Department of Mathematics and Statistics, Queen's University

JOHN COLEMAN

[redacted]
Head of the Department as of July 1, 1980, and a successor has been appointed.

He and his wife Marie-Jeanne will be on sabbatical leave next [redacted]
year, probably at the University of British Columbia.

John was born in Toronto in 1918, went to high school there and graduated from the University of Toronto in mathematics in 1939. [redacted]

He and Marie-Jeanne have two sons and two grandchildren.

After retiring as Head he will remain a member of the Department and plans to emulate his predecessor, Ralph Jeffery, who continued to teach three courses until he was 85 years old.

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JOHN COLEMAN DAY

The Department is planning a day on which all of John's former students, colleagues and associates may gather in order to honour him on his retirement as Head of the Department.

[redacted]

[redacted]

If you are interested in receiving further information about this event as it becomes available please fill out the following form and return it.

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John Coleman Day

[redacted]

Name and Address:

Degree from Queen's and year: (if applicable)

Mathematics and Statistics at een's 1960-1980

- John Coleman

It was on July 1, 1960 that I assumed responsibility as Head [illegible] of the Department of Mathematics at Queen's. If all goes according to plan, on July 1 of this year, after twenty years, I shall [illegible] step down and Lorne Campbell will take on the task of guiding the Department of Mathematics and Statistics. Nowadays, in most universities a twenty-year tenure as Head of a Department would seem so extraordinary as to be noteworthy. Not so at Queen's; in fact, I had only four predecessors (Williamson 1842-80, Dupuis 1880-1911, Matheson 1911-43, Jeffery 1943-60) whose tenure averaged [illegible]

Since when I began as an Assistant Professor at Queen's in 1943,

[illegible]

in 1952, the princely sum of $3000, moon-lighting in the summer

[illegible]

This small incentive gave a remarkable fillip to mathematics in Canada.

However, Jeffery was equally concerned for good undergraduate teaching and convinced of the importance of the relations of the as the central focus of the building. Our excellent collection of monographs and journals and their pleasant physical setting has brought many satisfying expressions of admiration and envy from distinguished visiting mathematicians.

In 1968, the Department had the good fortune of being awarded a Negotiated Development Grant by the NRC. There is [redacted] forward as was documented in my Report to the NRC in 1972.

[redacted]

have been impossible. In so doing, (i) the average competence of this Department has been markedly raised; (ii) many research papers of good quality have been produced which would not have been possible without the Grant; and, (iii) insofar as the Univer- [illegible]

will carry the significant increase of mathematical power into the future. Naturally, I used the opportunity of reporting to attempt [illegible]

However, I am personally strongly critical of the very widespread ethos in North America which encourages the pure mathematicians to exist independently of, and with little contact with, applied mathematicians. Though he was pre-eminent as a pure mathematician, my predecessor - Professor Jeffery - worked extremely hard to maintain happy relations between the Mathematics Department and the Engineering Faculty of Queen's. He succeeded in this and it has been a main plank in my policy to foster the same good

[redacted]

relations. It is only in such a context that one can expect to have a proper understanding of the role of mathematics in the total republic of the sciences and make a "useful" contribution to the Canadian economy viewed in the largest possible sense.

[redacted]

during the past four years, and even though there are some people outside the country who would rate us as the best all-around department, I would be the last to suggest that we have, in fact, achieved anything close to the level of quality which the country

[redacted]

to the Department, and by the impression other mathematicians have of our published papers, the Queen's Papers in Pure and Applied Mathematics are a not insignificant factor. Edited by Professors Ribenboim and Coleman, and published by the Campus Bookstore, this series has been a financial success and now consists of 52 titles. [illegible]

[illegible] without math[illegible] the Economist of October 27, 1979 devoted five pages (107-114) of its section on Business to an informative if they are to avoid mere ignorant oscillation between [redacted]

can be no vision of this depth apart from a philosophy [redacted]

THE NEW HEAD

The Principal formed a search committee in October, 1979 to advise him on a successor to Professor Coleman as head of the Department. Included on the committee were three members of [redacted]

In February the Principal announced that Lorne Campbell will be the new Head for a five year term beginning July 1, 1980.

