

**S. Louridas and M. Rassias: Problem-Solving and
Selected Topics in Euclidean Geometry: In the Spirit of
the Mathematical Olympiads, Springer, 2013.
ISBN:978-1-4614-7272-8, EUR 42.79, 235 pp.**

REVIEWED BY JIM LEAHY

The success of the International Mathematical Olympiad (IMO) has helped to revive interest in Euclidean geometry and to halt somewhat its decline during the second half of the twentieth century. Consequently there is a constant trickle of new publications on the subject of which the book under review is one. Both authors have connections with the IMO. Sotirios E. Louridas has been a coach of the Greek Mathematical Olympiad team while Michael Th. Rassias is a winner of a silver medal at the IMO 2003 in Tokyo and holds a Master of Advanced Study from the University of Cambridge.

The book has six chapters with a foreword by Fields Medalist Michael H. Freedman. Chapter 1, Introduction, is short with a little history of geometry and containing Euclid's axioms and postulates. Chapter 2 deals with the basic concepts of logic and covers methods of proof including proof by analysis, by synthesis, proof by contradiction and proof by induction with examples. The one induction example is more a problem in number theory than geometry having the theorem of Pythagoras as a starting point. There is no other problem in the book that uses proof by induction. Chapter 3 covers geometrical transformations, viz. translations, symmetry, rotations, homothety and inversion. These are illustrated with examples and some theorems with proofs. The section on inversion will be found particularly useful to students and teachers as it gives several examples of its power in solving certain types of problems. Some of the later IMO type problems in the book also use inversion, something not common in many publications on Euclidean geometry.

Chapter 4 is a collection of thirty-eight theorems some of which are proved. The selection of theorems is excellent. Knowledge of these theorems together with the theorems of Euclid would go a long way towards solving many a geometrical problem. The proof of

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Feuerbach's theorem, Theorem 4.21 in the book, contains an error and the proof of Morley's theorem, Theorem 4.11, is not correct. In the latter case if the word 'isosceles', used twice, is replaced by 'equilateral' the proof would be correct but incomplete. Interestingly the construction at the beginning of this proof is similar to the construction used in MacCool's proof of Morley's theorem [1].

Chapter 5 offers sixty-five problems divided into three categories, problems with basic theory, problems with more advanced theory and geometrical inequalities. There is little difference between the first two categories and many of the problems are of IMO standard. The solutions follow in chapter 6 forming the main body of the work. Reading through the solutions is not easy. In some cases parts of the solutions seem to have been omitted and a good deal has been left to the reader usually without any comment from the authors. The statement of problem 6.2.25 p.169 is false as the wrong angles are designated as being equal. The solution uses the correct two angles but if you were attempting to solve the problem without consulting the solution, which you would expect a reader to do, your work would be in vain. The problems are restated before each solution in chapter 6 and the error is repeated. The solution of problem 6.2.22 p.164 is also incorrect since it would require the side of an inscribed pentagon to also be a tangent to the circumscribing circle! Obviously there are several misprints in this solution. On the other hand some of the proofs are quite innovative and the solution of problem 6.2.15 p.151 is an excellent example of the use of inversion.

There is an appendix on the Golden Section which is a reprinting of an article by Dirk Jan Struik in [2]. I fail to see the point of this as it is a popular article containing all the usual material of such articles which can be found in many publications and on the internet. Besides the Golden Section is not mentioned anywhere in the main text of the book. There is also a useful index of symbols used in the text, a subject index and a list of references, ninety-nine in all, including a reference to Wiles' paper on the solution of Fermat's Last Theorem! Since there are no references in the text, apart from acknowledging authors of problems, the references should rightly be called a bibliography.

To summarise, this is not a book showing how to solve problems in geometry except in the sense of learning from seeing problems solved. This is not a criticism as much can be learned in this way particularly

if a solution has been attempted beforehand. The book is beautifully produced, the quotations at the head of each chapter adding to the publication. However the work is unfortunately marred by poor editing and proofreading. I counted over sixty errors, omissions, typos or misprints, mostly the latter, which does not make for easy reading. In addition some solutions have no diagram. Woody Guthrie, the American folk singer, once said that he liked books with errors as it made them more human. I doubt he ever read a mathematics text.

REFERENCES

- [1] M.R.F. Smyth: *MacCool's second proof of Morley's miracle*, Irish Mathematical Society Bulletin, Number 72, Winter 2013.
- [2] Th. M. Rassias (ed): *Mathematics in education*, University of LaVerne Press, California, 1992, pp. 123-131.

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