MATHEMATICAL PROCEEDINGS

(formerly Proceedings)

of the Cambridge Philosophical Society

VOLUME 177





Published by the Press Syndicate of the University of Cambridge The Pitt Building, Trumpington Street, Cambridge CB2 1RP, United Kingdom

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Shaftesbury Road, Cambridge CB2 8BS, United Kingdom 32 Avenue of the Americas, New York, NY 10013–2473, USA 477 Williamstown Road, Port Melbourne, VIC 3207, Australia C/Orense, 4, planta 13, 28020 Madrid, Spain Lower Ground Floor, Nautica Building, The Water Club, Beach Road, Granger Bay, Cape Town 8005, South Africa

© Cambridge Philosophical Society 2024

Printed and bound by CPI Group (UK) Ltd, Croydon, CR0 4YY

INDEX FOR VOLUME 177

	PAGE
Adams, C., Romrell, Z., Bonat, A., Chande, M., Chen, J., Jiang, M., Santiago, D.,	
Shapiro, B. & Woodruff, D. Generalised knotoids	. 67
Andrew, N. & Martino, A. Centralisers of linear growth automorphisms of free groups	. 219
Bérczes, A., Bugeaud, Y., Győry, K., Mello, J., Ostafe, A. & Sha, M. Multiplicative	
dependence of rational values modulo approximate finitely generated groups	. 149
Blomme, T. Tropical curves in abelian surfaces I: enumeration of curves passing	
through points	. 109
Boden, H. U., Elmacioglu, C., Guha, A., Karimi, H., Rushworth, W., Tang, YC. &	
Wang Peng Jun, B. On knots that divide ribbon knotted surfaces	439
Boroński, J. P. Linked orbits of homeomorphisms of the plane and Gambaudo–Kolev	
Theorem	. 103
Carvalho, M., Rodrigues, F. B. & Varandas, P. Topological and metric emergence of	
continuous maps	. 525
Conlon, D. & Lee, J. Domination inequalities and dominating graphs	
Diao, Y. The ropelength conjecture of alternating knots	
Garcia-Calcines, J. M. & Vandembroucq, L. A study of the Ganea conjecture for topological	
complexity by using weak topological complexity	. 241
Gerin, L. The Ulam–Hammersley problem for multiset permutations	
Gorodetsky, O. Smooth permutations and polynomials revisited	
Hu, D., Kaneko, I., Martin, S. & Schildkraut, C. On a Mertens-type conjecture for	
number fields	481
Käenmäki, A. & Nissinen, P. Non-invertible planar self-affine sets	
Kasprowski, D., Powell, M. & Ruppik, B. Homotopy classification of 4-manifolds with finite	
abelian 2-generator fundamental groups	. 263
Ko, H. & Mazorchuk, V. Graded extensions of Verma modules	. 285
Lee, Y. Discrepancy bounds for the distribution of <i>L</i> -functions near the critical line	313
Leng, J., Sah, A. & Sawhney, M. Improved bounds for five-term arithmetic progressions	. 371
Lindemann, D. & Swann, A. Special homogeneous surfaces	
Ma, S. Differential forms on universal K3 surfaces	
Paterson, R. The Failure of Galois Descent for <i>p</i> -Selmer Groups of Elliptic Curves	. 185
Roche–Newton, O. A better than $3/2$ exponent for iterated sums and products over \mathbb{R}	. 11
Yan, J. Computing the Cassels–Tate pairing for genus two jacobians with rational	
two-torsion points	415
Zakharov, D. Most integers are not a sum of two palindromes	363

INSTRUCTIONS TO AUTHORS

1. Preparation of Manuscripts

A paper should be submitted electronically to mpeditor@hermes.cam.ac.uk in pdf form only. Authors are encouraged to prepare their manuscripts in LaTeX 2e using the PSP class file. The class file together with a guide, PSP2egui.tex, and sample pages, PSP2esam.tex, can be downloaded from ftp://ftp.cambridge.org/pub/texarchive/journals/latex/pspcls in either packed or unpacked form. These files will be updated periodically: please ensure that you have the latest

A cover page should give the title, the author's name and institution, with the address to which mail should be sent.

The title, while brief, must be informative (e.g. A new proof of the prime-number theorem, whereas, Some applications of a theorem of G. H. Hardy would be useless).

Authors are asked to provide an abstract as a basis for search on the Web. This may be an explicit abstract at the start of the paper. Otherwise the first paragraph or two should form a summary of the main theme of the paper, providing an abstract intelligible to mathematicians. Please note that the abstract should be able to be read independently of the main text. References should therefore not be included in the abstract.

