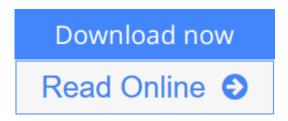# Problem-Solving and Selected Topics in Euclidean Geometry: In the Spirit of the Mathematical Olympiads

By Sotirios E. Louridas, Michael Th. Rassias

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"Problem-Solving and Selected Topics in Euclidean Geometry: in the Spirit of the Mathematical Olympiads" contains theorems which are of particular value for the solution of geometrical problems. Emphasis is given in the discussion of a variety of methods, which play a significant role for the solution of problems in Euclidean Geometry. Before the complete solution of every problem, a key idea is presented so that the reader will be able to provide the solution. Applications of the basic geometrical methods which include analysis, synthesis, construction and proof are given. Selected problems which have been given in mathematical olympiads or proposed in short lists in IMO's are discussed. In addition, a number of problems proposed by leading mathematicians in the subject are included here. The book also contains new problems with their solutions. The scope of the publication of the present book is to teach mathematical thinking through Geometry and to provide inspiration for both students and teachers to formulate "positive" conjectures and provide solutions.

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Editorial Review

Review

From the reviews:

"Sotirios E. Louridas and Michael Th. Rassias, the authors of the book at hand, put together an excellent collection of problems for practice. They provide detailed solutions following the masters of that skill. … an active reader would greatly benefit from reading the book; while working out the problems is bound to sharpen his or her problem solving skills. … it's a worthy addition to a library of a problem solver."

?Alex Bogomolny, **MAA Reviews**, December, 2013

"The book is a wonderful presentation of the essential concepts, ideas and results of Euclidean Geometry useful in solving olympiad problems of various level of difficulties. The theoretical part is excellently illustrated by challenging olympiad problems. The complete solutions to these problems are carefully presented, most of them together with several interesting comments and remarks. ... All in all the text is a highly recommendable choice for any olympiad training program, and fills some gaps in the existing literature in Euclidean Geometry. The book is a very useful source of models and ideas for students, teachers, heads of national teams and authors of problems, as well as for people who are interested in mathematics and solving difficult problems."

?Mihaly Bencze, **EMS Newsletter**, November 2013

"A subject of high interest for problem-solving in Euclidean Geometry is the application of geometric transformations ... The authors have succeeded to study with great accuracy these transformations. Additionally, they have applied them in order to obtain very nice solutions for some quite challenging problems ... The book is full of new and challenging ideas that will provide guidance and inspiration for future study in the fundamental area of Euclidean Geometry. The large collection of problems in this book provides a valuable recourse for advanced high school students, university undergraduates, instructors, and Mathematics coaches preparing students to participate in mathematical Olympiads...."

?Nicusor Minculete, **Gazeta Matematic?**, Seria B., 10/2013

"This book provides an essential presentation of concepts and ideas as well as problems with their solutions in Euclidean Geometry, a traditional and still challenging part of Geometry.

?Dorian Andrica, **Zentralblatt**

"The book is mainly devoted to several very interesting problems, some of which constructed by the authors, that have been presented in a rigorous and self-contained manner. Emphasis is given in the discussion of a variety of methods, which play a significant role for the solution of problems in Euclidean Geometry. The book will be of particular interest to students and teachers who train them for Mathematical Olympiads and other Mathematical Contests. Additionally to everyone who enjoys studying some of the jewels of Euclidean Geometry and has some special love for good problems and beautiful ideas. ... The Foreword of the book has been written by Michael H. Freedman (Fields Medal in Mathematics, 1986) ... The authors deserve

congratulations for their excellent effort and success to provide a high quality service in fundamental mathematics. "

?Jose Luis Diaz Barrero, **Octogon Mathematical Magazine**, October 2013

"Sixty-five problems and their solutions are arranged in three parts: problems based on basic theory, problems based on advanced
theory, and geometric inequalities. Some problems were included in International Mathematical Olympiads (IMOs) or proposed in
short lists in IMOs ... the problem part of the book ... contains a collection of interesting problems. ... Chapter 4 seeks to "present some of the most essential theorems of Euclidean Geometry". Some of these theorems (Pythagoras', Ceva's, Menelaus') are important indeed and applicable to many problems."

?Yury J. Ionin, **Mathematical Reviews**, January 2014

"There are many excellent books on plane Euclidean geometry, exploring the subject at various levels. The book under review, which is foreworded by Michael H. Freedman (Fields Medal, 1986), adds yet another facet to this colorful subject. This delightful book presents a collection of problems in plane Euclidean geometry in the spirit of mathematical olympiads, along with their solutions. Additionally, it provides essential theory of plane Euclidean geometry, with proofs of some fundamental theorems. As such, this monograph is an excellent training manual to use in preparation for mathematical competitions and olympiads. Hence, this is a book that belongs in all academic libraries, from high school through graduate level."

?Abraham A. Ungar, **Acta Universitatis Apulensis**, 40/2014.

From the Back Cover

Problem-Solving and Selected Topics in Euclidean Geometry: In the Spirit of the Mathematical Olympiads contains theorems of particular value for the solution of Olympiad-caliber problems in Euclidean Geometry. Selected geometric problems, which have been given in International Mathematical Olympiads (IMO) or proposed in short lists in IMO, are discussed. Additionally, a number of new problems proposed by leading mathematicians in the subject with their step-by-step solutions are presented. The book teaches mathematical thinking through Geometry and provides inspiration for both students and teachers.

From the Foreword: *"…Young people need such texts, grounded in our shared intellectual history and challenging them to excel and create a continuity with the past. Geometry has seemed destined to give way in our modern computerized world to algebra. As with Michael Th. Rassias' previous homonymous book on number theory, it is a pleasure to see the mental discipline of the ancient Greeks so well represented to a youthful audience."*

– Michael H. Freedman (Fields Medal in Mathematics, 1986)

Sotirios E. Louridas has studied Mathematics at the University of Patras, Greece. He has been an active member of the Greek Mathematical Society for several years both as a problem poser and a coach of the Greek Mathematical Olympiad team. He has authored in Greek, a number of books in Mathematics.

Michael Th. Rassias has received several awards in mathematical problem-solving competitions including

two gold medals at the Pan-Hellenic Mathematical Olympiads of 2002 and 2003 (Athens, Greece), a silver medal at the Balkan Mathematical Olympiad of 2002 (Targu Mures, Romania) and a silver medal at the 44th International Mathematical Olympiad of 2003 (Tokyo, Japan). He holds a Diploma from the School of Electrical and Computer Engineering of the National Technical University of Athens and a Master of Advanced Study in Mathematics from the University of Cambridge. He is currently a PhD student in Mathematics at ETH-Zürich. At the age of 22, he authored the book *Problem-Solving and Selected Topics in Number Theory: In the Spirit of the Mathematical Olympiads* – Foreword by Preda Mih?ilescu (Springer, 2011), ISBN: 978-1-4419-0494-2.

About the Author

Michael Th. Rassias is a brilliant young mathematician and son of a highly regarded author and acclaimed mathematician, Themistocles Rassias. He has received several awards in competitive mathematical problem solving. He received first prize in the Jozef Wildt International Mathematics Competition for three consecutive years in 2004, 2005 and 2006. He was also the silver medalist at the 44th International Mathematics Olympiad of 2003 held in Tokyo, Japan.

Rassias's last book with Springer is entitled "Problem-Solving and Selected Topics in Number Theory" and was published Nov. 23, 2010.

S.E. Louridas does not hold a present affiliation but has written 6 olympiad related books and has trained young people in math olympiads for several years in Greece.

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