Skittles.

However, we found that although there may have been enough locations in Sonora to buy this many bags, not all stores sold the size we needed. For this reason, we had to reduce our sample size. Perhaps taking a sample of the entire county rather than one city would have yielded more accurate results.

Tests:

The Chi-Square Goodness-of-Fit Test was conducted on two occasions. The first of the Chi-Square tests conducted was to compare the Wrigley Company claimed Skittle color proportions, to those we collected. The Wrigley company claimed their proportions to be: “Green: 19.7%, Yellow: 19.5%, Orange: 20.2%, Red: 20%, and Purple: 20.6%”.

The second Chi-Square test conducted was to compare “perfect world” Skittle color proportions, to the proportions we collected. In a perfect world, the proportions of each color in a bag of Skittles would be 20% each.

Confidence Intervals were also calculated.

Results:

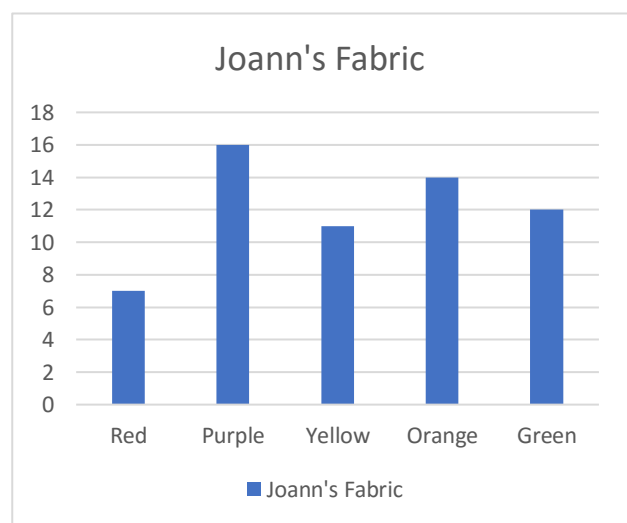
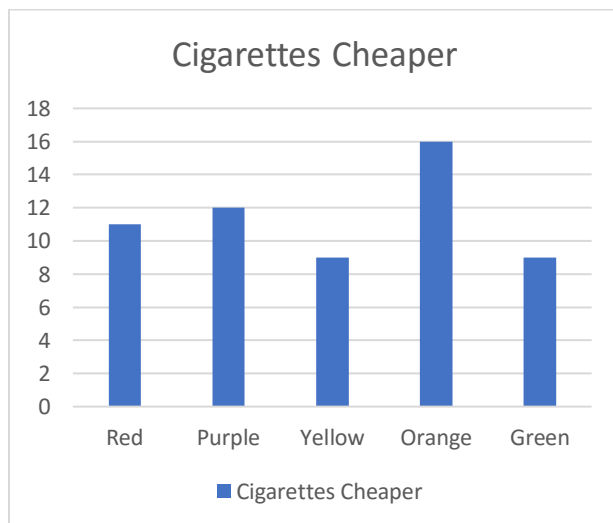
Cigarettes Cheaper	Joann’s Fabric	Sierra Energy	Lower Savemart	Candy Vault
Red: 11	Red: 7	Red: 14	Red: 11	Red: 9
Purple: 12	Purple: 16	Purple: 16	Purple: 11	Purple: 19
Yellow: 9	Yellow: 11	Yellow: 10	Yellow: 15	Yellow: 12
Orange: 16	Orange: 14	Orange: 10	Orange: 10	Orange: 11
Green: 9	Green: 12	Green: 8	Green: 12	Green: 10
Total: 57	Total: 60	Total: 58	Total: 59	Total: 61