Authors are encouraged to check that where references are given, they are used in the text. Experience has shown that unused references have a habit of surviving into the final version of the manuscript.

For a typescript to be accepted for publication, it must accord with the standard requirements of publishers, and be presented in a form in which the author's intentions regarding symbols etc. are clear to a printer (who is not a mathematician). Please also check the Cambridge University Press website for information about the style in which the paper should be submitted.

2. Notation

Notation should be chosen carefully so that mathematical operations are expressed with all possible neatness, to lighten the task of the compositor and to reduce the chance of error. For instance n sub k is common usage, but avoid if possible using c sub n sub k. Fractions are generally best expressed by a solidus. Complicated exponentials like:

$$\exp\{z^2\sin\theta/(1+y^2)\}$$

should be shown in this and no other way.

It helps if displayed equations or statements which will be quoted later are numbered in order on the right of their line. They can then be referred to by, for example 'from (7)'.

The author must enable the printer (if necessary by pencilled notes in the margin) to distinguish between similar symbols such as o, O, o, O, O; $x, \dot{X}, x; \phi, \Phi, \varnothing;$ l, l; ϵ, k, κ, k .

Footnotes should be avoided.

Please use typewriter font for all addresses and email addresses.

Omit * from the end of proofs.

In listing assertions, conclusions, etc. do not use a vertical column of dots and do not follow (a) or (i) by a capital letter (eg. (i) the absolute value . .)

In making references precise use [3, theorem 5.1]

3. Diagrams

Diagrams should be in black ink or from a high-quality laser printer and should not be larger than 30 cm by 45 cm. Lettering to be inserted by the printer should be shown clearly on copies of the figures rather than on the original drawings. Please note that a charge may be made if hand-drawn diagrams need to be re-drawn for publication.

A typed list of captions may be provided at the end of the manuscript in the following format:

Figure 1. A basis for .

Note that there is no point at the end of the heading. All headings should be centred.

4. Tables

Tables should be numbered (above the table) and set out on separate sheets. Indicate the position of each in the text as for figures:

Table 3 here

Heading for tables should be shown in the following way:

 $A \ basis for \dots$

Table 1. Note that there is no point at the end of the heading. All headings should be centred over columns.

5. References

References should be collected at the end of the paper numbered in alphabetical order of the authors' names. Where references are given, they should be used in the text. Titles of journals should be abbreviated as in Mathematical Reviews. The following examples show the preferred style for references to a paper in a journal, a paper in a proceedings volume, a book and an unpublished dissertation:

[1] J. F. Adams. On the non-existence of elements of Hopf invariant one. Ann of Math. (2) 72 (1960), 20-104.

[2] M. P. Fouram and D. S. Scott. Sheaves and logic. In Applications of Sheaves Lecture Notes in Math. vol. 753 (Springer-Verlag, 1979), pp. 302-401.

[3] P. T. Johnstone. Stone Spaces. Cambridge Studies in Advanced Math. no. 3 (Cambridge University Press, 1982).

[4] F. W. Lawvere. Functional semantics of algebraic theories. PhD. thesis. Columbia University (1963).

6. Submission of papers accepted for publication

When a paper has been accepted for publication the relevant TeX files of the final version, accompanied by a pdf file, should be sent to the Editor by e-mail.

This journal issue has been printed on FSCTM-certified paper and cover board. FSC is an independent, nongovernmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see www.fsc.org for information.

MATHEMATICAL PROCEEDINGS

of the

 $Cambridge\ Philosophical\ Society$

VOLUME 177 PART 3, pages 371-551, November 2024

CONTENTS

James Leng, Ashwin Sah & Mehtaab Sawhney Improved bounds for five-term	
arithmetic progressions	71
Jiali Yan Computing the Cassels-Tate pairing for genus two jacobians with	
rational two-torsion points 41	15
Hans U. Boden, Ceyhun Elmacioglu, Anshul Guha, Homayun Karimi, William	
Rushworth, Yun-Chi Tang & Bryan Wang Peng Jun On knots that divide	
ribbon knotted surfaces	39
Ofir Gorodetsky Smooth permutations and polynomials revisited 45	55
Daniel Hu, Ikuya Kaneko, Spencer Martin & Carl Schildkraut On a Mertens-	
type conjecture for number fields	31
Maria Carvalho, Fagner B. Rodrigues & Paulo Varandas Topological and metric	
emergence of continuous maps	25

©The Cambridge Philosophical Society 2024

Cambridge Core

For further information about this journal please go to the journal website at: cambridge.org/psp



