ISSN 0157-776X

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

Volume 4 (1982), Number 3 (December),

pp. 14 - 30

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., Dr. D.R. Breach, Department of Mathematics, University of Canterbury, Christchurch, New Zealand.

GENERAL ANNOUNCEMENTS

1. New Addresses

T.E. Gilham,
Lot 103, Samuel St.,
Mt. Helena,
W.A. 6555.

J.G. Oxley,
Mathematics Department,
Louisiana State University,
Baton Rouge,
Louisiana 70803
U.S.A.

2. Visitors

Professor E.A. Bender, of the U.S.A. will be visiting Australia from late September, 1982, until late January, 1983. For further details, contact

Dr. N.C. Wormald,
Department of Mathematics, Statistics
and Computer Science,
University of Newcastle,
Shortland,
N.S.W. 2307.

3. Forthcoming Conferences, Workshops

XIth Combinatorial Math Conference, University of Canterbury, Christchurch, New Zealand, 29th August - 2nd September 1983, being the eleventh of the Australian Conferences on Combinatorial Mathematics organised by the Combinatorial Mathematics Society of Australasia.

Contributed papers in all areas of pure and applied combinatorics of 30 minutes duration are welcome. Of this time 5 minutes should be allowed for questions. Those contributing such papers are asked to forward a title and short abstract by July 2nd 1983.

Registration fees are payable at the conference and will be
$45 (NZ) for CMSA members;
$50 (NZ) for non-members (giving membership for the rest of the year);
$22.50 (NZ) for students and unemployed persons.

Participants will recieve a copy of the Conference Proceedings in due course.

Accommodation is available in the campus halls at $21 (NZ) per adult for dinner, bed and breakfast. A deposit of $15 (NZ) by July 2nd 1983 is required. Such accommodation is unavailable after September 2nd 1983. The conference ends at midday of that day. For further information contact: Dr. D.R. Breach, Department of Mathematics, University of Canterbury, Christchurch, New Zealand.

British Combinatorial Conference, 11th - 15th July, 1983, Southampton, Hampshire, England.

Further details can be obtained from Dr. A.D. Keedwell, Department of Mathematics, University of Surrey, Guilford, Surrey, GU2.5XH.

Workshop - Latin Squares: Their Construction and Application

A four week seminar/workshop on latin squares is planned for the period July 18 - August 12, 1983 at Simon Fraser University. Since the objective of the seminar is to bring together researchers to work on latin squares and related problems in combinatorial designs, it will be very informal. In order to allow participants time to work together, talks will take place only on Tuesdays and Thursdays. Two presentations will be given on each day. Invited speakers have been asked to present a survey (with related problems) of their present research activities. The invited participants include:

L.D. Andersen (Denmark)	K.T. Phelps (U.S.A.)
R. Häggkvist (Sweden)	A. Rosa (Canada)
A.J. W. Hilton (U.K.)	D. Stinson (Canada)
J. Horton (Canada)	G.H.J. van Rees (Canada)
A.D. Keedwell (U.K.)	W.D. Wallis (Australia)
C.C. Lindner (U.S.A.)	L. Zhu (China)

For further information please contact: Dr. Katherine Heinrich, Department of Mathematics, Simon Fraser University, Burnaby, B.C., Canada V5A 1S6 (permanent address)/Department of Mathematics, University of South Carolina, Columbia, SC 29208 U.S.A. (from 15/12/82 until 30/4//83).

4. Journal Addresses

It is planned to publish a list of journal addresses in Australasia. We wish to include only journals for which submissions can be made within Australasia - either journals published here or journals with at least one editor in this area. As a general rule, the list should include any journal to which the submission of a paper in pure or applied combinatorics would be appropriate, and also newsletters of combinatorial interest. Please send details of any journals with which you are associated, and any suggested titles which may otherwise escape our notice, to

Professor W. Wallis,
Department of Mathematics,
University of Newcastle,
Shortland,
N.S.W. 2307.

5. Titbits for publication can be sent to

Dr. D.R. Breach,
Department of Mathematics,
University of Canterbury,
Christchurch,
New Zealand.

Titbits = {abstracts, new graduates, problems, solutions, new papers,...} .

6. Abstracts of Theses and Recent Publications

Abstract of Ph.D. Thesis, University of Melbourne, Australia.

DEGREE MULTISETS OF HYPERGRAPHS

David Billington

A multiset is a "set" which may have repeated elements. If s is a positive integer then an s-uniform hypergraph is a hypergraph in which every block, or edge, contains exactly s points. A hypergraph in which every block contains at least s points is called an s^+-hypergraph. Let $R(\Delta,s)$ denote the set of all s-uniform hypergraphs which have Δ as their multiset of degrees. Similarly $R(\Delta,s^+)$ denotes the set of all s^+-hypergraphs which have Δ as their degree multiset. We make $R(\Delta,s)$ into a graph by defining two elements of $R(\Delta,s)$ to be adjacent if and only if one can be obtained from the other by a very simple operation called an exchange. By considering the components of $R(\Delta,s)$ we are able to make $R(\Delta,s^+)$ into a suitable graph.