Dr. Campbell, who has been a member of Queen's University since 1963, received his B.Sc. from the University of Manitoba, his M.S. from Iowa State and his Ph.D. from the University of [redacted]

Telecommunications Establishment of the Defence Research Board

THE PRINCIPLE OF INCLUSION AND EXCLUSION

by

Dave Mason

(David Mason obtained his B.Sc. in Mathematics in 1972 and his M.Sc. in 1973, both at Queen's, his supervisor being Norm Pullman. [redacted] the Department of National Defence.)

[redacted] means "the application of scientific knowledge and techniques to the solution of operational problems". In my case these problems may

A survey of the class shows that the actual number of students with various combinations of these properties is:

$N(A) = 11$ $\qquad$ $N(A,B) = 6$

$N(B) = 15$ $\qquad$ $N(B,C) = 4$

$N(C) = 6$ $\qquad$ $N(A,C) = 3$

$$N(A,B,C) = 1$$

[illegible]

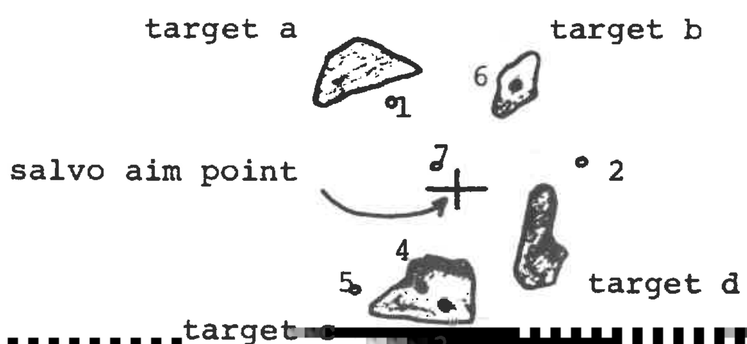
have blue eyes and can roller skate. The counts generated consider [illegible]

$$
\begin{aligned}
N(A',B',C') &= 25 \\
&- N(A)-N(B)-N(C) \\
&+ N(A,B)+N(A,C)+N(B,C) \\
&- N(A,B,C) \\
&= 5
\end{aligned}
$$

You may find it easier to visualize the reasoning used by drawing

Proof of the Principle can be done by induction on M, the number of properties. Note that since "not (not A)" is precisely "A", we could rewrite the above identity with the A_1' on the right and the A_i on the left and it would be equivalent.

Problems typically suited to the application of the Principle of Inclusion and Exclusion are those where the number of objects with certain properties is difficult to determine, but the number of objects without these properties is easily calculated (or



For each rocket there are 5 possibilities: it either hits one of the targets ('a','b','c' or 'd') or it misses all of them. That means there are 5^7 or 78125 possible outcomes of one rocket salvo launch (we assume the rockets are distinguishable).

To apply our general theory in this case, we take our set

[redacted]

of "objects" to be the set of all possible outcomes. The value

[redacted]

of N is 78125. We are interested in four "properties" that an individual outcome can have:

A) that target "a" is hit at least once.
B) that target "b" is hit at least once.
C) that target "c" is hit at least once.

[redacted]

$N(A'B') = N(A'C') = N(A'D') = N(B'C')$

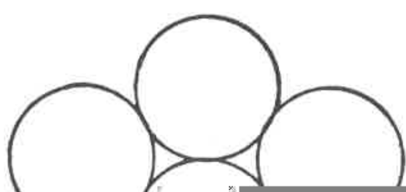
[redacted]

Applying the Principle then gives us

[redacted]

$$= 25,200$$

[redacted]



Rocket
Launcher
Cross-Section

From the drawing it appears that six circles fit exactly around one in the middle. In fact it's true, but do you know the reason? [illegible]

How many rockets could be carried in a launcher with an additional [illegible]

row of tubes around the outside of the seven? (Ans. 19). Do they also fit exactly around the perimeter? (Ans. yes). How about for one more row? (Ans. 37). Try it with a bunch of pennies and the symmetry will become [illegible]

Mathematics and Engineering students Andrew Long and Rick White competed in the Ontario Engineering Design Competition [illegible]

PEOPLE IN THE NEWS

John Coleman, Liberal candidate, narrowly lost the recent federal election to Flora MacDonald. He reduced the Conservative lead from 20% in 1972 to a mere 2.5% on February 18, and, indeed, both the CBC and CTV networks predicted his victory based on early poll results. He won in the city of Kingston itself but was surpassed in the surrounding Kingston township.

