

# No, Your Color is Actually Wrong :(

An AP Stats project by Lucas Woychick  
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In the year 2017 B.C.E.

# Introduction

In my youth at my middle school, I noticed that there was one topic that people were more divided on than anything: organizational colors for classes. Someone would mention how science was blue, and a chorus of voices sounded back, saying, “No, science is red,” or “You absolute buffoon, it’s green.” The correct answer is blue, because that’s the one I use, but I need some statistical evidence of that. Thus, I set out to find: Which color is the right color for each core subject? (In which “right” means most popular.) To find this, I’d need do some research.



# My Research



cool ap stats memes



All **Images**

Videos

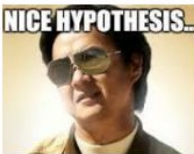
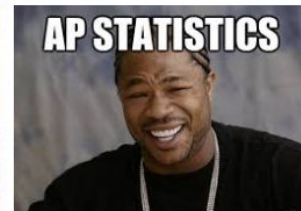
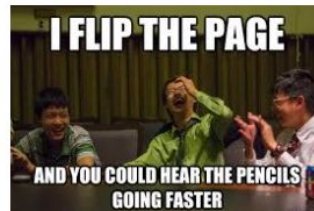
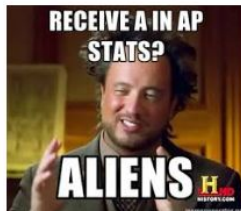
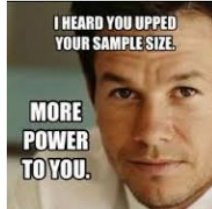
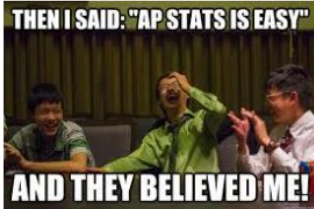
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# Data Collection

To randomly select students to sample, I chose cluster sampling. I used a list of all the classes in Washburn, then found which ones were available to survey during the hour I was gathering data. I used randInt( on the calculator to select classes. Once I had, I explained to the selected classes the survey, then asked for volunteers. In this fashion, I gathered my data from 46 students, 41 of which did color-code their subjects.

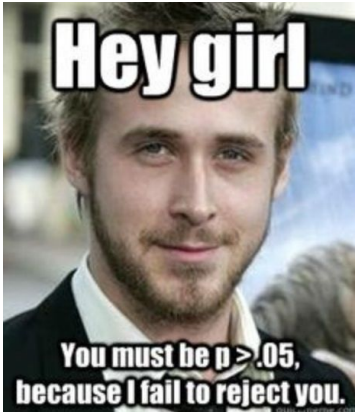
The  
survey I  
used

Do you have specific colors that go with specific subjects in your school supplies? For example, math stuff is red, science is green, etc.?

Yes      No

If so, what color do you have for...

Math \_\_\_\_\_  
Science \_\_\_\_\_  
Social Studies \_\_\_\_\_  
English \_\_\_\_\_

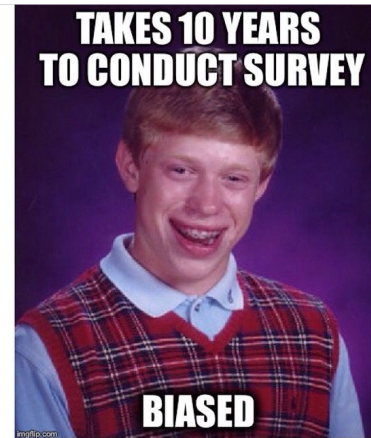




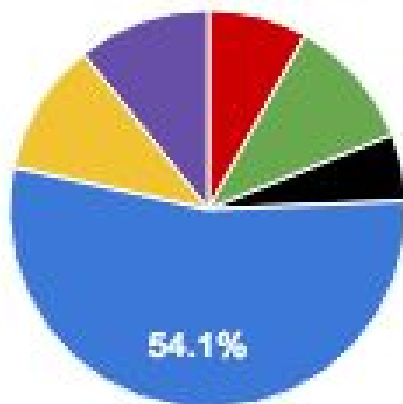
# Exploratory Data Analysis

From the start, it's obvious that the numbers are very skewed. Each subject has a specific color that about 50% of the sample had, and each of the other colors are much less. Overall, the distribution of colors is fairly even, but when broken down by subject, the pattern becomes clear.

