Nir

Math

Ratios and Proportions or: Cats, Pizzas and Amazon

You babysit 12 cats, and they are very hungry. So, you decide to order each of them 2 pizza slices (I checked, cats eat pizza). That's a great excuse to use ratios. A ratio is a relationship between numbers, in this case, 2 pizzas to a cat. In "math language", you express that like division, and as a fraction, . But you have 12 cats, so now you also have an excuse to use proportions. A Proportion is an equation of multiple ratios, yes, those of pizzas and cats. Then to calculate how much pizza you need, you write the proportion. . Because , . You should buy 24 pizza slices. By the way, if it was not clear until now, this essay is going to show that ratios and proportional reasoning are useful even outside of math class.

Now back to the Pizza. Even though it is not healthy for cats to drink coke (I checked, cats don't drink coke), you want some for yourself. So you open the restaurant webpage and the prices are 2.25 for 20 ounces bottle and 3.25 for 2 liters bottle. Based on the fact that you know that about 34 ounces are a liter, you can compare which one is a better deal, and by how much. First, you try to find the unit rate for the big bottle: . Same process for the big bottle: . It's now easy to see that the bigger bottle is much cheaper ( ), but how much do you pay for each extra ounce in the big bottle over the small one? around 2 cents, that is less than a of the price per ounce of the small bottle. Ratios let you convert quantities and compare between them pretty easily, which is useful in shopping, but also in whole lot of other areas.

Another area that uses ratios and proportions is economy, and that is what I chose to work on as my interest driven problem. I chose to find relationships in comparing different aspects of Amazon's growth. I chose Amazon because the company changed the retailing and selling world, and I wanted to explore how Amazon had grown over the years. First, I found the net sales in North America for every year since 1998. Then I made the following calculation: . That gave the yearly growth of sales. The growth moved between 150% between '98 to '99 and 2.5% two years later. In later years, the growth became more stable at around 30%.

But then I thought, what if I compared these numbers not with another "money aspect", but with Google searches. So I opened Google trends, and found the quantities of searches for Amazon of each individual month since 2004. Google does not give the exact number of searches, but just compared to the highest point. That means the month with the highest number of searches is ranked 100, and a month with ¾ of that quantity will be ranked 75. Interestingly, but somewhat expectedly, the ranking jumped at the end of each year, probably because it's the Black Friday and Christmas season. Additionally, the number of searches increased each year.

To make the searches comparable with the sales aspect of Amazon, I needed to convert the search rankings from monthly to yearly. So I found the average of each 12 months, and then compared it again to the new highest point. Then, I wanted to find the ratio of searches to net sales because that seemed like the more obvious relationship. To find the relationship I did and that gave me a list of what first seemed like bunch of random numbers. So to try and find the pattern, if there is one, I made a graph of that ratio over the years. The graph showed that the ratio was decreasing, which means that there were more sales per search than before. That implied that more people had either bookmarked Amazon or downloaded the app.

As you just read, ratios and proportions are very useful in real life. But you might have noticed that a bunch of these calculations could have been made without ratio structure, and that, I think, is one of the cool things about ratios. When we learn how to multiply, we learn how to expand a ratio, and division, that’s how to find the unit rate of the ratio. Even without their structure, so much of our math is related to ratios. Ratios and proportions are used to compare things as small as atoms in molecules, as big as companies’ potential, and as important as pizzas.