Absolute Change and Relative Change

by Sophia

1. Absolute Change and Relative Change

Absolute change is the actual change in units. It could be the actual change in pounds, degrees, inches, percentage points, or lots of different things.

⤷ **EXAMPLE** Suppose a political candidate's approval rating went up from 44% to 48%. That absolute change is four percentage points.

Relative change is the percent difference from the previous value, and it's always expressed as a percent.

🚩 **HINT**

Relative change can also be referred to as the percent error.

IN CONTEXT

An infant weighed 6.5 pounds at birth, and one year later, weighed 14.5 pounds. Decide if each of the following statements are true.

Statement 1: The infant's weight change was an increase of eight pounds.

Well, that's a true statement. 14.5 minus 6.5 is 8 pounds. It increased by 8 pounds.

Statement 2: The infant's weight change was an increase of 123%.

This one's a little bit less obvious, but it's also true. The eight-pound increase was more than double what the birth weight was. It was an increase of over 100%. In fact, when you do the calculation, 8 divided by 6.5 is 123%.

📄 **TERMS TO KNOW**

Absolute Change
The raw increase or decrease in the value of a variable

Relative Change
The percent increase or decrease in the value of a variable.

2. Calculating Absolute Change

How do you calculate absolute change? Another word for it is the absolute difference. You simply calculate the difference between the new and the old.

🧪 **FORMULA TO KNOW**

Absolute Change

$$Absolute\ Change = New\ (Observed)\ Value - Original\ (Actual)\ Value$$

In the example above, 14.5 minus 6.5 was a difference of 8 pounds.

$$Absolute\ Change = 14.5 - 6.5 = 8$$

It is also a positive 8 pounds because it went up, versus going down.

3. Calculating Relative Change

The relative change, or the relative difference, is calculated by taking the absolute difference and dividing it by its originating value.

🧪 **FORMULA TO KNOW**

Relative Change

$$Relative\ Change = \frac{Absolute\ Change}{Original\ Value}$$

In the example above, the absolute difference was 8 pounds and the original value was 6.5. When you put this into a calculator, you get 1.23.

$$Relative\ Change = \frac{8}{6.5} = 1.23 = 123\%$$

When expressed as a percent, 1.23 is 123%. That means that there was a 123% increase over the birth weight. That was the relative change.

4. Examples of Absolute Change and Relative Change

Consider the following example that shows this year and last year's enrollment at Memorial High School.

▶ WATCH

IN CONTEXT

Let's look at another example. The following table shows the results of the 1990 census and the 2000 census, along with the absolute change and relative change.

State	1990 Population	2000 Population	Absolute Change	Relative Change
Florida	12,937,926	15,982,378	3,044,452	24%
Georgia	6,478,216	8,186,453	1,708,237	26%
Hawaii	1,108,229	1,211,537	103,308	9%
Idaho	1,006,749	1,293,953	287,204	29%
Illinois	11,430,602	12,419,293	988,691	9%
Indiana	5,544,159	6,080,485	536,326	10%
Iowa	2,776,755	2,926,324	149,569	5%
Kansas	2,477,574	2,688,418	210,844	9%

Absolute Change: To calculate the absolute value, simply subtract the 1990 value from the 2000 value. For example, Florida's absolute value can be found by subtracting 12,937,926 from 15,982,378 to get an absolute change of 3,044,452.

All of the states in the list had increases in the population. Some were not very much, like Hawaii,

which only had about a 100,000-person increase. Some were a lot, like Georgia and Florida, which increased by over a million people. The highest absolute change was 3,044,452 people, in Florida.

Relative Change: The question of which state had the largest relative change between that time is a little bit different. Looking at Florida again, you need to figure out if the absolute change of around 3 million was a large change percentage-wise from the old population of about 13 million. It was a large increase but was it the largest percent increase in the list?

To find the relative change, take each absolute change and divide by the old population from 1990.

Florida's relative change was positive 24%--approximately 3 million divided by 13 million gives you about 24%. Georgia's increase was about 26%, a little bit larger of a percent increase than Florida. The highest of the list was a 29% increase in the state of Idaho. Notice it didn't have a very large absolute change. But its population wasn't very big to begin with, and so even a small absolute change can be a large relative change.

☑ SUMMARY

Absolute change is the absolute difference in raw numbers. It's the change in units. Relative change examines how the new number compares to the previous number in terms of a percent. Did it go up by 10%? Did it go down by 7%? What happened percentage-wise from then to now?

Good luck!

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🗎 TERMS TO KNOW

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⚗ FORMULAS TO KNOW

Absolute Change

$$Absolute\ Change = New\ (Observed)\ Value - Original\ (Actual)\ Value$$

Relative Change

$$Relative\ Change = \frac{Absolute\ Change}{Original\ (Actual)\ Value}$$