OCR A level Further Mathematics for Core Year 2 (A) by Ben Sparks and Claire Baldwin, pp. 342, £24, ISBN 978-1-4718-8648-5, Hodder Education (2017)

This book covers the compulsory Pure Core for Further Mathematics for the second year of A level study in English schools. It presupposes familiarity with the work in the first year of study, which is the subject of a companion volume from Hodder.

A textbook, however competent, is hardly ever the only resource for mathematics teaching, which occurs in the day-to-day interaction between teacher and pupil and between the pupils in a class. A book serves as a useful reminder of what has occurred in the lesson, perhaps clarifying some points which were not well understood or suggesting other approaches to the material. To achieve this, it needs to be carefully structured—particularly when reviewing material from the first year of study—with a sufficient number of worked examples as well as exercises that progress in difficulty to a point where they challenge even the best students. Glossy pictures are all very well, but much more important are diagrams which illustrate what is going on, particularly in knotty three-dimensional problems on vectors or geometry.

On this basis, this book does a reliable job. Readers are reminded of material from the first year of study, so they do not need to refer back to an earlier textbook. For example, there is a substantial review of matrices and determinants before new material—finding the inverse of a 3×3 matrix—is tackled, followed by a well-illustrated discussion of the intersection of three planes. Similarly, pupils are reminded of what they learned about complex numbers, before new topics—such as the represention of relationships on an Argand diagram—are introduced.

Occasionally I feel that the authors might have been a little more adventurous. For example, the first chapter, which covers the properties of scalar and vector products, feels to me like a series of recipes, and I would have appreciated more background for the results. Why, for instance, is $\mathbf{a}\cdot\mathbf{b}$, which is defined as $|\mathbf{a}|\,|\mathbf{b}|\cos\theta$, equal to $a_1b_1 + a_2b_2 + a_3b_3$? That is not hard, but it requires several steps: first show distributivity and then use components. It is more difficult to show why the vector product is distributive over vector addition, and again this is simply given as a fact. There are, of course nice geometrical arguments which have more explanatory power than an algebra bash. However, this is an early chapter and perhaps the writers were proceding gingerly.

On the whole, though, the book is prepared to stimulate even the most alert reader. The chapter on de Moivre's theorem is a good example. After some work on roots of unity, it tackles the use of the theorem in deriving multiple angle identities. In my experience, this is one of the most challenging subjects for teaching, largely because it requires a synoptic recall of much of the syllabus – the binomial theorem, multiple angle identities, surds, integration and more. The list of ‘key points’ at the end of this chapter in the book is adequate testimony to this. Another hard topic is the use of vectors in three dimensional geometry, where the real issue is adequate visualisation, and the account of how to find the distance between skew lines makes use of excellent diagrams. The final chapter, on second order differential equations, requires new vocabulary (general solutions, auxiliary equations and particular integrals) and methods from across the syllabus, including, of course, a bow to mechanics when interpreting the various solutions.

This book should provide a sterling service to pupils and to teachers.

10.1017/mag.2022.152

GERRY LEVERSHA
15 Maunder Road,
Hanwell, London W7 3PN
e-mail: *g.leversha@btinternet.com*