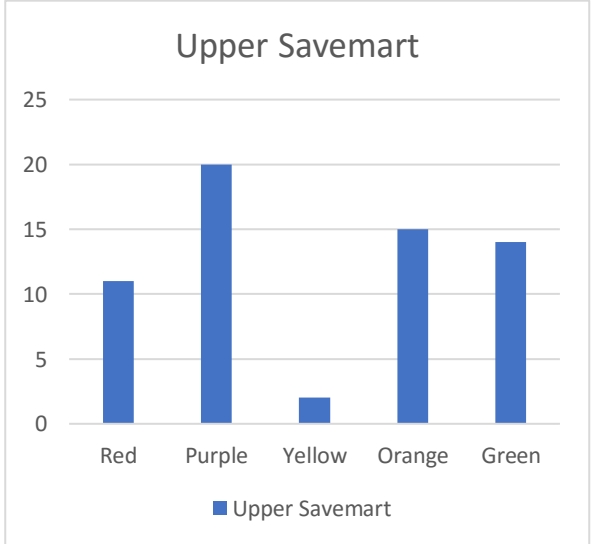
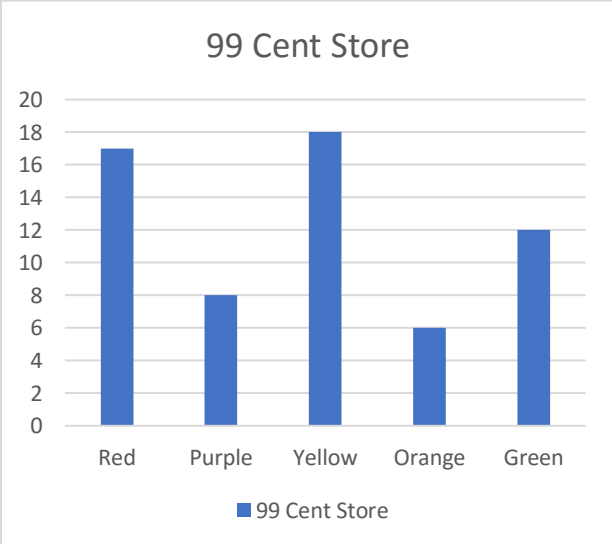
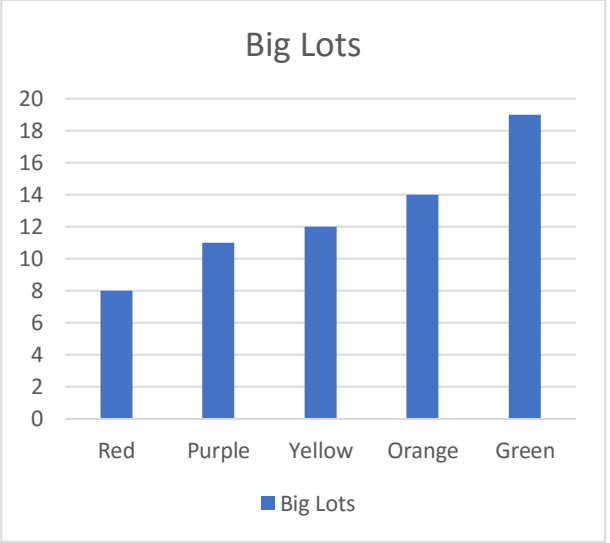
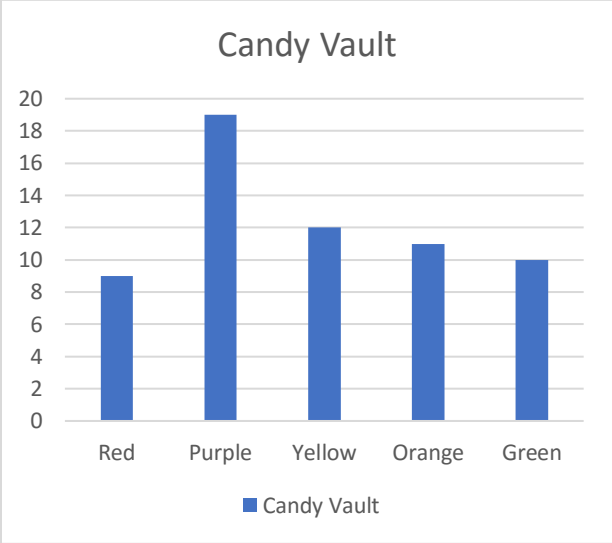
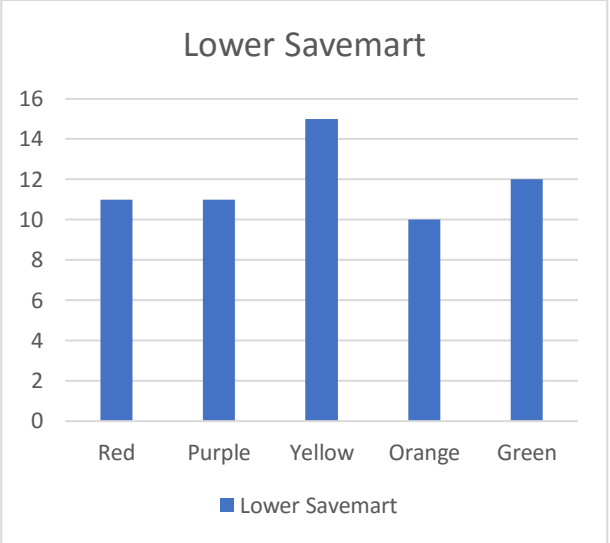
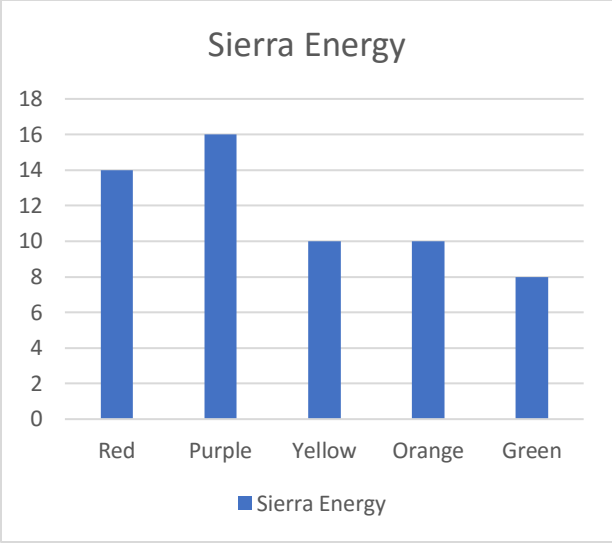
Big Lots	99 Cent Store	Upper Savemart	CVS	Dollar Tree
Red: 8	Red: 17	Red: 11	Red: 4	Red: 9
Purple: 11	Purple: 8	Purple: 20	Purple: 13	Purple: 7
Yellow: 12	Yellow: 18	Yellow: 2	Yellow: 16	Yellow: 18
Orange: 14	Orange: 6	Orange: 15	Orange: 15	Orange: 16
Green: 19	Green: 12	Green: 14	Green: 15	Green: 12
Total: 64	Total: 61	Total: 62	Total: 63	Total: 62