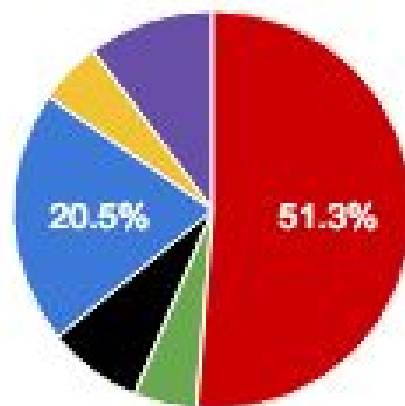
Math is overwhelmingly red, science is green, english is blue, and social studies is yellow. But is it statistically significant?????!?!?!?



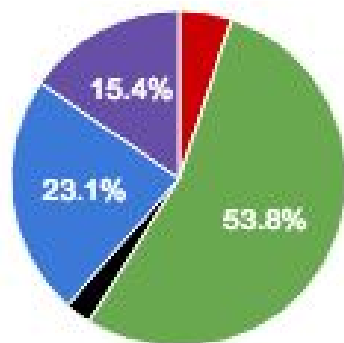
## English



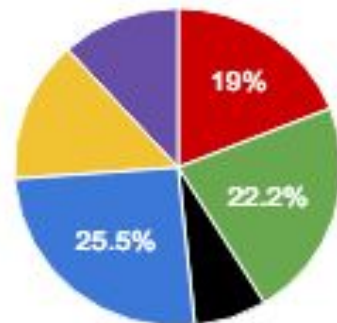
## Math



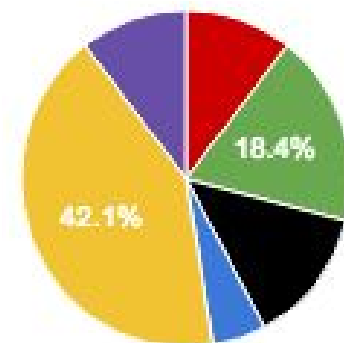
## Science



## Total



## Social Studies



# Proving It





# Inference

**P:** We are interested in the distribution of the color-coding by subject used by all Washburn students.

**H:**  $H_0: p_{\text{red}} = .16667, p_{\text{blue}} = .16667, \dots$

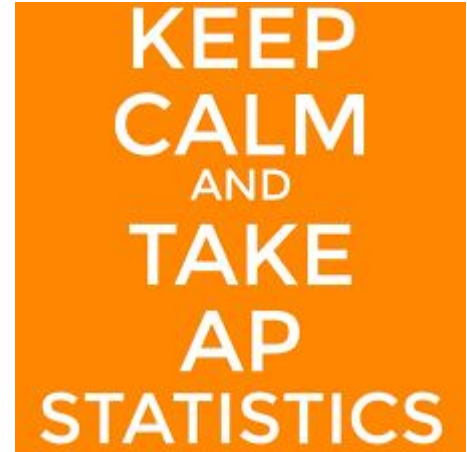
$H_a$ : At least two of these proportions are incorrect.

**A:** - The sample was taken randomly.

- All expected counts are at least five.

- There are more than 460 students in Washburn, so  $\square N \geq n$ .

