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Basic Review

Introduction to Ratios

A ratio is a quotient of two numbers. It is used to compare these numbers. The ratio of a to b is written as:

$$a \text{ to } b \qquad \text{or} \qquad a:b \qquad \text{or} \qquad \frac{a}{b}$$

Ratios are very common in everyday life. One familiar example of a ratio is miles per gallon. If you use 4 gallons to drive 120 miles, the ratio of miles to gallons that your car got was 120:4, or 120/4. You can then reduce this, just like you would a fraction, to 30:1 representing 30 miles per gallon.

A ratio is a comparison of two quantities. It is interpreted as a fraction in many applications. If the ratio compares quantities with different units, such as distance and time units, then it is often called a **rate**. A **percentage** is a ratio in which the second quantity is understood to be 100. That is, a percentage is a ratio that compares a number with 100.

Setting up and Comparing Ratios

Ratios are often used to compare items. For example, when we go looking for a new car, one criteria of comparison is the ratio "miles per gallon" the car gets, with the most economical car getting more miles per gallon.

Before we can compare items using ratios, we need to know how to take a statement and turn it into a ratio. When you wish to set up a ratio, you need to know:

- _The items being compared.
- _The relationship between the items.

Let's look back at the car example above. If we travel 120 miles and use 4 gallons of gas, we want to know the ratio of miles to gallons of gas. One easy way to remember how to set up ratios is to use the wording above "a to b." We want to determine miles to gallons, or miles/gallons. As we saw above, this ratio is 120/4, which can be simplified to 30/1.

Suppose we want to compare the miles per gallon ratio of two cars. Our car traveled 120 miles on 4 gallons of gas. We find that our neighbor's car traveled 210 miles and used 6 gallons of gas. Which car gets the best gas mileage?

It is difficult to determine whose car has better gas mileage by just looking at the information in the previous paragraph. However, it is easier to compare when we use the ratio of miles/gallon for each car. The neighbor's car's ratio of miles to gallons is 210/6, which reduces to 35. Here we can see that their car gets better gas mileage, that is, more miles per gallon.

	Miles Traveled	Gallons of Gas	Miles/Gallon
Our Car	120	4	30/1
Neighbor's Car	210	6	35/1

Example

You need to buy a bottle of catsup. As you look at the bottles on the shelf, you notice that you can pay $2.70 for an 18 oz. bottle, or you can pay $1.68 for a 12 oz. bottle. Which bottle is the better buy?

First, let's set up a table for the information we have:

	Cost	Size in oz.	Cost per ounce
18oz bottle	$2.70	18	
12oz bottle	$1.68	12	

What we need to determine is the ratio that goes in the last column. In this example, the ratio we will use is cost/size, or cost per ounce. This is commonly used in grocery stores and is referred to as unit price.

Ratio Cost/Size for 18 oz. Bottle:

$$\frac{\$2.70}{18oz.} = \frac{\$.15}{1oz.} \quad or \quad \frac{15cents}{ounce}$$

Ratio Cost/Size for 12 oz. Bottle:

$$\frac{\$1.68}{12oz.} = \frac{\$.14}{1oz.} or \frac{14cents}{ounce}$$

If we fill in the table above, we get:

	Cost	Size in oz.	Cost per ounce
18oz bottle	$2.70	18	15 cents/oz
12oz bottle	$1.68	12	14 cents/oz

Here we can see that the 12-ounce bottle is cheaper per ounce, so it's a better buy.

You may be asking yourself: how did we know we should use the ratio of cost per ounce, instead of ounces per cost? In many situations you may be told which ratio you should use. In this situation, the convention is cost per ounce. However, you could have used ounces per cost and still found that the 12-ounce bottle is a better buy.

NOTE: The 12 oz. bottle is 7.14 oz./dollar, and the 18 oz. bottle is 6.67 oz./dollar. Try this calculation and see if you can get this answer.