[ MATHS PROBLEM ]

# PERCENTAGE CHANGE

Understanding how successive percentage increases and decreases work can be tricky – try using these activities to help students comprehend what's happening

**Students often get confused when one percentage increase or decrease follows another. Each change takes place relative to the *current* amount, rather than the *original* amount, which can lead to misunderstandings and errors in students' calculations.**

## THE DIFFICULTY

This task helps make these difficulties more visible:

*Qayla thinks of an amount of money. She **increases** her amount by 10%. Then she **decreases** her new amount by 10%. Does she get back to the amount that she started with?*
*Why / why not?*

Many students will initially think it's obvious that Qayla must get back to her original amount, since a 10% increase and a 10% decrease seem clearly to be opposites.

If some students think that she doesn't, ask them the following:

*Does she get back to a higher amount than she started with, or a lower amount than she started with? Why?*

## THE SOLUTION

These tasks will help students figure out what's going on and further develop their understanding.

### 1. Try some numbers

Pick an easy amount of money, try what Qayla did and see what happens. For example, students might pick £60.

£60 increase by 10% £66

£66 decrease by 10% £59.40

10% of £60 is £6, so that's how much we have to *add on* in the first step. But 10% of £66 is £6.60, so *this* is how much we have to *deduct* in the second step.

Students may be surprised that the overall result is that they've lost 60 pence.

Students could try other starting amounts to see if the same thing happens – will the final result always be less than the starting amount? Will it always be 60 pence less?

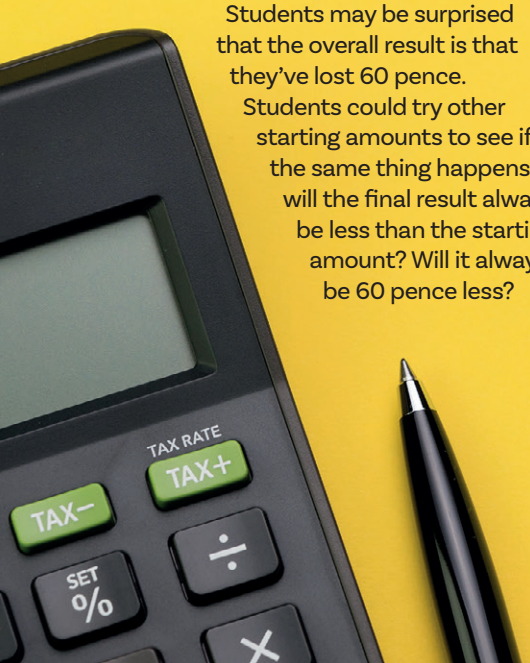
### 2. Draw a picture of what's going on

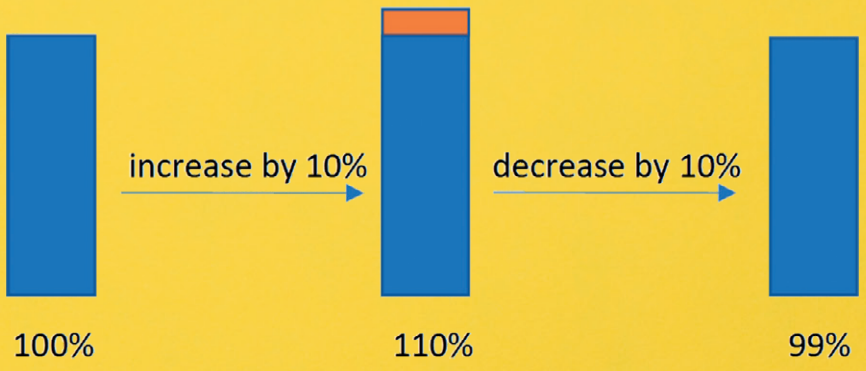
If students are familiar with bar models, they might be able to represent the situation visually, as shown below.

The key insight is that the 10% decrease is a larger 10% than the 10% increase was, because it's 10% of a larger (increased) amount. Relative to the original amount, the decrease is 11%, meaning that the final amount is 1% less than the starting amount.

***Check for understanding***

- What would happen if Qayla did the 10% decrease first, and then the 10% increase?
- What would be the overall effect of a 10% increase followed by a 20% decrease?
- What would be the overall effect of a 20% increase followed by a 10% decrease?
- Can you generalise what would be the overall effect of an *a*% increase followed by a *b*% decrease?
- What would be the overall effect of ten 10% decreases, one after the other? Would this take the final amount to zero?
- What would be the overall effect of ten 10% increases, one after the other? Would this end up doubling the original amount?

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