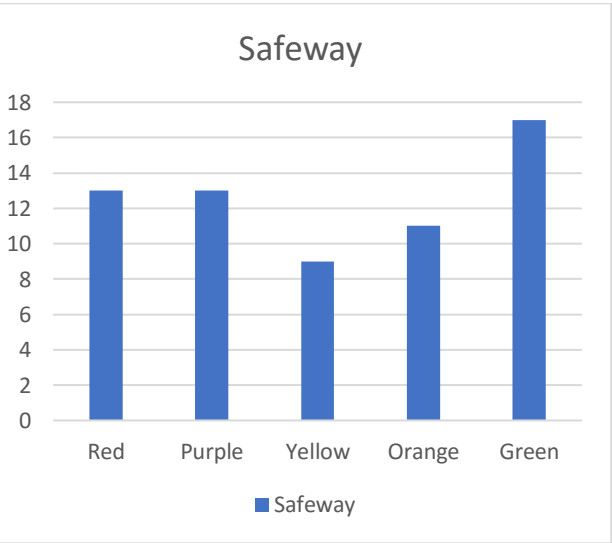
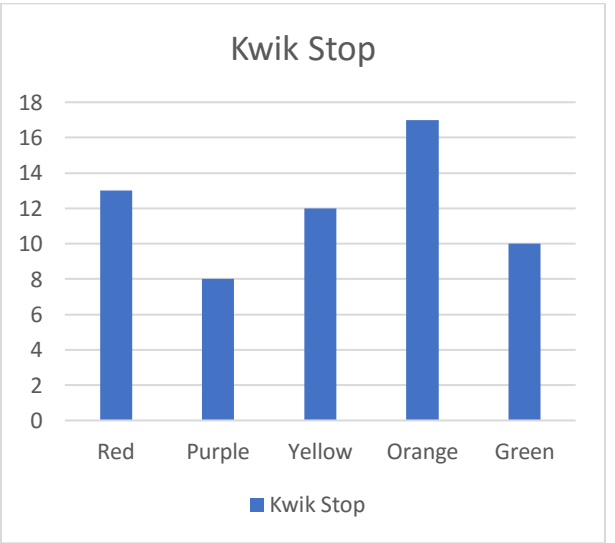
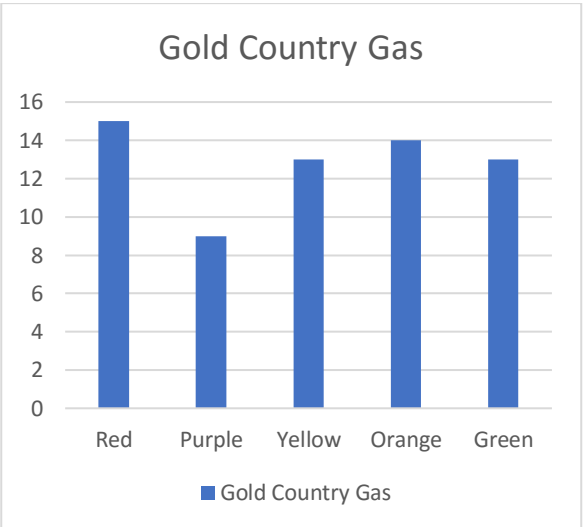
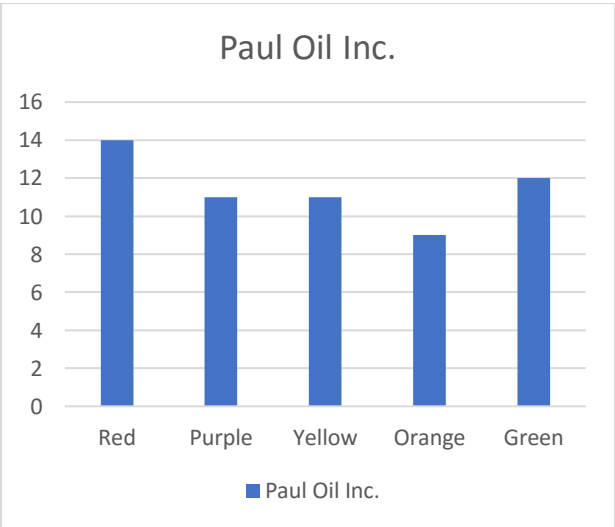
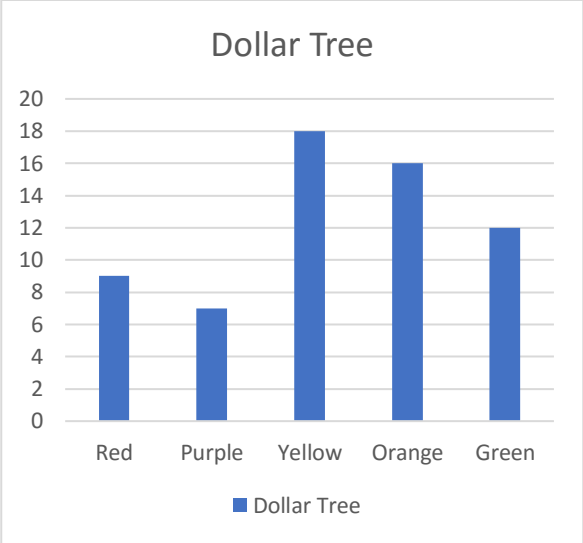
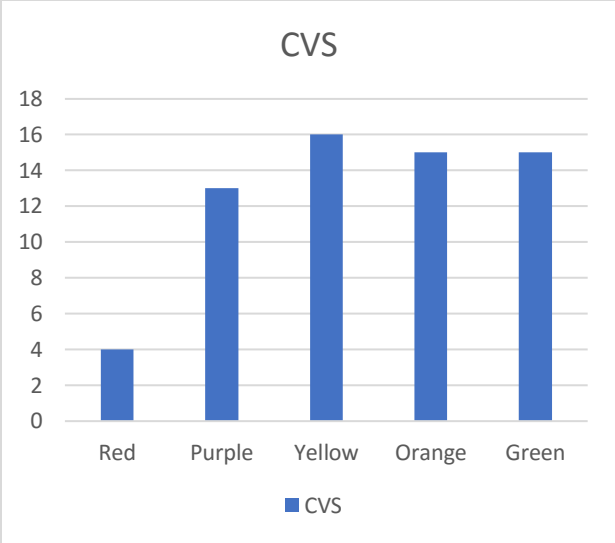
Paul Oil Co. Inc.	Gold Country Gas	Kwik Stop	Safeway	Price Co
Red: 14	Red: 15	Red: 13	Red: 13	Red: 9
Purple: 11	Purple: 9	Purple: 8	Purple: 13	Purple: 12
Yellow: 11	Yellow: 13	Yellow: 12	Yellow: 9	Yellow: 13
Orange: 9	Orange: 14	Orange: 17	Orange: 11	Orange: 14
Green: 12	Green: 13	Green: 10	Green: 17	Green: 13
Total: 57	Total: 64	Total: 60	Total: 63	Total: 61

