C O M B I N A T O R I C S

Volume 1 (1979) Issue 2, pp 9-18

Combinatorics is the newsletter of the Combinatorial Mathematics Society of Australasia, and is published by the Society. Annual subscription rate for individual non-members and institutions is $A4. All enquiries should be directed to the C.M.S.A., C/- Department of Mathematics, University of Newcastle, New South Wales, 2308, Australia.

NEW PUBLICATIONS

Authors are requested to contribute lists of publications from 1978, and send future details of publications on appearance to Dr. D.A. Holton, Department of Mathematics, University of Melbourne, Parkville, Vic. 3052.

I. Abdul-Kader, Path decompositions of digraphs, *Bull. Austral. Math. Soc.*, 19, 1978, 205-216.

V.W. Bryant and J.E. Dawson, Designs and circuit bases, *Archiv. der Math.*, 30, 1978, 665-671.

V.W. Bryant, J.E. Dawson and Hazel Perfect, Hereditary circuit spaces, *Compositio Math.*, 37, 1978, 339-351.

K. Chidzey, The relationship between fixing subgraphs and smoothly embeddable subgraphs, *J. Austral. Math. Soc.*, 26*A*, 1978, 353-367.

J.E. Dawson, A remark on an exchange theorem for bases, *J. Math. Anal. Appl.*, 62, 1978, 354-355.

P. Eades and Jennifer Seberry, Some asymptotic results for orthogonal designs: II, Proceedings of International Conf. on *Problèmes Combinatoires et Théorie des Graphes*, Orsay, France, Editions du CNRS, Paris, 1978, 119-122.

E.F. Eckland, Jr., R.B. Eggleton, P. Erdös and J.L. Selfridge, On the prime factorization of binomial coefficients, *J. Austral. Math. Soc.*, 26*A*, 1978, 257-269.

J. Hammer, R. Levingston and Jennifer Seberry, A remark on the excess of Hadamard matrices and orthogonal designs, *Ars Comb.*, 5, 1978, 237-254.

D. Harries and H. Liebeck, Isomorphisms in switching classes of graphs, *J. Austral. Math. Soc.*, 26*A*, 1978, 475-486.

D.A. Holton and S. Purcell, The four colour theorem - a short history, *Aust. Math. Soc. Gazette*, 6, 1979, 11-14.

S.O. MacDonald and M.R. Vaughan-Lee, Varieties that make one Cross, *J. Austral. Math. Soc.*, 26*A*, 1978, 368-382.

P.J. Robinson and Jennifer Seberry, On the structure and existence of some amicable orthogonal designs, *J. Austral. Math. Soc.*, 25*A*, 1978, 118-128.

P.J. Robinson and Jennifer Seberry, A note on using sequences to construct orthogonal designs, in *Combinatorics*, *Colloq. Math. János Bolyai*, 18, 1978, 911-932.

A.G. Shannon, Fibonacci and Lucas numbers and the complexity of a graph, *Fibonacci Quarterly*, 1, 1978, 1-4.

J. Sims and D.A. Holton, Stability of cartesian products, *J. Comb. Th.*, 25*B*, 1978, 258-282.

RESEARCH ANNOUNCEMENTS

This department will publish research announcements, announcements of forthcoming publications and so forth. Please send contributions to Dr. D.A. Holton, Department of Mathematics, University of Melbourne, Parkville, Vic. 3052.

J.E. Dawson, Optimal matroid bases: an extension of the greedy algorithm.

Anthony V. Geramita and Jennifer Seberry, *Orthogonal Designs: Quadratic Forms and Hadamard Matrices*, Marcel Decker, New York.

R. Razen, Jennifer Seberry and K. Wehrhahn, Ordered partitions and codes generated by circulant matrices.

Jennifer Seberry, On skew Hadamard matrices.

Jennifer Seberry, Some remarks on generalised Hadamard matrices and theorems of Rajkundlia on SBIBD's, *Proc. Sixth Austral. Comb. Conf.*, Armidale, 1978.

Jennifer Seberry, Some remarks on amicable orthogonal designs, *Prof. Conf. on Combinatorial Math. and Optimal Design*, Fort Collins, 1978.

Jennifer Seberry, A class of group divisible designs.

G. Smith and J.E. Dawson, On the determination of the necessary and sufficient conditions for the existence of a solution to the $3 \times 3 \times 3$ multi-index problem, *Aplikace Matematiky*, to appear.