In this thesis we investigate the structure of the graphs $R(\Delta,s)$ and $R(\Delta,s^+)$ when Δ is countable. When Δ is finite we also consider the structure of two subgraphs of $R(\Delta,2)$.

Necessary and sufficient conditions on Δ and s are found for both $R(\Delta,s)$ and $R(\Delta,s^+)$ to be non-empty. To find these conditions we first construct canonical elements of $R(\Delta,s)$ and $R(\Delta,s^+)$. If Δ is denumerable then we determine the number of components and the number of isolated vertices of both $R(\Delta,s)$ and $R(\Delta,s^+)$. When Δ is finite we show that $R(\Delta,s)$ is connected. The definition of $R(\Delta,s^+)$ makes it connected when Δ is finite. All the finite multisets, Δ , for which either $R(\Delta,s)$ or $R(\Delta,s^+)$ has exactly one element, are given explicitly. To conclude our study of $R(\Delta,s)$ for arbitrary s and finite Δ we present some necessary conditions on Δ and s for $R(\Delta,s)$ to be a tree.

Finally we turn our attention to $R(\Delta,2)$ when Δ is finite. The vertices of $R(\Delta,2)$ are just the multigraphs which realise Δ . For any positive integer m , an m-graph is a multigraph which has at most m edges between any two points. By an exact

m-graph we mean an m-graph in which there exists two points which have exactly m edges between them. The subgraph of $R(\Delta,2)$ induced by the m-graphs is denoted by $R(\Delta,L(m))$, while $R(\Delta,E(m))$ denotes the subgraph of $R(\Delta,2)$ induced by the exact m-graphs.

The proof we give that $R(\Delta,L(m))$ is connected provides best possible upper and lower bounds for the shortest distance between any two vertices of $R(\Delta,L(m))$. Although $R(\Delta,E(m))$ is in general not connected, very weak sufficient conditions on Δ and m are found which ensure that $R(\Delta,E(m))$ is connected.

Abstract of M.Sc. Theses, University of Canterbury, Christchurch, New Zealand.

DECOMPOSABLE 2-(11,5,4) and 3-(12,6,4) DESIGNS

A.R. Thompson

A decomposable 2-(11,5,4) design is one of the blocks of which can be used to form two disjoint 2-(11,5,2) designs. This investigation describes all such designs of which there are 58 non-isomorphic types. Each 2-(11,5,4) design can be embedded into a unique 3-(12,6,4) design. There are twelve decomposable non-isomorphic 3-(12,6,4) designs.

(Degree awarded with Distinction)

CHESS PLACEMENT PROBLEMS : A SURVEY

Eva Chan

A survey is made of the literature and recent results on the problems of placing mutually non-attacking pieces on an n×n chessboard. Rooks, queens, bishops, knights and kings are all considered in turn. For rooks in particular an extensive theory is available leading into rook polynomials on irregular boards. The equivalence of solutions under symmetry operations is discussed and in many cases precise numerical results are available. An outline of the connections with polynomials of binomial type and factorial polynomials is given.

Recent Publications

D.R. Breach, "Some 2-(2n+1,n-1) designs with multiple extensions", Proceedings of the VIth Australian Conference on Combinatorial Mathematics, Armidale, N.S.W., 1978, pp.32-40 (Springer-Verlag Lecture Notes Series No. 748).

D.R. Breach, "The 2-(9,4,3) and 3-(10,5,3) designs", J. Comb. Theory (A) 27, pp.50-63, 1979.

D.R. Breach, "Star gazing in affine planes", Proceedings of the IXth Australian Conference on Combinatorial Mathematics, Brisbane, 1981 (to be published; also exists as University of Canterbury, Department of Mathematics Research Report No. 17, 35 pp.).

D.R. Breach, "On the non-existence of 5-(24,12,6) and 4-(23,11,6) designs", University of Canterbury, Department of Mathematics Research Report No. 10, 5 pp., 1977.

D.R. Breach, "Some remarks on a family of f-designs", University of Canterbury, Department of Mathematics Research Report No. 16, 3 pp., 1981.

COMBINATORIAL MATHEMATICS SOCIETY OF AUSTRALASIA

Minutes of the Fourth Annual Meeting held on Thursday, 27th August, 1982, at the University of Adelaide, Adelaide, S.A.

1. Meeting opened 16.03 hours.

Present: R. Casse, Director

and 31 members

2. Apologies: D. Rogers, B. Neumann.

3. Minutes of the previous meeting

Accepted with the alteration of closing time to 13.54 hours.

4. Business arising from the minutes, not listed separately:

re Item 1 (General Business)

The director reported that local computing bodies were not interested in having the word "computing" included in the title of the conference.

The following motion was put to the members:
"That the name of the conference be changed to Conference on Combinatorial Mathematics and Computing".
Motion was amended to read:
"That the name of the conference be changed to Conference on Combinatorial and Computational Mathematics".
Amendment lost.
Original motion carried 9/6.

5. 1981 Treasurer's Report

See Statement following.

An additional $837 refund from Springer-Verlag and other additional expenses (typing, diagrams) are not included. The director moved a vote of thanks to the 1981 Treasurer. The director is to approach Springer-Verlag re their paying for the typing of the manuscript.

