An aperiodical issued at Kingston, Ontario by the
Department of Mathematics and Statistics, Queen's University

It is usually the case that one jackpot is much larger than the other. We will call the former 'jackpot 1' and the latter 'jackpot 2'. The first thing that we shall compute is the expected

[redacted]

every time that we pull the lever.

There is one '7' on each reel. Thus the probability of spinning a '7-7-7' on a pull of the lever is 1 in $22^3$. But we want to know how many pulls of the lever it will take (on average) to win jackpot 1.

Suppose that at the beginning of play jackpot 2 is lighted, but that after inserting 1 nickel into the machine jackpot 1 is lighted

[redacted]

Suppose we look around and find a machine with jackpots of \$160.00 and \$200.00 respectively. What is our expected gain playing this machine for $2 \times 22^3$ pulls, and what is our expected rate of hourly earnings?

As noted above, 1/20th of the money put into the machine goes [redacted] jackpot increases by \$5324.00/20 = \$266.20. Since we have the same likelyhood of winning the jackpot on each pull of the lever, each [redacted]

Our $22^3 + \frac{1}{2} \times 22^3$ pulls take us $\dfrac{22^3 + \frac{1}{2} \times 22^3}{300} = 53.24$ hours. Thus our expected gain playing the '5/5/2' method is \$16.55/hour, which is a significant improvement over the \$10.35/hour of the '5/5/5/5' method.

Finally, we address a problem which many of you may have thought of by now. If we start out with \$x and put it, and all [redacted]

JOHN COLEMAN DAY

Former and present students, colleagues and associates of [redacted]

on his retirement as Head of the Department.

[redacted] presented in the afternoon:

[redacted]

## THE MATHEMATICS AND ENGINEERING PROGRAM AT QUEEN'S

The program in Mathematics and Engineering was developed in 1964 at Queen's in response to a need for applied mathematicians who can work on engineering problems in research and development laboratories. It is the only such course offered in Canada and one of the few in North America. Traditionally, the applied mathematician has worked [redacted] recent years there has been a fruitful interplay between modern mathematics and engineering. The increasingly complex systems in use and under development today require correspondingly sophisticated mathematical descriptions and analyses. Because of this, all [redacted]

[redacted]

Graduates of the program find employment is a wide variety [redacted]

from its inception up to and including the class of 1979. On graduation [redacted]

# PEOPLE IN THE NEWS

Terry Smith attended the ASOC/ASA thirty-sixth annual Conference

Dan Norman spoke to a session at the fall meeting of the Quinte - St. Lawrence Mathematics Association, on the subject of preparing students for university-level mathematics courses.

Peter Taylor led a workshop on the teaching of calculus at the June 1980 meeting of the Canadian Math Education Study Group at Laval University. In July 1980 he gave an invited talk at the Conference on Animal Conflict at the University of Sheffield, U.K. [redacted]

Rick Mollin has joined the Department as an Assistant Professor. Rick received his B.A. and M.A. in mathematics from the University [redacted]

# The Bureaucracy of Omnitopia

by

T. H. Merrett

(Tim Merrett, Queen's 1964, wrote the article on "Databases, Relations and Functional Dependences" which appeared in the [illegible])

Once upon a time in the near Kingdom of Omnitopia, King Ruler was playing a game of Mediates with Shufflesmug, the Royal Secretary, and listening to his complaints.

"And Farmer Sunney was asking again today to graze his cow in the Olympic Training Field. He even brought hay into my office to show me how much better it was there than in his own field," fumed Shufflesmug, concluding a long list of administrative grievances. [illegible]

bureacrat.

(3) Principle of Hierarchy:

Mediation and Buck-passing must not be circular.

[redacted]
would be unwise to commit more than half the population of the Kingdom of Omnitopia (which was 27,182,818 souls) to a bureaucracy, he decided to weaken the Principle of Hierarchy.

(3') No cycle of mediation or buck-passing must be smaller than a given size.

