$$0 \in \sigma(x^*x) \Rightarrow 0 \in \partial\sigma(x^*x) \qquad \text{(by Lemma 8)}$$

$$\Rightarrow \exists \; (z_n)_{n \in N} \subset A, \; \text{with} \; ||z_n||=1 \; (n \in N)$$

$$\text{such that} \; x^*xz_n \to 0.$$

$$\Rightarrow (xz_n)^*xz_n \to 0$$

$$\Rightarrow xz_n \to 0 \qquad \text{(by B}^* \text{ property)}$$

$$\Rightarrow 0 \in \sigma_\ell(x).$$

Well, you couldn't get much easier than that. We are tempted to say that it's "the right proof", but there may well be a dozen others with equal claim. Who knows?

References

1. AXLER, S, and SHAPIRO, J.
   "Putnam's Theorem, Alexander's Spectral Area Estimate, and VMO", *Math. Ann.*, 183 (1985) 161-183.

2. GOODEARL, K.R.
   '*Notes on Real and Complex C*-Algebras*', Shiva Publishing Ltd, 1982.

3. HALMOS, P.
   '*A Hilbert Space Problem Book*', 2nd ed., Springer-Verlag, 1982.

Department of Mathematics,
University College Cork.

PLAYING THE NUMBERS GAME IN NEW YORK

Gabrielle Kelly

When I arrived in New York I was struck by the curious phenomenon of lines of people outside very small newsagents and tobacconists. It was widespread. All over Manhattan from 216th St to 14th St, from west side to east side there were snake lines of people on the pavement. They were Hispanics, blacks, whites and Chinese. They ranged from street people and bag ladies to white-coated MDs and business executives. Were they lining up to be rubber-stamped? Did I need some more identification other than my two university IDs, my social security number, my telephone and computer numbers, bank numbers and alien card number? I then saw the magic word - Lotto. Ah! The numbers game I thought. Run by the Mafia I thought. But what about those MDs? Over the next couple of days I was advised by bus drivers, at the hardware store and by my doorman to go out and buy my Lotto number. Surely, I said, not braving to reveal my ignorance. Every four-year old in New York obviously knew all about it. Strangers called to me in the street - got your Lotto number yet?

I enquired from my colleagues. A $41 million prize had accumulated and the draw was to be in two days time - August 23rd. Some of my colleagues were also buying tickets. A ststistician went on TV to declare to the public "the bigger the prize, the bigger the payoff!" I could not believe my ears. On the average I thought ..., in the long run. The front page of the *New York Times*, August 22, revealed all.

The New York Lotto 48

Select any combination of six numbers between 1 and 48. Enter as often as you like. Minimum purchase 2 tickets. Tickets are 50 cents each. You win:

First Prize : all your 6 numbers are drawn.

Second Prize: 5 of your 6 numbers are drawn.

Third Prize : 4 of your six numbers are drawn.

Fourth Prize: 3 of your 6 numbers are drawn and of
your remaining 3 numbers one matches a
supplemental number that is drawn after
the 6 main numbers.   The supplemental
number is used only in figuring fourth
prize.

Under the law that created the New York State Lottery
nine years ago, 45% of the revenue from ticket sales is used
to finance education, with 40% going into the prize pot.   The
remaining 15% goes to administering the lottery.   The 40%
that is prize money is split as follows: 50% for the 1st
prize, 11% for the second prize, 28% for the third prize and
11% for the fourth.   Prize money is split if there are joint
winners.   If there are no winners the money is carried over to
the next drawing in the appropriate prize category.   The
reason for the Lotto fever this August was that there had been
no first prize winners in the previous seven drawings.   With
the money rolled over, it was predicted that there would be a
total of $47 million in prize money, with $41 million of that
going to 1st prize.

To Play or Not to Play: That is the Question

There are 72 million possible combinations of 6 numbers.
If I buy two tickets, my odds are 6.1 million to 1 of winning
a prize.

Assuming random choice of numbers, lottery officials were
predicting 6 first prize winners.   Taking *only* first prize of
$41 million into account shared among 6, I computed my average
winnings to be approximately a dime, based on a purchase of two
tickets.   A dime is a positive number!   A gambling game with

average payoff positive is almost unknown.   But the average
means the long run, i.e. repeated plays of the game.   And to
quote Keynes: "In the long run we are all dead."   My chances,
I knew, of winning first prize were 1 in 72 million.   I spent
my $1 on a nice cool beer.   But there are many experts.

More Words to the Wise

"Your lucky number enclosed in a privacy folder", read the
Lucky Green Number Machine on 42nd St.   "All numbers randomly
selected by a computer (experts say random is best)."

The Happy Players Club suggests numbers to play based on
"probability and past pattern performance".   The Lottery Ad-
vantage Newsletter (run by a former stockbroker) provides read-
ers with a variety of charts to determine, for example, which
numbers tend to win together or which numbers are hot and which
are cold.   Advice abounded: "Don't choose a number less than
32 - many people use birthdays and months to select their num-
bers and you have to share the prize."   A less empirical app-
roach was offered by the astrologers. "Luck", according to Mr
Martin, a Long Island astrologer and lottery specialist who
advises clients, is determined in part by the "metaphysical
essence of the trine aspects at the time of birth", and people
born under the Sagittarius sun sign, such as Mayor Koch and
Woody Allen, tend to be naturally blessed.

If You Win ...

The State Lottery director advised: "Get a lawyer, hire an
accountant, write a will, and get an unlisted telephone number."

Meanwhile ...

On August 22nd, tickets were selling at the rate of 20,000
a minute as people waited in line at 3,903 ticket outlets thr-
oughout the State.   Lines started at 4.00 a.m. and some people

waited as long as three hours.   One came with $1,100 to buy
tickets for himself and everyone on his block.   Executives of
companies bought tickets for employees - a summer bonus.

In Case You Missed It:

14-17-22-23-30-47

Supplementary Number : 33

What They Won

First Prize : $13,666,666.66.

Three tickets shared $41 million.

Second Prize: $2,611.50.

578 tickets had five of the numbers.

Third Prize : $79.50.

48,052 tickets had four of the numbers.

Fourth Prize : $23.00.

65,037 tickets had three of the numbers
plus the supplementary number.

Total number of ticket sales: 36 million approximately.

One first prize ticket was owned by a pool of 21 factory
workers, most of them recent immigrants.   Everyone was del-
ighted with this.   After taxes, they got $36,000 a year for the
next 20 years.

postscript

De Moivre, corresponding with Lord Carpenter concerning
his work 'The Doctrine of Chances', wrote: "this is not to
promote play but rather that people knowing the correct odds
in play will become more chaste in their gambling habits".
Times have not changed.

Reference

New York Times, August 22 - August 26, 1985.

School of Public Health (Biostatistics),
CUNY,
New York, N.Y. 10032.

Congratulations!

To Phil Rippon (OU), our Problem Page Editor, on being awarded
a Junior Whitehead Prize by the London Mathematical Society in
June 1985.