

Friendly mathematical exercises

Disclaimer: This is the description of a project aiming at inclusion. The project has not started yet. Please get in touch if you would like to contribute to this project, for example by helping developing or testing the exercises.

In her books, Eugenia Cheng likes to mention a mathematical school exercise where a person goes and buys 75 watermelons. If you think about it, the situation is absurd (we are not speaking of a catering service that could maybe do such a purchase for real). We guess that average pupils might not notice the weird scenario because they might just be busy with solving the problem (for example, calculating the total price). In case they do notice, they might just raise their eyebrows and ignore the matter. Or laugh about it with their school mates. Now you might also believe that some pupils get stuck on the detail or are disturbed by it. Because the situation is, in some sense, impossible.

To understand how much this could be shocking or unpleasant, imagine that you would have to make a proportion aiming at computing the amount of victims of a serial killer: you would be at best distracted, and you might resolve to boycott the immoral exercise completely, shutting down.

Some people are less inclined than others to omit details. For example, it might be the same for a mathematical problem whether you first buy bread at the bakery and then milk at the supermarket or the other way round (for example, for the money you spend in total). But it's not the same in real life (in fact, this actually leads to a different outcome if it turns out that you only have enough money to buy one of the two products, or if one shop closes sooner than the other and you don't make it on time...).

Some exercises lack realism, for example Eugenia Cheng likes to mention an exercise where you give one cookie and then another cookie to some child and then supposedly have to say that the child has 2 cookies, but the child would (realistically) have eaten the cookies, so there would be in fact 0 cookies. However, our point of view is not aiming at realistic or "better" exercises, but aiming at exercises who do not bother certain minorities of pupils for avoidable reasons. As we aim at inclusiveness, then we should understand what can make a difference, and produce friendlier variants of the exercises.

Another aspect is the chronic lack of information that one finds in certain exercises. For example, if you buy 2 apples and then you buy 3 apples, how many apples do you have at home?

Sherlock Holmes might ask whether you went home (with the apples) after the purchase. Or maybe ask how many apples did you have prior to the purchase or if you gave away the apples on the way home, or.... Again, the average pupil might just play Sherlock Holmes in guessing what the teacher wants to hear as answer. Probably, 5 in this case. And again other pupils might be stuck with questions which are simply impossible to answer. As if one would ask you: "How many eggs do you need to make the cake?" Unless you make a random guess (say, 4 eggs), then you might refuse to answer unless somebody tells you which cake and for how many people. Or, more bluntly, if you are been asked "What's his name?" and it puzzles your brain because you can't possibly find out whom is meant.

Some school mathematical exercises might simply be oversimplifying, like “If 3 cows produce 20 litres milk every day, how many litres milk would produce 5 cows in one week?” Beyond the unclear formulation of whether 20 litres milk is meant for the 3 cows or for each cow, we have other mathematical uncertainties. We suppose that each cow is the same in what it concerns producing milk. We suppose that such mathematical cows produce the same quantity of milk every day (possibly forever). This exercise is like playing a card game with some implicit rules that nobody needs to spell out because they are somewhat understood. However, there might be certain pupils that might rejoice in clarifications. Like additional information of the form “suppose that all cows produce the same amount of milk which is every day the same”. Our first guess is also that the average pupil might in fact rejoice in the oversimplification, which makes the exercise easier (in fact, that makes the proportion feasible). To be honest, there are mostly idealised proportion exercises because real-life quantities might only be roughly proportional (and only within certain ranges).

To wrap up, the aim of our project is understanding if there is room for improvement with the current school exercises and, after identifying what could be an issue for certain categories of pupils, produce (and make freely available) more suitable exercises.