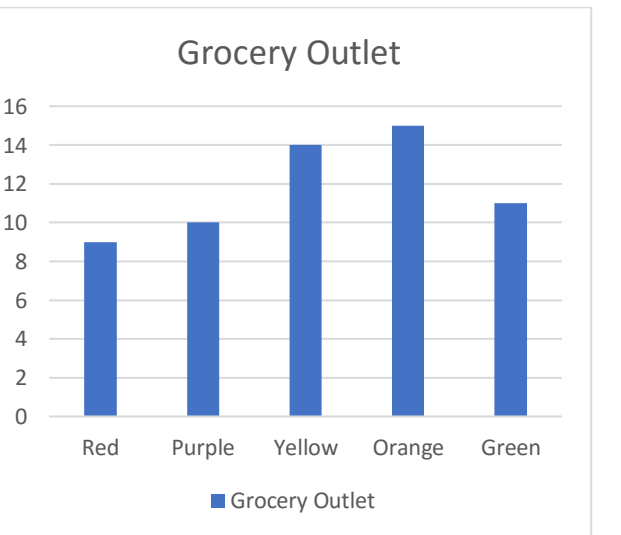
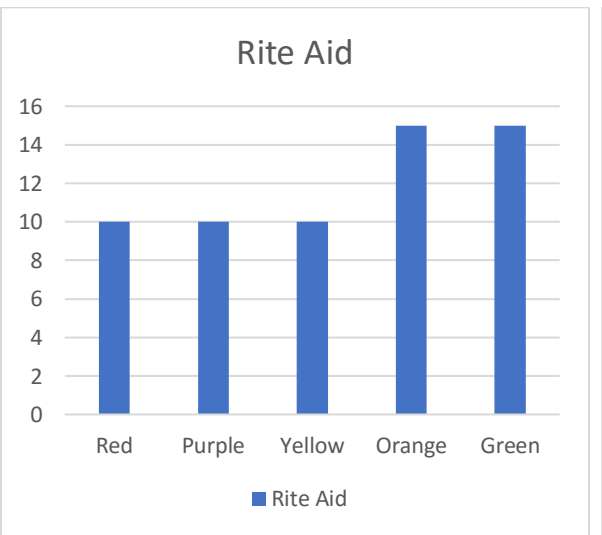
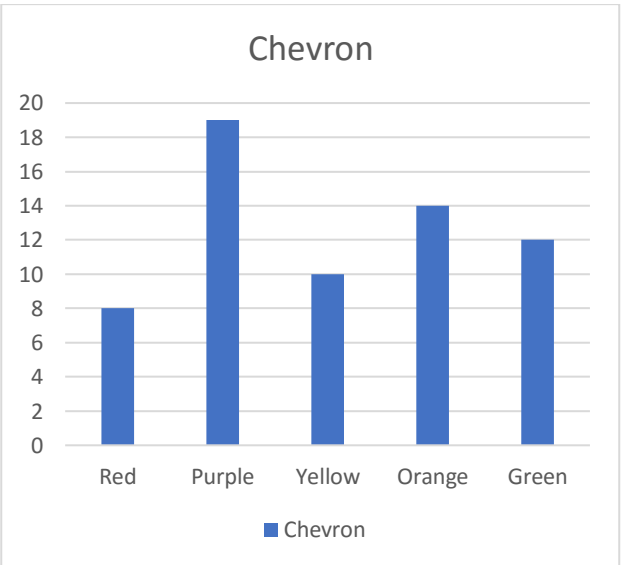
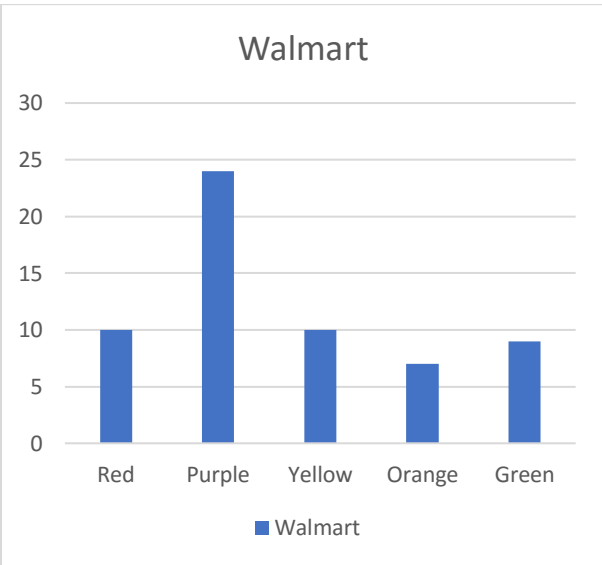
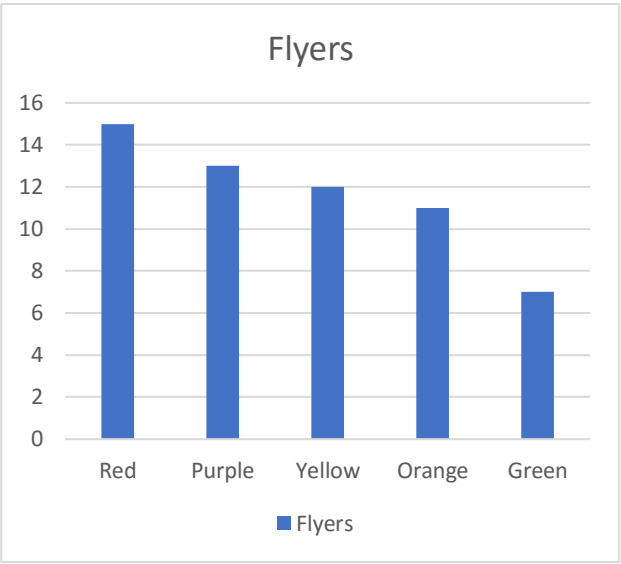
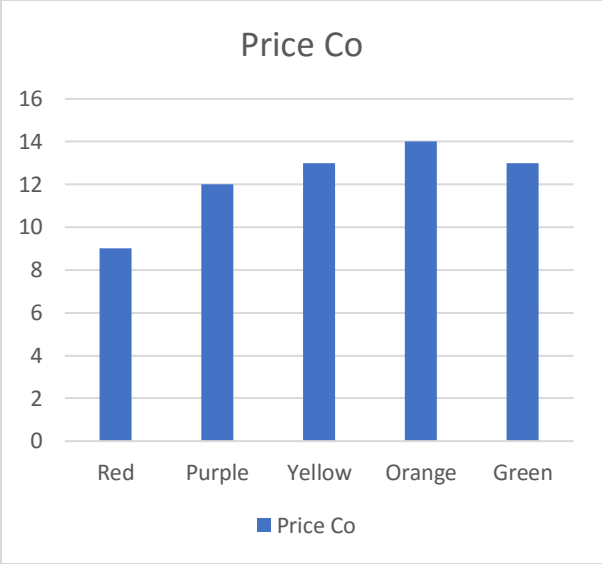
Flyers	Walmart	Chevron	Rite Aid	Grocery Outlet
Red: 15	Red: 10	Red: 8	Red: 10	Red: 9
Purple: 13	Purple: 24	Purple: 19	Purple: 10	Purple: 10
Yellow: 12	Yellow: 10	Yellow: 10	Yellow: 10	Yellow: 14
Orange: 11	Orange: 7	Orange: 14	Orange: 15	Orange: 15
Green: 7	Green: 9	Green: 12	Green: 15	Green: 11
Total: 58	Total: 60	Total: 63	Total: 60	Total: 59

