

CAS in the Swedish national tests in upper secondary level

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ABSTRACT

The introduction of calculators with CAS as an allowed tool in Swedish national tests in mathematics has resulted in several challenges in the construction and development of these tests. In our presentation we will share our experiences dealing with these challenges and present some solutions together with an analysis of their consequences. Furthermore we will present some conclusions from an ongoing developmental project regarding a future introduction of computers as tools in students work with Swedish national tests in mathematics.

CAS has been allowed in the national course tests in mathematics (NCT) for the Swedish upper secondary school since 2007. It's compulsory for the school to arrange NCTs and according to existing regulations, teachers should use these course tests as an aid so that the bases for marking are as uniform as possible throughout Sweden.

One of the requirements for the NCT, which comprise a technology free part and a technology active part, is that the problems in the test must be done in a way that those who have a CAS-calculator are not allowed to have any advantage compared with those who have a graphic-calculator. Based on studies at our own department, and the work of others (see e.g. Flynn & MacRae, 2001), we know a great deal about which tasks that are CAS-neutral, CAS-trivial, etc. This knowledge has caused us to move tasks that are directly solved by CAS (e.g. solve $\sin(2x) = 0.78$) from the part of the test where calculators are allowed to the "calculator-free" part. However, this causes problems because students often need to do some calculations in order to solve the problem. Other challenges with respect to CAS-in the development of Swedish national tests in mathematics are how to signal to students that they are allowed to use the calculator and how students can be expected to show their work when using advanced calculators in solving problems.

In the development of future national tests with CAS we must consider that lap-top computers will be common and students might not have a hand-held calculator. In addition, web-based CAS has developed and we will most likely see more and more of teaching based on these tools. In such a scenario it seems unreasonable to expect

students to have an advanced calculator for the sole purpose of demands on national tests. At the same time, web-based resources require web-access which in turn opens for unwanted cooperation and cheating. Future tests do most likely need a part where no ICT is allowed. Another part could focus problem-solving allowing student to use any technology available to perform the necessary procedures for arriving at an answer. These challenges have no immediate solution, but some suggestions will be discussed.

Keywords

National tests, CAS, computers, fairness