
Why workings?

Nevil Hopley

A recent activity with my students highlighted for me how the manner in which a question is asked affects how the students tackle it. The task for the students was using a TI graphical calculator program called 'Ultimate Brackets' that required them to expand sets of algebraic brackets and type in the simplified answers. Now, we've all set tasks like this for our students from textbooks, and they typically set out the required lines of expansion and simplification as the teacher would have probably already shown them (umpteenth times) on the board. They then check their answers with those at the back of the textbook and move on. The basic requirements of the calculator task were no different, but there was a major change in how the students set about tackling it.

As they were using the calculator and it

only required the final answer, many of them tried to do the whole process mentally. This was impressive to witness, but only worked up to a point. When they felt they could no longer do it mentally, they started scribbling (in every sense of the word) some illegible lines of algebra on the covers of their books – more often than not in the corner somewhere, with each line's writing becoming smaller and smaller as space ran out. Sometimes they managed to get the right answer, but more often they did not. What surprised me was their total rejection of the expected norm of communicating their lines of working. They explained that this was because the program only wanted to know the final answer. But this was no different from what the textbook exercise wanted! They clearly did not see the value in setting out lines of working.

Only after they kept getting the more complex ones wrong and asking for help were they then advised by me to set out their workings more neatly and clearly. This invariably then delivered the right answer.

I have been chewing over this issue for quite some time now, seeking to find the clinching argument to present to students as to why mathematicians show workings. Yes, an examiner needs to see them; yes, they help the teacher to spot where you might have gone wrong; yes, they even help you to get the right answer. However, all of these still seem to bounce off those students who consider it a sign of weakness not to get the right answer by the least written effort. And please don't get me started on (the same?) students who don't draw helpful diagrams as part of their workings!

Nevil Hopley is Head of Mathematics at George Watson's College, Edinburgh, and writes software for TI graphical calculators (for details, go to www.CalculatorSoftware.co.uk).