field guide to SIMPLE GRAPHS

Volume 2: The Sparse 8-Point Graphs

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This book was produced on a MacIntosh computer using Freehand® software.

Peter Steinbach is a mathematics educator and former industrial designer, now teaching at the Albuquerque Technical-Vocational Institute. His current interests include graph theory, combinatorial geometry, early mathematics and elementary education, and development of math classroom manipulatives and games.

For
Tom Steinbach, Jr.
1950–2000
and
Curtis Anthony Barefoot
1951–2004

Preface to the Second Edition and Volumes 2 & 3

Thanks to everyone who expressed their needs for more information and everyone who pointed out errors in the first edition, here is the Second Edition of the Field Guide.

There are four main additions. Readers asked for more information on trees, and I have supplied five theorems and an extra set of drawings that show centers and centroids. Some readers wanted to see more cubic (3-regular) graphs, and this was an easy task thanks to the work of Bussemaker et al. The new Chapter 3 on subgraphs was my own idea since I needed this data and anticipated that others would need it as well.

But the overwhelming response was: "We need the 8-point graphs! How soon can you draw them?" It has taken a very long time to draw just half of them for Volume 2, and from the outset I could see that the other half was not going to happen — and not because there are so many of them. It would be impossible to choose just one or two forms to portray most of these dense graphs, and even given a best form, its legibility (therefore its usefulness) is severely limited. As R C Entringer says, any graph that is large enough is solid black. But one does not need pictures of dense graphs if their sparse complements are available. For instance, a search for triangles in a dense graph is equivalent to a search for non-triangles in its complement.

I have Ronald Read of the University of Waterloo to thank for graciously supplying a list of degree sequences of the 8-point graphs and the numbers of graphs with each sequence. From there I modified the existing drawings of 7-point graphs, and relatively few had to be drawn from scratch.

June 3, 1995

The Second Revised Edition of 2004 corrects errors, expands Table 1 (pp. 180 – 181), and adds two properties to the regular graphs of Chapters 5 & 6. Most of the errors of Volume 1 occurred in the subgraphs of Chapter 3. Special thanks to Peter Adams of University of Queensland, Roger Eggleton of Illinois State University, James MacDougall of University of Newcastle, and Ebad Mahmoodian of Sharif University of Technology for correcting Chapter 3. They have also mapped the subgraph lattice of the 8-point graphs (see www.maths.uq.edu.au/~pa/research/posets4to8.html).

The same year also marks the actual (rather than the expected) completion of Volume 2, *The Sparse 8-Point Graphs*, the most difficult job I have ever done. Volume 3, *The Book of Trees*, was released without fanfare in 1999.

September, 2004

Volume 2: The Sparse 8-point Graphs

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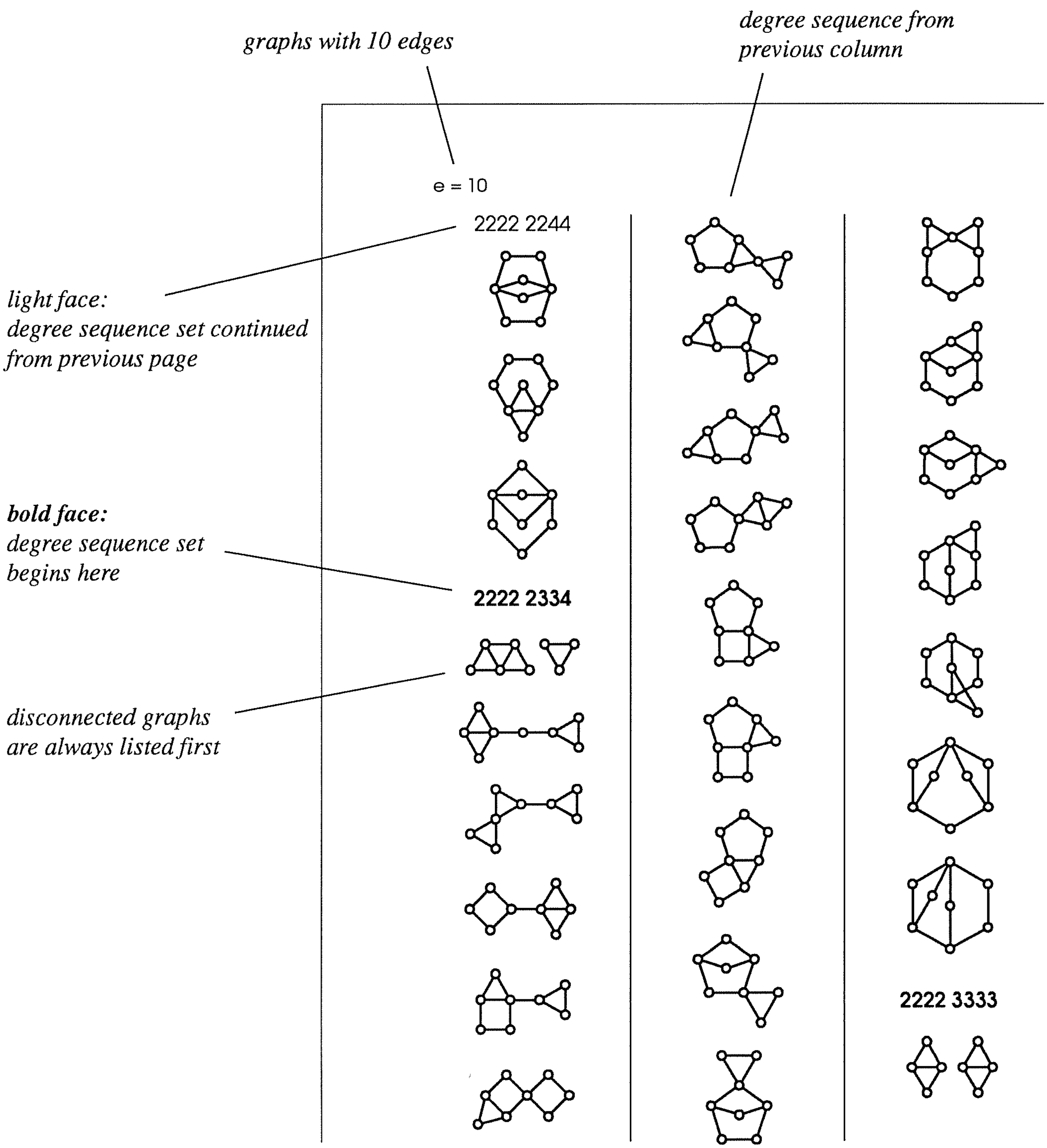
Legend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bold face: degree sequence set begins here
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disconnected graphs are always listed first
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