[redacted]

# THE GEOREGE L. EDGETT STATISTICAL LABORATORY
## at Queen's University

by

[illegible]

every area of research: it is used extensively in agriculture, biology, psychology engineering, the social sciences, medicine and to a lesser extent in many other disciplines. It is natural, therefore, that over the years many departments at Queen's found a need for statistical expertise in both teaching and research and solved their problems in a variety of ways. Some hired statisticians, others encouraged their more mathematically inclined staff members to learn about statistics and still others relied heavily on the Department of Mathematics and Statistics. Although all this activity did produce an increased awareness and use of statistics on campus, the quality of instruction and practise was somewhat uneven.

The statistical laboratory serves the entire university and [redacted]

science and medical departments. Not surprisingly some of the purely Arts departments, such as French and English, have needed statistical [redacted]

## A Clever Little Puzzle - The Vicar and the Verger

by

Dave Mason

The vicar and the verger were out for a stroll one Sunday afternoon.

Verger: How was attendance at Church this morning?

<u>Vicar</u>: Not so good. There were just three females in attendance. The product of their ages was 2450 and the sum of their ages was twice yours. Can you tell me their ages?

<u>Verger</u>: (after some thought): No, I'm afraid not.

<u>Vicar</u>: You <u>could</u> if I told you that I was the oldest one in Church this morning.

[redacted]

* * * * * * * * * *

Among VISITORS TO THE DEPARTMENT this winter are

[redacted]

# NEWS FROM GRADUATES

## 1973

John Redding

After graduation from Queen's in Mathematics and [redacted] power supplies. His first employment was with the Bell Northern subsidiary in California. After several job changes, 1980

Frank Dixon

Frank has been in Calgary for the last year working with a small geophysical exploration company doing computer programming. He says that promotional and salary prospects look very good!

1979

Les Gulko

Les is doing graduate work at MIT in nuclear engineering and is planning next to study business.

[redacted]

| NAME | SUPERVISOR | TITLE |
|---|---|---|
| LIZOTTE-VOYER, Danielle | B.J. Kirby | Economic Operation of Hydro-Thermal Electric Power System |
| McGUGAN, James | N. Pullman and S.G. Akl | Local Neighbourhood Search Heuristics for the Travelling Salesman Problem |
| HODDER, James | B.J. Kirby | Recent Research into a Minimization Problem |

PH.D.'S AWARDED RECENTLY BY THE DEPARTMENT

| | | |
|---|---|---|
| HAMILTON, David | D.G. Watts | Experimental Design of [redacted] |

[redacted]

# PROBLEM SECTION

by

Peter Taylor

The following problem was posed in the last issue.

## Problem No. 3

### A Four Dimensional Polyhedron

Let K be the set of all $3 \times 3$ "doubly stochastic" matrices: all entries $\geq 0$ and row and column sums equal to 1 . K can be realized as a subset of nine-dimensional space. What does it look like? Give a geometric description.

## Solution

The problem is not as formidable as first appears. K itself is not nine-dimensional but really only four; there are four "degrees of freedom" in specifying such a matrix. And K is a regular convex polyhedron with lots of symmetry, like, for example, the icosahedron, but one dimension higher. Still you can't quite visualize it but I gave you a start by asking how you might describe an icosahedron to an inhabitant of a 2-dimensional world. You could describe and count its vertices, edges, and triangular faces, and say something about how

$$\begin{matrix} 1-x & x & 0 \\ x & 1-x & 0 \\ 0 & 0 & 1 \end{matrix}$$ for $x$ between 0 and 1 forms an edge and there are 9 edges of this type, one for every $2\times 2$ submatrix.

1-x x 0

[illegible]

[illegible] the three zeros). Call these type 1 and type 2 edges.

[illegible]

Finally we look for the 3-dimensional faces. First note that matrices of K with all entries > 0 must be in the interior of K , whereas a matrix with at least one 0 entry will be in at least one 0-face. Indeed for each (i,j) the set of all matrices in K

are 9 of them. What do they look like? Take the one defined by

$a_{11}$ 0 . The 2×2 upper left corner looks like $\begin{vmatrix} 0 & x \\ y & z \end{vmatrix}$ . The three parameters x,y and z determine a member of K if and only if

$$0\leq x,y,z\leq 1$$

$$x+z\leq 1$$

$$y+z<1$$