ABSTRACTS

Members of the society are invited to send abstracts of recent results and reports on research-in-progress to Dr. D.A. Holton, Department of Mathematics, University of Melbourne, Parkville, Vic. 3052. *Please indicate if preprints are available.*

MEMBERSHIP LIST

It is planned to publish a list of members' names and addresses in the next issue of *Combinatorics*. If any member wishes his or her mailing address suppressed, or marked "temporary", please inform the editors by 30th June.

SECOND NOTICE

SEVENTH AUSTRALIAN CONFERENCE ON COMBINATORIAL MATHEMATICS

The seventh Australian Conference on Combinatorial Mathematics will be held at the University of Newcastle in the week 20th-24th August, 1979. All those interested are cordially invited to attend.

Programme

Hour-long addresses will be delivered by R.C. Mullin (University of Waterloo) and N.L. Biggs (Royal Holloway College). There will be sessions for contributed papers - see below. The first Annual General Meeting of the Combinatorial Mathematics Society of Australasia will be held at the Conference. The social programme will include a Conference dinner (cost approximately $10 per head) and wine-and-cheese parties. If there is enough interest, we shall organize an afternoon's excursion through the Hunter Valley, including vineyard visits and a barbecue. (The cost would probably be $6-$7, but this would depend on the numbers involved.) The organizing committee welcomes any suggestions for mathematical activities (special interest sessions, instructional lectures, forums, ...) or other proposals for the conference.

It is planned that registration should take place on Sunday evening, 19th August, and at 9 a.m. on 20th August, so that talks can begin at about 9.30 a.m. on the Monday. The conference should close at about afternoon tea time on the Friday.

Registration Fees

The fee will be $11 for ordinary participants, and $7 for full-time students. In both cases there will be a $2 reduction for members of the C.M.S.A.

Contributed Papers

Papers are welcome in all areas of pure and applied combinatorics. Contributed talks should be of 30 minutes' duration. It is planned to publish a refereed volume of Proceedings of the Conference. All speakers will be expected to supply short abstracts of their talks. If you wish to give a paper, please indicate this on the reply form, and please send an abstract by 16th July.

Accommodation

Accommodation has been reserved at motels close to the University and also downtown. Please indicate your requirements on the enclosed form. A deposit of $10 per person is required with your application. These will be processed in strict order of receipt. The final date for booking accommodation is 16th July. The motels are:

1. Shortland Hotel-Motel: A limited number of single and twin accommodation is available.

   Tariff: $16 single, $24 double } Includes breakfast

   The Shortland is within walking distance of the University and is served by public transport to the city.

2. Mayfield Motel:

   Tariff: $20 single, $24 twins } Includes breakfast

   The Mayfield Motel is 3km from the University and 10km from the city and is served by public transport.

3. Great Northern Hotel:

   Tariff: $15 single with bath & toilet facilities
   $20 share with facilities
   $10 single - no private bath
   - does not include breakfast

   The Northern is an older hotel in the centre of town. There is a bus service to the University.

4. Travelodge Motel:

   Tariff: $30 single, $38 double } Does not include breakfast

   The Travelodge is situated in the centre of town, close to the beach, and served by the same transport as the Northern.

We shall allocate people to shared rooms in the motels if requested.

Responses

Please fill in the enclosed form, to indicate:

- whether you expect to attend the conference;
- whether you expect to present a paper;
- whether you expect to attend the conference dinner;
- whether you would attend a vineyard excursion;
- whether you need accommodation.

The form must be returned by 16th July, but it will be convenient if you return it as soon as possible; amendments can be made subsequently.

Next Notice

The third notice will appear in the third issue of *Combinatorics*, in July, and will be sent to all non-subscribers who have requested it.

R.W. Robinson,
G.W. Southern,
W.D. Wallis,
Organizing Committee

CONFERENCE PROCEEDINGS

Springer-Verlag will publish the Proceedings of the Sixth Australian Conference on Combinatorial Mathematics in the Lecture Notes in Mathematics series. Editors are A.F. Horadam and W.D. Wallis. The volume runs to viii + 208 pages. Contents are:

HIGHER DEGREES

It is planned to list higher degrees by thesis on combinatorial subjects which are taken in Australasian institutions. Details should be sent to - Dr. Anne Penfold Street, Department of Mathematics, University of Queensland, St. Lucia, Qld. 4067 - *and should include the name of supervisor, date of award, and a short abstract.*

In order to compile a complete record, we request details of any past theses as well as future ones.

