Consider the following question:

Why it is that when the price of petrol goes up by 10% and then comes down 10%, it doesn’t finish up where it started?

1. Write an explanation for the general public. Do not use mathematical symbols, as most people find them difficult to understand.
2. Write an explanation for mathematicians, combining words and symbols for maximum clarity. You should deal with a more general problem of two opposite percentage variations of an arbitrary non-negative quantity, not specialized to petrol, or to 10% variation, or to the fact that the decrease followed the increase and not the other way around.

Both explanations should not be more than 200 words.

1) When we increase the price of petrol by 10%, we add a tenth of the value to the current price. Then, if we want to decrease the price by 10%, we subtract a tenth of the starting price plus a tenth of what we added before to the price increased. In the end, the final price will be lower than the starting price because we added and then subtracted the same quantity, and then we subtracted another quantity.\*

2) Let n be the price of petrol. We want to increase n by 10%. To get such a result, we have to multiply n by 10% and then we add the result to what we had before, as we can see in the following expression:

$$n+10\%(n)=n+\frac{10n}{100}=n+\frac{n}{10}=\frac{11n}{10}$$

Then we (would) want to decrease this quantity by 10%. Likewise, we multiply what we obtained before by 10% and then we subtract the result from the price increased of 10%, as we can see in the following expression:

$$\frac{11n}{10}-10\%(\frac{11n}{10})=\frac{11n}{10}+\frac{11n}{10}∙\frac{10}{100}=\frac{11n}{10}+\frac{11n}{100}=\frac{121n}{100}$$

It is clear that the final result cannot be equal to the initial price n, on the contrary it is much lesser than n.

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[186 words]

\* Easy and straightforward. But why didn’t you add real numbers to make it easier for your “public” to understand? For example: let’s say the price is 10. The 10% of 10 is 1. If we add 1 to the initial price (10) we get 11. Now, the 10% of 11 is 1.1. If we subtract 1.1 from 11 we get 9.9, which is lower than the beginning price…