

The
**Population
Explosion**
and Other
**Mathematical
Puzzles**

Dick Hess



World Scientific

The Population Explosion and Other Mathematical Puzzles

Population Explosion and Other Mathematical Puzzles is a wonderful addition to Dr Dick Hess's previous successful books, *Mental Gymnastics: Recreational Mathematical Puzzles*, *Golf on the Moon*, (Dover Publishing, 2011 and 2014 respectively) and *Number-Crunching Math Puzzles* (Puzzlewright, 2013), a republication of *All-Star Mathlete Puzzles* (Sterling Publishing, 2009). In this latest volume, there are 116 recreational mathematical puzzles and problems that will challenge and entertain bright minds. They are mostly new problems on creative themes, encompassing a wide range of difficulty from amusing to complex. Intended to hone mathematical thinking skills and reasoning ability, solving the puzzles may require considerable perseverance.

Open this book to find a captivating assortment of geometric, digital, logical, probability, analytical, physics and trapezoid puzzles. Find out what happens with jeeps in the desert and be amused or confused by some MathDice puzzles.

While most of these puzzles can be solved by pencil and paper analysis, there are some that are best tackled with a computer to find a solution. Be prepared to keep your wits about you!

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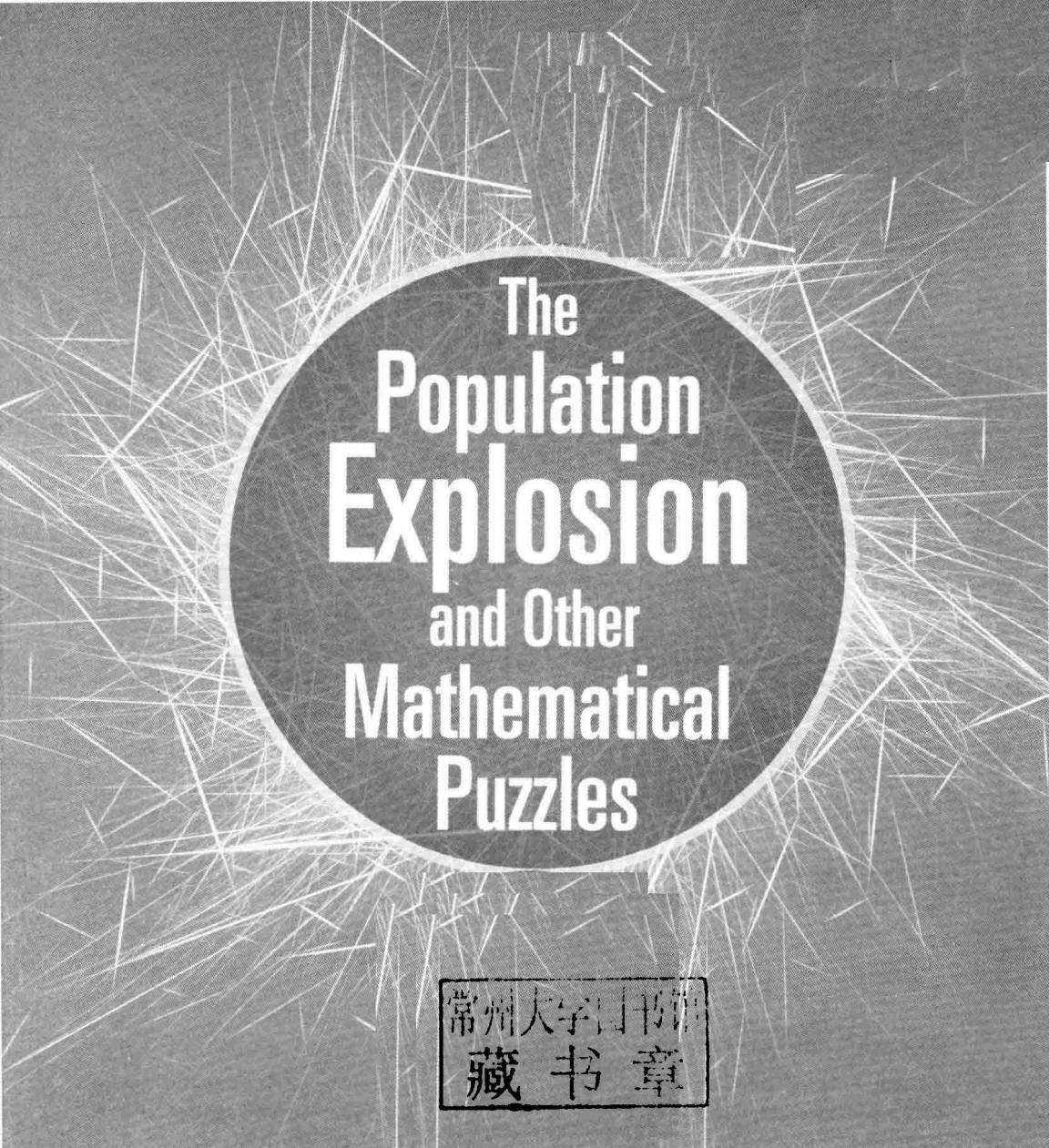
ISBN 978-981-4740-97-5



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Top 10 Most Popular Explosive and Other Mathematical Puzzles





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藏书章

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NEW JERSEY • LONDON • SINGAPORE • BEIJING • SHANGHAI • HONG KONG • TAIPEI • CHENNAI • TOKYO

Published by

World Scientific Publishing Co. Pte. Ltd.

