



## How to Find the Unit Rate

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If we are going to use math to predict outcomes, one of the most useful measures we can establish is the unit rate of change. In this lesson, you'll learn how to find the rate of change and apply the formula to real-life examples.

### What Is a Unit Rate?

Ah, summertime - ice cream, baseball games, and swimming pools. Well, there would be a swimming pool if yours would ever fill with water! The hose is now in the pool and slowly filling the pool with water, and I mean slowly. You look at your watch - you told your friends the pool would be ready for swimming in three hours, but is that enough time to fill the pool? You know that the volume of your pool is 18,000 gallons, but how long will it take to fill?

To answer that, you need to use a unit rate. A **unit rate** is the measure of the amount of one unit it takes for something to happen in other units. Some common unit rates include miles per hour, cost per item, and earnings per year.

### Why Use a Unit Rate?

Look at your swimming pool. You've had the water on for an hour, and it has barely made a dent in filling the pool. When will it be done? You know that the flow rate for your water hose is about 6 gallons per minute. The hose has been flowing for 60 minutes, so that means about 360 gallons have flowed into the pool. Even after another three hours, that is still quite a bit shy of the 18,000 gallons that you will need to have your pool party.

Luckily for you, your best friend is a fireman and has access to high-pressure hoses. You agree to pay for the water if they pump it. Those pumps have a much higher flow rate: 100 gallons per minute. That means your pool will be full just in time.

### Finding the Unit Rate

But wait, how did we find the unit rate in the first place? In short, we took a defined period of time and measured the output during that time. You calculated how many gallons of water your hose could fill in a minute. You filled 6 gallon jugs in one minute, so that meant that you had a flow rate of about 6 gallons per minute. Your friend's hose, on the other hand, could fill those same jugs in a matter of seconds.

Another way to find the unit rate is to measure how long it takes you to do something that has a known quantity. Imagine that you had a friend who lived 100 miles away. It takes you 2 hours to drive to see her. In other words, your average rate during that time is 50 miles per hour, since 100 miles divided by 2 hours is 50 miles per hour. **Per** is a word we use in rates to mean divided by.

## Unit Rate Example

Let's take another look at unit rates. You are pulled over by a police officer who has accused you of speeding. You explain that it took you 3 whole hours to make it the 210 miles across the state. The police officer must do the math to determine whether or not you were speeding. He needs to know your unit rate. First, he'll set up the equation: 210 miles divided by 3 hours. Then, divide it out. The answer is 70 miles per hour. Since the state-wide speed limit is only 65 miles per hour, he determines that you were in fact speeding, and you just tattled on yourself. Way to go!

## Lesson Summary

In this lesson, we looked at how to calculate unit rates of change. A **unit rate** is the measure of the amount of one unit it takes for something to happen in other units. Some common unit rates include:

- Miles per hour
- Cost per item
- Earnings per year

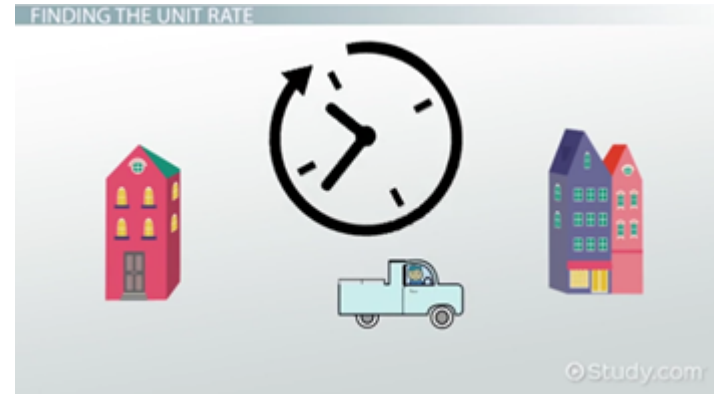
To find the unit rate, you can take a defined period of time and measure the output during that time, as we did with our swimming pool example, or measure how long it takes to do something that has a known quantity, as we did when determining your mile per hour rate in the speeding example. A smaller or larger rate of change can affect how long it takes something to happen. To find the unit rate of change, simply divide the total amount of change in a quantity by the amount of time it took to achieve that change.

## Lesson at a Glance

A unit rate is the measure of the amount of one unit it takes for something to happen in other units. Some common unit rates include: miles per hour, cost per item, and earnings per year. To find the unit rate of change, simply divide the total amount of change in a quantity by the amount of time it took to achieve that change.

## Learning Outcome

After reviewing this lesson, you should be able to calculate the unit rate by using certain given quantities.



*If given miles driven in an hour, you can determine how many miles you can drive in three hours.*