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Proportion: Definition, Application & Examples

When we want to compare one ratio, or fraction, to another equivalent ratio, it's a proportion. Learn all about proportions and practice solving proportion problems in this lesson.

Proportions

Meet Jason Burger and Jennifer Queen. They're not only married; they just started a business together: Burger Queen.

This is great. How great? So great that they now need to learn about proportions to help their business grow.

A **proportion** is a set of ratios that are equal to each other. What's a ratio? It's a comparison of one thing to another. For example, at Burger Queen, it takes one pound of beef to make four burgers. So the ratio of pounds of beef to burgers is 1 to 4, which we can write as 1/4.

A proportion is just two ratios that equal each other. So if Jennifer is ordering beef, and she wants to have enough for 500 burgers, she sets up an equation: $1/4 = x/500$. Instead of four burgers, she wants 500. Instead of one pound of beef, she'll need, well, we don't know. So we use x.

To solve this proportion problem, we cross-multiply. So $1 * 500 = 4 * x$. That's $4x = 500$. 500 divided by 4 is 125. So Jennifer needs 125 pounds of beef for 500 burgers. Our final proportion looks like this: $1/4 = 125/500$. In any proportion, you could simplify one side of the equation so that it's the exact same as the other. 125/500 can be simplified to 1/4.

Sample Problem #1

That's pretty much all you need to know to solve proportion problems. Figure out your fractions, then cross-multiply. Let's try a sample problem.

In one hour, Burger Queen serves 35 customers. At that rate, how many customers will be served in eight hours?

We need to figure out our fractions. We're comparing hours to customers. Our first ratio is 1/35. That's one hour to serve 35 customers. Our second ratio is x/8. We want to know how many customers, or x, will be served in eight hours.

If we set them equal to each other, that's 1/35 = x/8. Wait, that's not right. Our numerator in the first ratio is one hour. In the second one, our hours are in the denominator. That won't do. That's like putting a piece of a bun between two burgers. Be sure that your ratios line up. If it's helpful, include the labels of what they describe.

We should have 1/35 = 8/x. That's hours to hours and people to people. Much better.

Now, let's cross-multiply. This is x = 35 * 8. So x is 280. In eight hours, Burger Queen serves 280 people. Not bad!

Sample Problem #2

In fact, things are going very well for Burger Queen. First, they expand to three locations. After successfully avoiding a trademark lawsuit from a similarly-named competitor, they decide to ramp things up and expand to 15 total restaurants. Wow!

Expansion means proportion problems. If three restaurants require 46 employees, how many employees will be required at 15 restaurants?

Let's set up some ratios. We're going from three to 15 locations, so our first ratio is 3/15. And we had 46 employees, but we don't know how many we'll need, so our other ratio is 46/x. That makes our equation 3/15 = 46/x.

That gets us 3x = 15 * 46. 15 * 46 is 690. Divide that by 3 to get 230. So they'll need 230 people. That's a lot of fry cooks, burger flippers and the all-important multitasking drive-thru operator/soda filler/cash handler/bagpipe players. Did I mention Burger Queen has bagpipe players? And yet they still manage to draw in customers. Those burgers must be amazing.

But wait, did we have to solve this problem in this way? Could we have said three locations require 46 people, so 3/46 = 15/x? Yep, we could. As long as our ratios accurately represent the facts and are set equal to each other appropriately, then there's more than one way to peel this potato. For fries. It's a French fry reference. Oh, never mind. Let's move on.

Percent Problem

One day, Jason launches a new promotion. All day Tuesday, burgers are 25% off. If a burger normally costs $4.50, what is the sale price?

Let's set up our proportion! Okay, let's see. We want a ratio of the sale price to the original price. That's going to be x/4.50.

But what's the other ratio? This is a percent problem. A percent is just a ratio, though it may not look like one. Kind of like how a veggie burger is still called a burger, but it doesn't look (or taste) like one. 25% is just 25/100.

So is our proportion x/4.50 = 25/100? No. Remember, the burgers are 25% off. The sale price will then be 75%, or 100 - 25, of the original price. That makes our proportion x/4.50 = 75/100.

It's cross-multiply time. 100x = 4.50 * 75. So 100x = 337.5. And x = 3.375. Let's round that to $3.38. That's our sale price on burgers.

Lesson Summary

To summarize, a **proportion** is a set of ratios that equal each other. For example, 2/3 = 4/6.

To solve proportion problems, determine what your sets of ratios, or fractions, look like and how they are equal. Make sure you don't reverse one. Then just cross-multiply!

With percent problems, take extra care to note which fraction to use. For example, if something is 70% off, the ratio for the percent that includes the sale price is 30/100.

Now where did I put those fries?

Learning Outcomes

Following this lesson, you'll have the ability to:

- Define proportion

- Explain how to solve problems with proportions

- Identify the extra care that needs to be taken when solving percent problems