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

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## General Announcements

Under this heading we publish short news items for the information of members. All contributions should be sent to Dr. Sheila Williams, Department of Mathematics, University of Queensland, St. Lucia, Queensland 4067, Australia.

### NEW ADDRESSES

Dr. Trevor E. Gilham, Department of Mathematics,  
R.A.A.F. Academy, Point Cook, Victoria 3029, Australia.

Dr. David G. Glynn, 5 Warwick Avenue,  
Brighton North, South Australia, 5048.

### TEMPORARY ADDRESSES

Professor Robert W. Robinson for 1981.

Until Mid-March: c/- Professor E.M. Palmer, Mathematics Department,  
Michigan State University, East Lansing,  
Michigan 48824, U.S.A.

Until End of May: c/- Professor R.P. Dilworth, Mathematics Department,  
Caltech, Pasadena, Calif. 91125, U.S.A.

Until End of August: c/- Professor R.C. Read, Department of Combinatorics  
& Optimization, University of Waterloo, Waterloo,  
Ontario, N2L 3G1, Canada.

Until Mid-December: c/- Professor F. Harary, Department of Mathematics,  
University of Michigan, Ann Arbor, Michigan,  
48109, U.S.A.

### SUBSCRIPTION RENEWAL

Members of C.M.S.A. are reminded that their annual subscriptions fall due on 1st January 1981. The ordinary and concession rates remain at \$A4 and \$A2 respectively. Please make cheques payable to C.M.S.A. and send, with full name, address and phone number, to Sheila Williams, Director C.M.S.A., Department of Mathematics, University of Queensland, St. Lucia, Queensland 4067, Australia.

### NEW PUBLICATIONS AND RESEARCH ANNOUNCEMENTS

Authors are invited to send details for publication in *Combinatorics* to Dr. Derek A. Holton, Department of Mathematics, University of Melbourne, Parkville, Victoria 3052, Australia.

## Higher Degrees

Supervisors of higher degree theses on combinatorial mathematics in Australasian institutions are invited to send details - recipient's name, supervisor's name, degree, date awarded, institution, title, abstract - to Dr. Sheila Williams, Dept. of Mathematics, University of Queensland, St. Lucia, Queensland 4067, Australia.

Student Degree Date Awarded	Supervisor Institution	Title Abstract reference
WORMALD, Nicholas C. Ph.D. 1980	R.W. Robinson U. of Newcastle	Some Problems in the Enumeration of Labelled Graphs

### ABSTRACT

A method of counting labelled 3-connected graphs is presented. The enumeration is accomplished by employing a new characterisation of 3-connected graphs, based on an examination of the graphs which may result when a line is removed from a 3-connected graph. The same general principle is first applied to counting connected and 2-connected labelled graphs. In all three cases, it is necessary to keep track of both the numbers of points and of lines. Numerical results are supplied, showing the numbers of connected, 2-connected and 3-connected labelled graphs with  $p$  points for  $p$  up to 20.

The characterisation result for 3-connected graphs also allows us to count labelled 3-connected cubic graphs. Labelled cubic graphs and labelled connected cubic graphs have already been counted by Read. As no cubic graph is 4-connected, the picture is completed by counting labelled 2-connected cubic graphs. This is done by taking into consideration graphs which are cubic except for one or two points of degree 2. The same method is used to re-derive some of Read's results for labelled cubic graphs and labelled connected cubic graphs. Numerical results are listed for graphs with up to 30 points.

An asymptotic formula for the number of labelled cubic graphs with a given number was also found by Read. A generalisation of this problem is solved here by beginning with a known result concerning the asymptotic enumeration of matrices with given row and column sums. By this means we find an asymptotic formula for the number of labelled graphs (or pseudographs) with points of given degrees, as long as the degrees of the points in the graphs (pseudographs) are bounded. The numbers of cycles of given fixed length can also be specified. This yields, for example, an asymptotic formula for the number of labelled  $r$ -regular graphs with girth  $j$ , for fixed  $r$  and  $j$ .

The asymptotic formula for the number of labelled graphs with points of given degrees is used to show that almost all labelled graphs with points of given degrees lying between  $r$  and  $R$  are  $r$ -connected, where  $r$  and  $R$  are fixed,  $3 \leq r \leq R$ . This implies, for instance, that almost all labelled  $r$ -regular graphs are  $r$ -connected for any fixed  $r \geq 3$ . A similar procedure is used to show that for fixed  $k > 0$  and  $r \geq 3$ , almost all labelled  $r$ -regular graphs with girth at least  $\lceil k/(r-2) \rceil$  are cyclically  $k$ -connected. This provides an asymptotic formula for the number of labelled cyclically  $k$ -connected  $r$ -regular graphs with  $p$  points, for fixed  $k$  and  $r$ .

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