



Percentage Change

Subtract the old from the new, then divide by the old value. Show that as a Percentage.

Comparing Old to New



Change: subtract old value from new value.

Example: You had 5 books, but now have 7. The change is: $7 - 5 = 2$.



Percentage Change: show that change as a **percent of the old value** ... so divide by the old value and make it a percentage:

So the percentage change from 5 to 7 is: $2/5 = 0.4 = 40\%$

Percentage Change is all about comparing old to new values. See [percentage change, difference and error](#) for other options.

How to Calculate

Here are two ways to calculate a percentage change, use the one you prefer:

Method 1

Step 1: Calculate the change (subtract old value from the new value)

Step 2: Divide that change by the old value (you will get a decimal number)

Step 3: Convert that to a percentage (by multiplying by 100 and adding a "%" sign)

Note: when the new value is greater than the old value, it is a percentage increase,

otherwise it is a decrease.

Method 2

Step 1: Divide the New Value by the Old Value (you will get a decimal number)

Step 2: Convert that to a percentage (by multiplying by 100 and adding a "%" sign)

Step 3: Subtract 100% from that

Note: when the result is positive it is a percentage increase, if negative, just remove the minus sign and call it a decrease.

Examples

Example: A pair of socks went from \$5 to \$6, what is the percentage change?

Answer (Method 1):

- Step 1: \$5 to \$6 is a \$1 increase
- Step 2: Divide by the old value: $\$1/\$5 = 0.2$
- Step 3: Convert 0.2 to percentage: $0.2 \times 100 = \mathbf{20\% \text{ rise.}}$

Answer (Method 2):

- Step 1: Divide new value by old value: $\$6/\$5 = 1.2$
- Step 2: Convert to percentage: $1.2 \times 100 = 120\%$ (i.e. \$6 is 120% of \$5)
- Step 3: Subtract 100%: $120\% - 100\% = 20\%$, and that means a **20% rise.**

Another Example: There were 160 smarties in the box yesterday, but now there are 116, what is the percentage change?



Answer (Method 1): 160 to 116 is a decrease of 44. Compared to yesterday's value:

$44/160 = 0.275 = \mathbf{27.5\% \text{ decrease}}$.

Answer (Method 2): Compare today's value with yesterday's value: $116/160 = 0.725 = 72.5\%$, so the new value is 72.5% of the old value.

Subtract 100% and you get -27.5% , or a **27.5% decrease**.

Why Compare to Old Value?

Because you are saying how much a value has changed.

Example: Milk was \$2, now it is \$3, did it rise \$1 compared to \$2 or \$3 ?

We compare to the **original \$2 value**, so we say the change is $\$1/\$2 = 0.5$ which is a **50% increase**.

The Formula

You can also put the values into this formula:

$$\frac{\text{New Value} - \text{Old Value}}{|\text{Old Value}|} \times 100\%$$

(The "|" symbols mean **absolute value**, so negatives become positive)

Example: There were 200 customers yesterday, and 240 today:

$$\frac{240 - 200}{|200|} \times 100\% = \frac{40}{200} \times 100\% = \mathbf{20\%}$$

A 20% increase.

Example: But if there were 240 customers yesterday, and 200 today we would get:

$$\frac{200 - 240}{|240|} \times 100\% = \frac{-40}{240} \times 100\% = -16.6...\%$$

A 16.6...% decrease.

How to Reverse a Rise or Fall

Some people think that a percentage increase can be "reversed" by the same percentage decrease. **But no!**

Example: 10% of 100

A 10% increase from 100 is an **increase of 10**, which equals 110 ...

... but a 10% reduction from 110 is a **reduction of 11** (10% of 110 is 11)

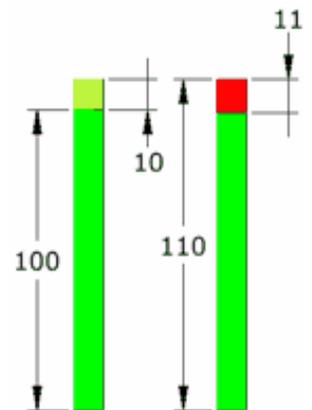
So we ended up at **99** (not the 100 we started with)

What happened?

- 10% took us **up 10**
- **Then** 10% took us **down 11**

Because the percentage rise or fall is **in relation to the old value**:

- The 10% increase was applied to **100**
- But the 10% decrease was applied to **110**



How to do it properly

To "reverse" a percentage rise or fall, use the right formula here:

To Reverse:	Use this Percent:	Example 10%
An "x" percent rise:	$x/(1+x/100)$	$10/(1+10/100) = 10/(1.1) = 9.0909...$
An "x" percent fall:	$x/(1-x/100)$	$10/(1-10/100) = 10/(0.9) = 11.111...$

Or use this handy-dandy **calculator** (just type in a value and click in the other box)

Percent Rise: <=> Percent Fall:

[Question 1](#) [Question 2](#) [Question 3](#) [Question 4](#) [Question 5](#)
[Question 6](#) [Question 7](#) [Question 8](#) [Question 9](#) [Question 10](#)

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