6. Director's Report

[See Report following.]

The following motions were put to the members.

1. That letters of thanks be sent to the departments and other bodies for their support.

2. That copies of the Proceedings be sent to the same bodies, when available.

3. That the Director's Report be accepted and Society record a vote of thanks to the 1982 Director.

All motions carried.

7. Affiliation with A.M.S.

The A.M.S. at their meeting of 9/5/82 resolved the following: "To set up a committee consisting of Dr. Anderssen, Dr. Casse, Professor Hannan and Professor Preston with the power to co-opt to investigate the way in which the Society caters for relatively large subgroups of members with similar specialised mathematical interests."

The following motion was put to members:
"That the Director meet with representatives from the A.M.S. to investigate the way in which affiliation can be achieved."

Motion carried.

8. 1983 Conference

Dr. Breach reported that the University of Canterbury, Christchurch, N.Z. will be the venue, from Monday August 29 to Friday September 2, 1983.

The following motion was put:
"That Dr. Breach be appointed Director of the Society for 1983."

Motion carried.

9. 1984 Conference

Proposed venue: University of Western Australia, Perth.

10. Any other business.

i) Dr. Breach suggested that a liaison officer be appointed in Australia for 1983 (NZ) Conference. W. Wallis accepted position.

ii) D. Rogers (in absentia) suggested:
"1. That a photocopy of published papers be sent to authors.
2. That the committee consider the possibility of arranging for all members (not just participants) of the Society to buy copies of the Proceedings at a suitable discount.
3. That the Committee investigate the possibility of including within the Proceedings additional material which will increase the research value of the volume."

It was agreed that the Director consider the first motion.
It was moved and carried:
"That spare copies of the Proceedings be given away to members."
The third suggestion was defeated.

11. There being no further business, the meeting closed at 16.37 hours.

Director, 1982.

COMBINATORIAL MATHEMATICS SOCIETY OF AUSTRALASIA

Financial Statement for the period 1 Jan 1981 to 31 Dec 1981

			$
Opening Balance 1 Jan 1981 (from Deakin)			1141.87
Receipts			
Membership		292.69	
Donations		650.00	
Interest		162.93	
Conference:	Registration	1120.00	
	Excursions	335.20	
	Dinners	426.00	
	Sale of wine	8.50	
		2995.32	4137.19
Expenditure			
Postage		167.28	
Photocopying		54.68	
Receipt books		3.77	
Typing		274.80	
Labels		1.58	
Conference:	Excursions	315.20	
	Invited speakers	410.00	
	Student subsidies	130.00	
	Wages	100.00	
	Food and wine	174.80	
	Files	30.00	
	Name tags	0.30	
	Projectionist	36.00	
	Car expenses	31.13	
	Union College	652.00	
	Slide	0.90	
		2382.44	$ 1754.75
Closing Balance 31 Dec 1981 :			
	Credit Union	1753.87	
	Petty Cash	0.88	
			$ 1754.75

Auditor's Statement :

I have examined the accounts and verified that they represent a true and fair view of the financial affairs of the Society.

H. Finucan

DIRECTOR'S REPORT

a) Membership

The total membership has stayed approximately unchanged ($\triangleq$ 100).

b) 10 A.C.C.M.

We have 63 participants, including 8 invited speakers and 15 overseas delegates.

Support has been provided by the ANZ Banking Group, T.A.A., The Australian Mathematical Society, the Applied, Computing, Pure and Statistics Departments of the University of Adelaide.

c) Committee and organisation

The committee consists of

Director	-	L.R.A. Casse
Secretary	-	E. Cousins
Treasurer	-	M. Sved
Editors of Newsletter	-	E. Cousins and L.R.A. Casse

Every member of the Adelaide "Geometry Seminar" has been involved in the organisation of this year's conference. I would like to thank everyone for the hard work and support. I would also like to thank Ms. Henderson and Mrs. Renshaw for their kindness and typing.

d) Matters arising from 9 A.C.C.M.

I was asked to investigate the possibility of including "computing" in the title of the conference. I contacted the local computer scientists, and found that there was no interest in the idea.

L.R.A. Casse

The following pages contain the membership list of the C.M.S.A.

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THE OPTIMIZER'S SONG

It's the wrong line,
In the wrong space,
Though this face is charming it's the wrong face;
It's not the optimal face,
But it's a better face,
So it's all right with me.

(*PIVOT, PIVOT*)

It's the wrong rank,
And the wrong range,
So I'll pivot once and make a small change;
Function's negative!
My, that's so strange!
And it's no use to me.

There's a function I'm trying so hard to improve,
A value I'm trying to get,
But somehow I just can't get out of this groove,
And into the feasible set!

Comrade Khachiyan
Needs no pivot,
But it takes him eighteen years to give it!
It's not in NP,
But it's such lousy P
That it's no use to me

(*BACK TO SIMPLEX*)

Well, it's the due time
On the due date,
And the value's still far too approximate,
But the project's late,
So we'll iterate,
And perhaps time will tell

If it's all right -
If it's all right -
With BELL!