Total Red: 217
 Total Purple: 292
 Total Yellow: 237
 Total Orange: 254
 Total Green: 232
 Total Skittles: 1,212

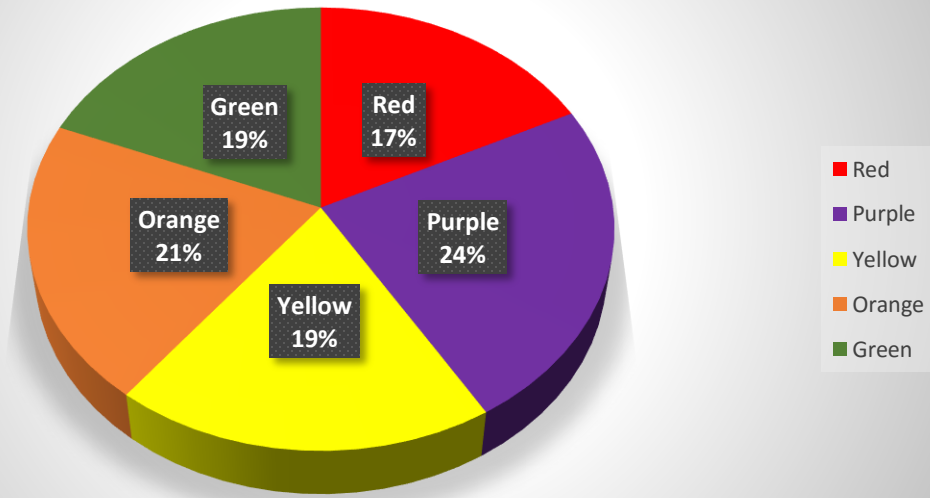




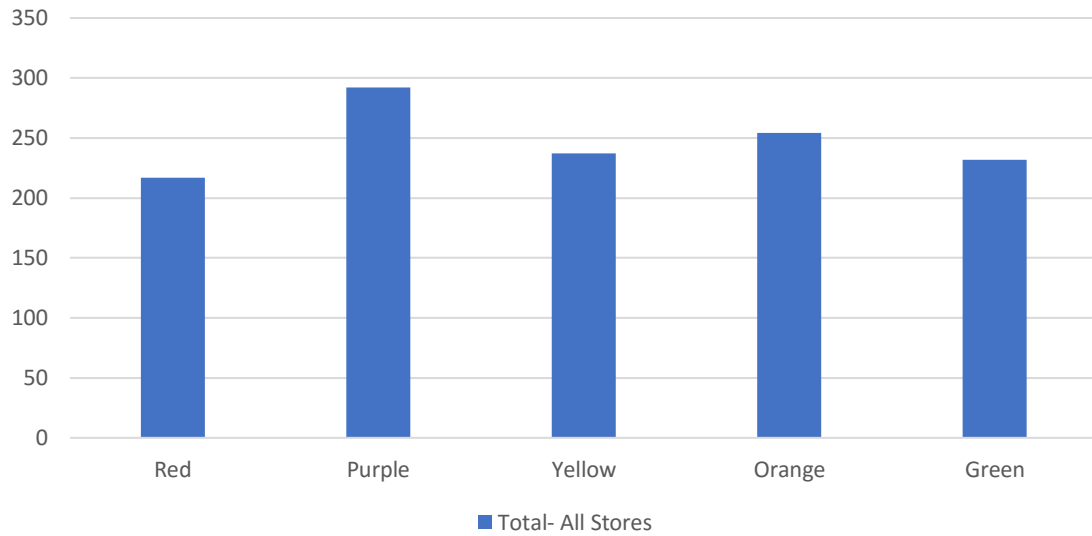




Total- All Stores



Total- All Stores



Chi-Square Goodness-of-Fit Test

$H_0 : p_1 =$ $p_2 =$ $p_3 =$ $p_4 =$ $p_5 =$

Observed Counts:

Chi-Square Statistic: 9.882; DF: 4; p-value: 0.042

Interpretation: Assuming that null hypothesis is true, the probability of seeing a chi-square statistic of 9.882 or greater is 0.042. That is, if the probabilities claimed by H_0 are true, then 4.2% of similarly collected samples will have a chi-square statistic of 9.882 or greater.

The results of the Chi-Square test against the Wrigley claimed Skittles proportions are shown above. It has a Chi-Square Statistic of 9.882, Degrees of Freedom of 4, and a P-value of 0.042. We used an alpha limit of 0.01.

Chi-Square Goodness-of-Fit Test

$H_0 : p_1 =$ $p_2 =$ $p_3 =$ $p_4 =$ $p_5 =$

Observed Counts:

Chi-Square Statistic: 13.381; DF: 4; p-value: 0.01

Interpretation: Assuming that null hypothesis is true, the probability of seeing a chi-square statistic of 13.381 or greater is 0.01. That is, if the probabilities claimed by H_0 are true, then 1% of similarly collected samples will have a chi-square statistic of 13.381 or greater.

The results of the Chi-Square test against the “perfect world” claimed proportions are shown above. It has a Chi-Square Statistic of 13.381, Degrees of Freedom of 4, and a P-value of 0.01. We used an alpha limit of 0.01.

Confidence Intervals were calculated at 95% for each proportion using a 10-key calculator. The intervals are as follows:

Red (0.157, 0.201), Purple (0.217, 0.265), Yellow (0.174, 0.218), Orange (0.187, 0.233), Green (0.169, 0.213)

Conclusions:

The conclusion taken from the Chi-Squared Goodness-of-Fit Test with Wrigley's claimed proportions was: With a fixed level of alpha being 0.01, there was not significant evidence to reject the null hypothesis of the Wrigley claimed proportions of colored Skittles.

The conclusion taken from the Chi-Squared Goodness-of-Fit Test with the "perfect world" claimed proportions was: With a fixed level of alpha being 0.01, there was significant evidence to reject the null hypothesis that each color of Skittles in a bag would have a proportion of 20%.

Additionally, where our hypothesis had been that there would be more red Skittles and less green, it appears that in this case almost the opposite is true in that red had the lowest numbers.

References:

G. (n.d.). What is the percentage of each color in a bag of Skittles. Retrieved April 16, 2017, from [http://www.answers.com/Q/What is the percentage of each color in a bag of Skittles#slide=2](http://www.answers.com/Q/What_is_the_percentage_of_each_color_in_a_bag_of_Skittles#slide=2)

www.holt.blue -Used for Chi-Squared Goodness-of-Fit Tests