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# Analyzing the "Calculator Effect" of Different Kinds of Software for School Arithmetics and Algebra

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The author of this paper realised the need to think about misuse effects when participating in two activities connecting Mathematics teaching and computers: addition of school-style step by step solutions to the output of CAS, and compiling a workbook that contains programming tasks extracted from School Mathematics.

The possibility of getting the answer and solution of arithmetic and algebra tasks from external sources is currently provided by four kinds of software:

1. **Spreadsheets.** We usually think that spreadsheets do decimal calculations. Solving examples from School Mathematics demonstrates an unexpected and undocumented mixture of decimal and algebraic calculations.
2. **Lightweight drill environments** for arithmetic and algebra. They have quite small calculator effect because usually they do not enable entering user-provided exercises.
3. **Step by step solution environments** (MathXpert, Aplusix, T-algebra). The key question is again whether the student gets right to enter initial expressions of the tasks.
4. **"Algebra calculators".** There are a few dozen programs designed specifically for doing students' homework (producing solutions with necessary explanations) for almost all technical exercises of School Algebra. But very often the calculators implement textbook algorithms without any intelligence.

Item 4 means that availability of solutions in educational CAS (for example, in Geogebra) will not change the situation very much. In the first years, the CAS solutions will most likely have the same imperfections as the current algebra calculators.

Many school arithmetic and algebra tasks can be converted to programming tasks: long multiplication or division, reducing fractions, multiplication of polynomials. For routine tasks, programming does not replace exercising with something easier. The situation can be different when we come to the more original tasks in textbooks. A task of replacing stars with given numbers can lead to an interesting logical journey. However, stronger students in middle grades are perfectly capable of programming a brute-force solution search. It is important to think about ways of protecting the more interesting tasks in textbooks from such shortcuts.

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