5 Toh Tuck Link, Singapore 596224

USA office: 27 Warren Street, Suite 401-402, Hackensack, NJ 07601

UK office: 57 Shelton Street, Covent Garden, London WC2H 9HE

Library of Congress Cataloging-in-Publication Data

Names: Hess, Dick.

Title: The population explosion and other mathematical puzzles / Dick Hess.

Description: New Jersey : World Scientific, 2016.

Identifiers: LCCN 2015044541 | ISBN 9789814740975 (hrd : alk. paper) |

ISBN 9789814733755 (pbk. : alk. paper)

Subjects: LCSH: Mathematical recreations. | Mathematics--Problems, exercises, etc.

Classification: LCC QA95 .H4785 2016 | DDC 793.74--dc23

LC record available at <http://lcn.loc.gov/2015044541>

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

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Typeset by Stallion Press

Email: enquiries@stallionpress.com

Printed in Singapore by Mainland Press Pte Ltd.

The Population Explosion and Other Mathematical Puzzles

*To the loving memory of my dear brother,
Robert A. (Bob) Hess,
9 November 1940 to 2 March 2015.*

Preface

This book is a sequel to *Mental Gymnastics: Recreational Mathematical Puzzles* and *Golf on the Moon*, written by me and published by Dover Publishing Co. in 2011 and 2014 respectively. The puzzles in all volumes are for the reader's enjoyment and should be passed on to others for their enjoyment as well. They are meant to challenge mathematical thinking processes, including logical thought, insight, geometrical, analytical and physical concepts, and may require considerable perseverance. While most of the puzzles can be solved by pencil and paper analysis, there are some that are best tackled with a computer to search for or calculate a solution. Be prepared to keep your wits about you.

I often encounter the ideas for many of these puzzles in publications or on-line sources that offer problem columns or puzzle sections. These include *Crux Mathematicorum with Mathematical Mayhem*, *Journal of Recreational Mathematics*, *Pi Mu Epsilon Journal*, *Puzzle Corner in Technology Review*, *Ponder This* and *Puzzle Up*. Other puzzle ideas were introduced to me by word of mouth through a delightful community of puzzle solvers. I owe a debt of gratitude to all enthusiasts who love to share their latest challenges and listen to mine.

Dick Hess

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Chapter 1

Playful Puzzles

1

Word Mystery

What word has 8 letters, sometimes has 9 — it always contains 8 letters, occasionally uses 12 though! Find either of two answers.

2

Salary Secrecy

A group of 5 employees is at lunch and the subject of their average salary comes up. They all want to know the average but don't want to give information to any other about their own salary. Each has a pencil and piece of paper and there is no one else to assist them. How can they meet their objective?

3

Relations Puzzles

- (a) A man points to another man and says: "Sons and daughters have I none but that man's father is my father's son." How are the two men related?
- (b) Ray's son-in-law is my Uncle Bob's father. If I am related by blood to Ray how is Ray related to me?

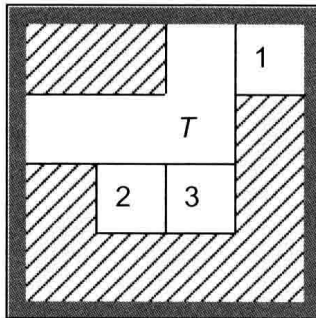
2 *Population Explosion and Other Mathematical Puzzles*

(c) “Daughters and nephews have I none but Chris’s father-in-law is my mother-in-law’s son.”

- (i) What is the speaker’s gender?
- (ii) What is Chris’s gender?
- (iii) How are the speaker and Chris related?

4
Slider

Use only five sliding block moves to get the piece labeled *T* to the lower right corner. A move is one piece moved along any path.



5
Fastest Serve

A tennis player hits a serve that in kilometers per hour (kph) is exactly 100 more than when expressed in miles per hour (mph). How fast did he serve?

6
The Population Explosion

In March 2015 the estimated population of the earth reached 7.3 billion people. The average person is estimated to occupy a volume of 0.063 m^3 so the volume of the total population is 0.4599 km^3 .

- (a) Model the earth as a sphere with a radius of 6,371 km and spread the volume of people over the surface of the earth in a shell of constant thickness. How thick is the shell?
- (b) The population currently grows geometrically at 1.14% a year. How long will it take at this rate for the population to fill a shell one meter thick covering the earth? What will the population be then?
- (c) At the 1.14% geometric rate how long will it take and what will the population be to occupy a sphere with a radius expanding at the speed of light ($= 9.4605284 \times 10^{12}$ km/yr)? Ignore relativistic effects.

7

Catenary

A 15 meter chain hangs from two vertical 10 meter poles placed d meters apart. The low point of the chain hangs 2.5 meters from the ground. What is d ?