Tony Geramita has been invited to speak at the American Mathematical Society special session on commutative algebra in Philadelphia in April, 1980. After that he is visiting the Università di Catania for a month to give a series of lectures on algebra and geometry. Tony has recently been elected vice-president of King Cole Homes, a non-profit community housing project in Kingston.

Dan Norman spoke recently to a meeting of the Hastings County [illegible]

Tom Stroud is undertaking a data analysis for Educational Testing [redacted]

NEWS FROM GRADUATES

1973

Selma Tennenhouse is now working for Computech Consulting [redacted]

[redacted]

This spring's graduating students at Queen's University have achieved outstanding results in competition for prestigious national

[redacted]

This reflects, of course, the extremely high calibre of the

[redacted]

PROBLEM SECTION

by

Peter Taylor

The following problem was posed in the last issue [redacted]

=

[redacted]

Here is an example for $n = 5$.

$$\begin{aligned} x &= 4 \quad 7 \quad 8 \quad 1 \quad 4 \\ Tx &= 3 \quad 1 \quad 7 \quad 3 \quad 0 \\ T^2x &= 2 \quad 6 \quad 4 \quad 3 \quad 3 \\ T^3x &= 4 \quad 2 \quad 1 \quad 0 \quad 1 \quad . \end{aligned}$$

What happens, in general, if T is iterated indefinitely? I am especially interested in receiving any concise proofs. I [redacted]

I [redacted]

group theory, and even finite field extensions. This may explain [redacted]

Probably the way to begin thinking about a problem like this [redacted]

Now the characteristic polynomial of S_n is $p_n(\lambda) = \lambda^n + 1$. If we factor out as many copies as we can of $\lambda + 1$ (over Z_2) we get $\lambda^n+1 = (\lambda+1)^k r(\lambda)$ where $r(\lambda)$ is not divisible by $\lambda+1$, and has degree $n-k$. Then it can be shown that V_n is the direct sum of the two subspaces $A = \ker(S_n+I_n)^k$ of dimension k and $B = \ker \underline{r}(S_n)$ of dimension $n-k$. Further, T_n is nilpotent on A (some power of T_n vanishes) and is nonsingular on B. So starting with any element of V_n, if it is in A, then some power of T_n annihilates it; if it is not in A, then some power of T_n maps it into B. So we need only know how T_n acts on the S_n-orbits in B.

Well now this is getting rather esoteric, and it certainly isn't everyone's cup of tea, but if you recall some of your linear algebra, it gives you an idea of how far you can go in simplifying the analysis of the structure of T_n. What we have accomplished is this. If we know the number k of times that $\lambda+1$ is a factor [redacted]

the space of "periodic" vectors x of T_n (some power of T_n applied [redacted] the structure of T_5 . If we start with a constant in V_5 , we eventually wind up in a fixed cycle of period 3 - and it's always the same cycle up to shifts.

For another example, I will consider the case where n is a power of 2 , $n = 2^k$. It can be shown that, over Z_2 , $\lambda^n+1 = (\lambda+1)^n$ is the factorization in this case. This implies [redacted]

that $A = V_n$, and T is nilpotent: every vector is eventually transformed into zero. So the pattern we observed for $n = 4$ holds for any power of 2 . This result was also obtained by a [redacted]

Comments were also received from Peter Leipa (Toronto) who observed that all T-orbits wind up in a limit cycle. The case n=4 is treated in Ross Hensberger's book, Ingenuity in Mathematics, on page 80. I am indebted to Jack Harvey for this reference. If the problem still interests you and you find the sophistication forbidding, play with a few more examples (n=6 and n=7) and try to perceive the structures I have described.

Problem No. 3

[redacted]

[illegible]

(0-dimensional faces) each subtending [illegible] (1-dimensional) faces of which [illegible]

[illegible] there are 30 in all. There are 20 2-dimensional faces, all triangular. So far he can visualize everything.

[illegible] triangular faces fit together by labelling them and specifing adjacencies. Still, this doesn't [illegible] give much of a picture of what the whole thing looks like. You might [illegible] try the following. Take a horizontal "cutting plane" and lower it through the polygon describing how the [illegible]