Student Degree Date of Award	Supervisor Institution	Title Abstract reference*
1. HOGARTH, Pauline Cain M.Math. 1975	W.D. Wallis, U. of Newcastle	Decomposition of complete graphs [1]
2. HOMEL, Ross J. M.Sc. 1970	J. Robinson U. of Sydney	The construction and analysis of nested partially balanced incomplete block designs [2]
3. ROBERTS, Leigh M.Sc. 1974	Don Row U. of Tasmania	Automorphisms, flats and erections of pregeometries [3]
4. RYAN, Michael P. M.Sc. 1970	G.H. Jowett, U. of Otago	Orthogonal Latin squares and block designs [4]
5. JONES, Barry Ph.D. 1970	Don Row U. of Tasmania	Homomorphisms of projective planes [5]
6. WALLIS, Jennifer Seberry Ph.D. 1971	{B. Mond {G. Szekeres U. of N.S.W.	Combinatorial matrices, Bull. Austral. Math. Soc. 5 (1971), 285-286.
7. DOBSON, Annette J. Ph.D. 1974	B.C. Rennie James Cook U. of N.Q.	Numerical taxonomy for languages. Bull. Austral. Math. Soc. 11 (1974), 477-478
8. COOPER, Joan Ann Ph.D. 1975	{J.R.Seberry Wallis {W. Brisley U. of Newcastle	Some investigations of combinatorial integer matrices using cyclotomy. Bull. Austral. Math. Soc. 12 (1975), 475-476
9. LE PHUOC THO Ph.D. 1975	Don Row U. of Tasmania	Topological sharply transitive projective planes [6]

Student Degree Date of Award	Supervisor Institution	Title Abstract reference*
10. BEAMAN, Ian Robert Ph.D. 1977	W.D. Wallis U. of Newcastle	Variability of room squares, Bull. Austral. Math. Soc. 16 (1977), 479-480.
11. ROBINSON, Peter J. Ph.D. 1977	J.R. Seberry Wallis I.A.S., A.N.U.	Concerning the existence and construction of orthogonal designs, Bull. Austral. Math. Soc. 17 (1977), 297.
12. EADES, Peter Ph.D. 1977	J.R. Seberry P.J. Cossey S.G.S.,A.N.U.	On the existence of orthogonal designs, Bull. Austral. Math. Soc. 18 (1978), 157-158.
13. CACCETTA, L. Ph.D. 1977	K. Vijayan, U. of W.A.	Some extremal problems in graph theory [7]
14. MORGAN, Elizabeth Jane Ph.D. 1978	A.P. Street U. of Qld.	Construction of block designs and related results. Bull. Austral. Math. Soc. 19 (1978), 139-140

(to be continued)

* References are either to the Bulletin of the Australian Mathematical Society or to the collection of abstracts following this table.

ABSTRACTS

[1] P.C. Hogarth - Decomposition of complete graphs.

The decomposition of graphs into various types of factors is discussed generally. Then constructions are given for the decomposition of complete graphs into isomorphic stars, including a complete solution of the case where the number of edges in the star is prime.

[2] R.J. Homel - The construction and analysis of nested partially balanced incomplete block designs.

A nested PBIB design may be defined as a design with two systems of blocks, such that each block from the first system contains the same number of blocks from the second system, such that ignoring either system of blocks leaves a PBIB design whose blocks are those of the other system and such that the two PBIB designs have an association scheme in common. The thesis gives methods of construction of these designs by the method of differences, by constructions from finite Euclidean geometries and by some miscellaneous techniques.

[3] L. Roberts - Automorphisms, flats and erections of pregeometries.

We characterize pregeometries in terms of their flats - giving necessary and sufficient conditions for a collection of sets to be the flats of a pregeometry.

We begin a systematic study of automorphisms of pregeometries; arguing geometrically, we obtain the (known) factorization of a pregeometry into component pregeometries, and express the automorphism group of the pregeometry in terms of the automorphism groups of its components.

