



# TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION



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In the last issue of *Take It to the MAT*, we looked at a type of data known as *categorical* or *qualitative*. They are data that categorize individuals or describe some intrinsic quality. Examples include car makes, pet names, ice cream flavors, social security numbers (think about that one!), and candy colors. If data are not categorical, they are called *numerical* or *quantitative*—those derived from counting or measuring.

What can we do with categorical data? In the previous newsletter, we had used the example of determining the distribution of colors in a bag of candies. We organized our raw information into a frequency table to make it easier to interpret. What next?

An obvious next step would be to make a graph to visually represent the data. Graphs allow us to relate large amounts of data in one quick picture and more easily interpret it. The first type of graph we would use to display this data is a *bar graph*. Bar graphs can be created horizontally or vertically. Another type of graph that is used to display qualitative data is the *circle graph* or *pie graph*. One may also use color to enhance the graphs, but it should be avoided if it does not give any more information. The general rule when representing data with a graph is to display as much information as possible with as little ink as possible.

Bar graphs and circle graphs are both good choices for displaying categorical data. Each type of graph has its own advantages. Bar graphs allow easy comparisons among the counts of the categories. It's very clear in the bar graph above that there are about twice as many yellow candies as blue. Circle graphs make it simple to compare individual categories to the whole of the data. For instance, red and green candies comprise a little more than one-fourth of all candies in the bag.

Students frequently make mistakes in creating bar graphs. Most of those mistakes come from poor scaling of the graphs. Two incorrect bar graphs are shown with typical student errors. The first shows a lack of consistent scale. The differences between tick marks are 1, 2, 1, and 3, respectively, when reading up from the horizontal axis. In the second, the student has simply drawn increasingly taller bars with their corresponding frequency on the vertical axis. Unfortunately, it appears to the eye that blue is more numerous than red, which it is not.

Students may also be compelled to create a *line graph* for categorical data. Line graphs are typically used to show trends, and there are no logical orderings of colors for which to see a trend. Thus, in this situation, the line graph is not appropriate and is actually harder to interpret.

So, which graph best meets the criteria of being clear, concise, purposeful, and accurate?

Color	Tally	Count
Red	////	4
Green	/	1
Blue	///	3
Orange	////	4
Yellow	//////	7

