

YES, BUT WHY?

Teaching for understanding
in mathematics

ED SOUTHALL

@solvemymaths



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Introduction

I was never a keen mathematician as a child. When I first started school, I was good at maths, but I never really understood it. I followed algorithms, and churned out answers that matched those of the teacher, but I was never satisfied with the process. I knew how to check if things were correct, but it was the steps to get there that bothered me. I didn't understand them, and they were left to my imagination to try and explain. Mathematics gradually became a mysterious entity, whose rules and steps I was expected to unquestioningly memorise – which I dutifully did. However, the process of storing numerous algorithms and their quirky properties became increasingly tedious, and I fell out of love with the subject that once intrigued and excited me. It still felt important though. I continued to study it alongside other subjects right through to my graduation from university, and went on to become a teacher of ... computing, although, my skillset inevitably brought me back into the maths classroom. I was determined not to teach mathematics the way it had been taught to me. I revisited the various topics on the curriculum with a determination to understand everything. Every detail. Getting the right answers wasn't enough. Where did they come from? What was the point of each step for each solution? I wasn't interested in stating formulae, I was interested in deriving them. I wasn't satisfied with being told there were three types of average (there are more, I was lied to), I wanted to know *why*, I wanted to know who decided upon them as standard measures and I wanted to know about the struggles that people endured to make people listen the first time these ideas were mooted. Who was Pythagoras? Why do so many things have such bizarre names? Surds? Quadratics? Where do these words come from?

I needed to know. I wanted students to know. I wanted them to have the opportunity to genuinely understand, rather than passively accept mathematics.

As a teacher, this knowledge has transformed the way in which I teach. Concepts have origins, stories, logic, connections and intuitiveness – rather than being isolated sorcery. The feeling when a student gets the right answer is incomparable to when they say 'that makes *sense*'.

As a student, this additional understanding is transformational. Answers begin to *look* right, methods can be adapted and applied to different contexts, and students no longer need to rely on the memorisation of hundreds of disparate facts. Each concept is suddenly connected and the sophisticated beauty of

mathematics becomes clear. Perhaps even more importantly, mathematics becomes a joyful experience.

This book is intended as a complement to your existing subject knowledge. It is written with an underlying assumption that you are already familiar with many of the algorithms used to solve maths problems – and although time is spent revisiting those procedures, the emphasis here is on *how* they work, *where* mathematical rules come from and *why* they're important.