

## SIX CHARACTERS IN SEARCH OF AN ANSWER

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Most people find school math disconnected from the reality of their lives. Word problems, that ostensibly are intended to make a connection, are (stereo)typically artificial and unrealistic. Yet it is also recognized that mathematics permeates the everyday life of common people. Jean Lave and others have shown how mathematics situated in daily activities, such as choosing the best buy at a supermarket, represents a very different practice from that of school math.

We carried out an investigation based on a mathematical problem that relates to a situation that most adults in contemporary society have encountered many times, namely: "If you buy something in a store on which you have to pay tax and there is a percentage discount on the item, does it make a difference to what you have to pay if they add the tax first and then take off the discount or take the discount off first and then add the tax?"

This problem has been posed to 230 adult students in lower level college math classes designed to prepare them to be elementary school teachers. Students first give an immediate, intuitive, individual response and then work on the problem in groups. After whole-class discussion of the problem, the students are then set an assignment to interview five people, report on their responses, and reflect on those responses.

Less than 20% of initial responses among the students, and likewise among their interviewees, are correct. Incorrect answers are generally supported either by the argument that adding the tax first means that the discount is greater or, conversely, that taking the discount off first means the tax is less. The linguistic phrases "adding tax" and "taking off a discount" suggest that the problem is additive; in fact, if tax of 8% and discount of 15%, for example, are seen as equivalent to multiplication by 1.08 and 0.85 respectively, it is clear that the order of operations makes no difference.

When students discuss the problem in groups, or when the interviewees are allowed to work with pencil and paper or with a calculator, almost all calculate the results for one or two examples and on this basis conclude that the order does not matter. Almost nobody attempted a general proof using algebra.

The students comment on the impact that carrying out the interviews had on them, in particular their surprise that people with extensive knowledge of monetary transactions neither knew nor were able to logically infer the correct answer and were usually surprised by the result of carrying out calculations. The results have profound implications for the way in which people generally fail to perceive mathematics as a potential tool for analysis of aspects of their lives.