**N:** We will use a Chi-Square Goodness of Fit Test™



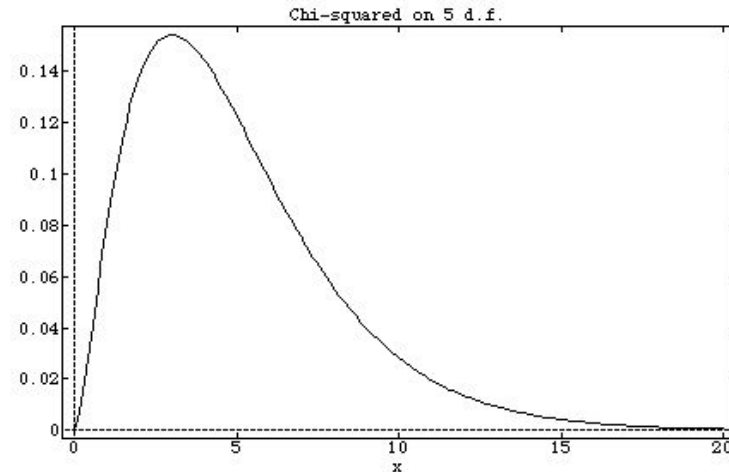
# Actual Mathy Part of Inference

T:  $X^2 = \sum (\text{Observed} - \text{Expected}) / \text{Expected} = ((20 - 6.5) / 6.5) + ((2 - 6.5) / 6.5) + \dots$

df = n - 1 = 5.  $X^2_{\text{math}} = 37.46$   $X^2_{\text{sci}} = 47.62$   $X^2_{\text{soc}} = 19.80$   $X^2_{\text{eng}} = 37.80$

O:  $P_{\text{math}} = 4.83 \times 10^{-7}$   $P_{\text{sci}} = 4.25 \times 10^{-9}$   $P_{\text{soc}} = 0.00136$   $P_{\text{eng}} = 4.14 \times 10^{-7}$

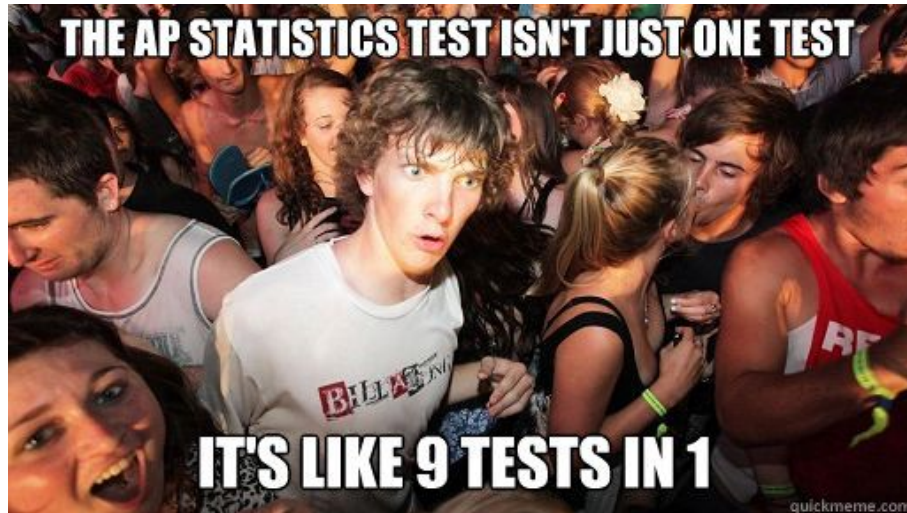
A graph of the P-values  
for each subject



# Conclusion of Inference

**M:** Because the P-values for each subject are significant at the  $\alpha = 0.05$  level, we reject the null hypothesis.

**S:** There is strong evidence that at least two of the proportions differ from their hypothesized values.



# Final Summary of Project

I was not very pleased with the results of this study. In the end, the data was so obviously uneven that the inference test was almost unnecessary. After doing some independent research on my own, I found the most probable reason for this: some middle schools made their students color-code their folders in a certain way.

There is a “right” color for each subject, but instead of being chosen democratically, these colors were chosen under authoritarian rule, and thus, their validity is questionable. If I were to do this again, I would ask a different question, perhaps asking why someone’s colors are the way they are. The main thing going against this project was my ignorance of the way middle schools forced organizational systems on students. In conclusion, if you use any of the most popular colors, you are a pawn of the government. (Not really).