



## How to Calculate Unit Rates & Unit Prices

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One of the most common uses of math is to find out whether something is a 'good deal.' The unit price, a special kind of unit rate, allows us to determine the best deals. In this lesson, learn how to calculate unit rates, including unit prices.

## Comparisons in Math

Let's say your favorite team has won 7 championships in 26 seasons, while your buddy's favorite team has won 3 titles in 13 years. Which team is better?

Here's another one. We could pay \$1.39 for a 5-ounce bag of gummy bears at one store, or \$8.99 for a 32-ounce bag at a different store. Which purchase is the better deal?

To help us make comparisons that make sense in the real world, a special type of ratio is helpful: the unit rate. Before we discuss unit rates, let's quickly review ratios.

## Ratios

**Ratios** are a comparison between two numbers (like  $\frac{8}{4}$  or 6 feet/4 feet). They can also be comparisons between different units (for example, price/ounce). Ratios can be expressed as fractions. When we divide the numerator by the denominator for a ratio of different units, the result is a special kind of ratio called a unit rate.

## Unit Rates

A **unit rate** is a ratio between two different units with a denominator of one. When we divide a fraction's numerator by its denominator, the result is a value in decimal form. For example:  $8/4 = 2$  and  $3/6 = 0.5$ . When we write numbers in decimal form, we can write them as a ratio with one as the denominator.

For example, we can write 2 as  $2/1$ , and 0.5 as  $0.5/1$ . However, since that approach can be a little clumsy, we usually drop the one. That said, it's important to remember the one is there, especially when working with unit rates.

For instance, 8 miles/4 hours = 2 miles/hour. Notice again that, while we did not include the 1, we did include the unit 'hour' Miles per hour is a familiar expression, as are unit rates such as:

- interest/amount invested
- revolutions/minute
- salary/year

Conversationally, the word "per" indicates we are using a unit rate.

## Unit Rate Calculations

To get the unit rate, simply divide the numerator by the denominator. The result indicates how many of the units in the numerator we can expect for every one of the units in the denominator. Let's go back to our earlier example about the sports teams.

Your team: 7 champs/26 season = 0.27 champs per season (cps)

Your buddy's team: 3 champs/13 seasons = 0.23 champs per season

The championship rate for your team (0.27 cps) is greater than the championship rate for your buddy's team (0.23 cps), so you could argue that your team is better.

## Unit Prices

The **unit price** is a type of ratio where the price is the numerator and the quantity of a good or product is the denominator. It allows us to compare the different quantities of a product. Returning to the gummy bear example from earlier in the lesson:

Store 1: \$1.39/5 oz. = \$0.278/oz. (or about 27 cents if you round down)

Store 2: \$8.99/32 oz. = \$0.281/oz. (or about 28 cents even per ounce)

Hmm. . . The unit price at store 1 is better than the unit price at store 2. As we'd probably eat all of the gummy bears no matter where we bought them, we'd be better off going with the smaller and, thus, healthier and more cost effective option at store 1.

## Lesson Summary

Let's review. **Ratios** are a comparison between two numbers expressed as a fraction. However, comparing two ratios of the same units (for example, championships/season), using the original numbers can make comparisons difficult.

A **unit rate** is a ratio between two different units with a denominator of 1. To calculate the unit rate, divide the numerator by the denominator. The resulting decimal number is the unit rate.

The **unit price** is a type of ratio where the numerator is the price and the denominator is the quantity of a good or product. It allows us to compare the different quantities of a product.

### Additional Activities

## How to Calculate Unit Rates & Unit Prices - A Practical Exercise

The following exercise is designed to help students apply their knowledge of unit rates and prices in a real-life business scenario.

### Scenario

You are the chief accountant at Jewel Design, a boutique fashion company that sells high-end clothing. Jewel Design maintains its premium appeal to customers by making custom-fitted dresses and tuxedos for men and women. Recently, the company has run into some financial difficulties and its president has sent you the following requests by email.

#### Email:

"There are two things that I wish to discuss with you.

1. We invested heavily in creating a sales team last year, and I now regret that decision. Because our business is relatively low volume, we do not need as many sales representatives as we currently employ. I've included some data below. Can you tell me who is the least-productive salesman while considering both their sales volume and salaries?
2. We've had a few offers from suppliers to provide us with high-quality silk. The three suppliers offer the same product quality, so I really want to focus on keeping costs low to boost profitability. Which supplier offers me the best unit price?"

**Attachment 1: Salesman Performance:**

Name	Annual Salary	Units Sold (previous year)
John	\$50,000	3,500
Jimmy	\$80,000	8,000
Jerome	\$40,000	3,000

**Attachment 2: Supplier Offers**

Supplier	Price	Square Feet Offered
A	\$10,000	2,400
B	\$12,000	3,000
C	\$18,000	5,000

## Required

Answer both of the president's questions.

## Solution

1. We must compute the rate of pay per unit sold. This is computed as follows:

Rate = Annual Salary / Unit Sold

Name	Annual Salary	Units Sold (previous year)	Rate
John	\$50,000	3,500	<b>50,000 / 3,500 = \$14.29</b>

Jimmy	\$80,000	8,000	<b><math>80,000 / 8,000 = \\$10.00</math></b>
Jerome	\$40,000	3,000	<b><math>40,000 / 3,000 = \\$13.33</math></b>

**John** is the least productive salesman since his rate is the highest at \$14.29 of salary per unit sold.

**2.** We must compute the price per square foot. This is computed as follows:

Price = Total Price/ Square Feet

Supplier	Price	Square Feet Offered	Unit Price
A	\$10,000	2,400	<b><math>10,000 / 2,400 = \\$4.16</math></b>
B	\$12,000	3,000	<b><math>12,000 / 3,000 = \\$4.00</math></b>
C	\$18,000	5,000	<b><math>18,000 / 5,000 = \\$3.60</math></b>

**Supplier C** offers the lowest (and therefore best) price per unit.