We use automorphisms of pregeometries and their characterization above by flats in the following three ways:

1. All erections of any pregeometry are constructed and their automorphism group determined.

2. We indicate a process for obtaining all pregeometries on a set from the geometries on smaller sets and their automorphism groups.

3. We begin the study of the transitivity of the automorphism group of a pregeometry on the flats and the elements of the pregeometry.

[4] M.P. Ryan - Orthogonal Latin squares and block designs.

We investigate the combinatorial problems of constructing

(i) orthogonal sets of Latin squares
(ii) block designs.

We derive a lower bound on the size of orthogonal sets of Latin squares. In addition we reformulate the concept of orthogonality of Latin squares and use this to relate these to permutations. Our way of doing this appears to be novel.

We review the methods for the construction of block designs. In this we develop some substitution methods - based on the notion of an associate array. Finally we give sufficient conditions for the omission of replicates of resolvable designs to give partially balanced designs.

[5] B. Jones - Homormorphisms of projective planes.

We give basic properties of homomorphisms of projective planes - discussing their effect on generators, subplanes, collineations and coordinate fields.

We are mainly concerned with construction and examination of homomorphisms. Three methods of construction are used. The first uses step-by-step construction from a generating set in free and open planes. The second class of examples arises from the valuation rings of alternative fields.

We spend some time investigating the structure of planes with sharply transitive collineation groups. The results of this investigation are used to construct homomorphisms of such planes. We show that this is a new class of examples.

Thus three aspects of planes, their incidence relations, their coordinate fields, and their collineation groups, each contribute methods of homomorphism construction.

Finally, we apply some of the methods and results concerning homomorphisms developed above to prove that certain alternative planes do not have cyclic sharply transitive collineation groups.

[6] Le Phuoc Tho - Topological sharply transitive projective planes.

We discuss the definition and basic properties of topological projective planes, and study their subplanes, collineations, homomorphisms and Lenz-Barlotti classification.

We are mainly concerned with the construction and examination of topological sharply transitive projective planes. We show that any T_0-topological group having a difference set gives rise to a topological sharply transitive projective plane. This construction gives information about

(i) The existence of various topological planes whose topologies are derived from one of their topological collineation groups.

(ii) The topological and geometric structures of these planes, and of some sharply transitive topological collineation groups.

(iii) Examples of proper (continuous and/or open) homomorphisms of such planes.

(iv) Subplanes, partitionings and embeddings of such planes.

Finally, we examine Desarguesian topological sharply transitive projective planes.

[7] L. Caccetta - Some extremal problems in graph theory.

The problem considered is that of constructing a graph of order n and diameter d with minimum number of edges such that by suppressing s or fewer vertices (edges) the subgraphs (partial graphs) obtained would have diameter $\lambda \geq k$. For $s=1$ and $k<5$, the problem is completely solved. Some partial results are obtained when $s=1$ and $k\geq 5$ and when $s>1$ and $k=2$.

ANNOUNCEMENTS

Under this heading we publish short new items for the information of members. All contributions should be sent to Professor R.W.Robinson, Department of Mathematics, University of Newcastle, N.S.W., 2308. *Typical "announcements" might include news of new appointments in Combinatorics, availability of lecture notes, honours, overseas visitors, and so forth.*

Meetings

First Franco-Southeast Asian Mathematical Conference, at Nanyang University, Singapore, 14th May to 1st June, 1979.

Seventh British Combinatorial Conference, at Cambridge University, 13th to 17th August, 1979. Contact B. Bollobás, Department of Pure Mathematics, Cambridge University, Cambridge, CB2 1SB, England.

Application of Graph Theory Conference, at the University of Essex, 20th to 24th August, 1979. Contact J. W. Kennedy, Institute of Polymer Science, University of Essex, Colchester, CO4, 3SQ, England.

Second Australian Number Theory Conference at Macquarie University, 26th August to 1st September, 1979. Contact J.H.Loxton, School of Mathematics, University of N.S.W., Kensington, N.S.W., 2033.

Second Meeting on Combinatorics and applications, at Santa Margherita Ligure, 14th to 19th April, 1980 (tentative). Contact E.G. Beltrametti, Institute di Scienze Fisiche dell' Università, Viale Benedetto XV, 5-16132 Genova, Italy.

Change of Address

Dr. K. Heinrich will be with the Department of Mathematics, Simon Fraser University, Burnaby, B.C., V5A 1S6, Canada, for one year.