

THE MATHEMATICAL ASSOCIATION

The fundamental aim of the Mathematical Association is to promote good methods of mathematical teaching. A member receives each issue of one or more of *The Mathematical Gazette*, *Mathematics in School*, *Primary Mathematics* (according to the class of membership chosen), together with Newsletters. Reports are published from time to time and these are normally available to members at a reduced rate. Those interested in becoming members should contact MA Headquarters for information and application forms. The address of the Association Headquarters is **259 London Road, Leicester LE2 3BE, UK (telephone 0116 221 0013)**. The Association should be notified of any change of address. If copies of the Association periodicals fail to reach a member through lack of such notification, duplicate copies can only be supplied at the published price. If change of address is due to a change of appointment, the Association will be glad to be informed. Subscriptions should be submitted to the Treasurer via Headquarters. Correspondence relating to **Teaching Committee** should be addressed to Mrs Mel Muldowney. The **Association's Library** is housed in the University Library, Leicester.

Views expressed in the *Mathematical Gazette* by authors or advertisers are not necessarily those of the Association.

THE MATHEMATICAL GAZETTE

Editor:

Dr Gerry Leversha,
15 Maunder Road,
Hanwell,
London W7 3PN
g.leversha@btinternet.com

Problem Corner:

Mr Nick Lord,
Tonbridge School,
Tonbridge,
Kent TN9 1JP
njl@tonbridge-school.org

Production Editor:

Mr Bill Richardson,
Kintail,
Longmorn,
Elgin IV30 8RJ
wpr3145@gmail.com

Reviews Editor:

Mr Owen Toller,
4 Caldwell House,
48 Trinity Church Road,
London SW13 8EJ
owen.toller@btinternet.com

Potential advertisers should send an e-mail to: *advertisingcontroller@m-a.org.uk*

Material for publication should be sent to the Editor.

Books for review should be sent to the Reviews Editor.

Advice to authors of notes and articles.

Study the format of articles in the *Gazette*. Please note the format for references, which should be listed in their order of appearance in an article. MSS may be submitted electronically, preferably in pdf format, or, if sent by post, should be typed and two copies included. (Mathematical expressions may be hand written.) Please send by e-mail not on floppy discs. This edition of the *Gazette* was produced on an Acorn machine using TechWriter and Draw. 10.1017/mag.2019.96

CONTENTS (continued)

Notes 103.15 to 103.27

When is the sum of the first n consecutive odd cubes a square?	<i>Paul Stephenson</i>	305
Variations on a theme	<i>Russell A. Gordon</i>	306
An unexpected closed form revisited	<i>J. A. Scott</i>	312
Trigonometric addition and subtraction formulas, a unified visual approach	<i>David Gau</i>	314
Bernoulli's inequality for negative exponents	<i>Horia Vijîtu</i>	316
Geometric problems leading to power means	<i>Russell A. Gordon</i>	318
Closed form evaluation of a class of improper integrals	<i>Paul Levrie</i>	323
On a problem of Sastry and a theorem of Serenus	<i>Mowaffaq Hajja</i>	328
On Pitot's theorem	<i>Martin Josefsson</i>	333
Partitions, geometric progressions and a Putnam problem	<i>Shane Chern, Shiqiu Qiu</i>	337
An extension of Thébault's second problem	<i>Raymond Viglione</i>	343
A proof of Clarke's conjecture	<i>Emrah Kiliç, Talha Arıkan</i>	346
A property of a particular unit-distance graph	<i>Martin Griffiths</i>	353
Teaching Note		
How is the scalar product derived?	<i>Frank A. Greco</i>	357
Problem Corner	<i>Nick Lord</i>	359
Student Problems	<i>Stan Dolan</i>	365
Reviews		368

The cover picture is published with the permission of
Gonville and Caius College, Cambridge.

CONTENTS

Articles

Sir Michael Francis Atiyah, O.M.	<i>Geoffrey Howson</i>	193
Locating parameters of interest in a conic section	<i>John D. Mahony</i>	196
Teaching proofs without words using dynamic geometry	<i>Moshe Stupel, Avi Sigler, Jay Jahangiri</i>	204
A hyperbolic proportionality theorem and hyperbolic surveying problems	<i>Robert L. Lamphere</i>	212
New points that belong to the nine-point circle	<i>David Fraivert</i>	222
Pascal-points quadrilaterals inscribed in a cyclic quadrilateral	<i>David Fraivert</i>	233
Finding the probability of a rare real world event	<i>John Wiorkowski</i>	240
The need for closure	<i>Christopher D. Hollings</i>	248
Linear differential equations with constant coefficients	<i>Bethany Fralick and Reginald Koo</i>	257
Latin square matrices and their inverses	<i>K. Robin McLean</i>	265
Launching a projectile to cover maximal area	<i>Robert Kantrowitz and Michael M. Neumann</i>	277
Rounding versus truncation estimates in difference calculations	<i>Leonard van Wyk</i>	285
The three Steiner-Lehmus theorems	<i>A. F. Beardon</i>	293

© The Mathematical Association 2019

Typeset by Bill Richardson

CAMBRIDGE
UNIVERSITY PRESS



MIX
Paper from
responsible sources
FSC® C007785

Printed in the UK by Bell & Bain Ltd.

ISSN 0025-5572