0 ∈ o(x^n) ⇒ 0 ∈ 3o(x^n)                  (by Lemma B)
⇒ ∃ (z_n)_{n ∈ N} ⊆ A, with ||z_n|| = 1 (n ∈ N)
such that x^nz_n + 0.
⇒ (x^nz_n + 0)
⇒ x^nz_n + 0                       (by B property)
⇒ 0 ∈ o(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,

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.

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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 newsgagents
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 obvi-
ously 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
statistician 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 Advantage Newsletter (run by a former stockbroker) provides readers 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 numbers and you have to share the prize." A less empirical approach 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 throughout 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 delighted with this. After taxes, they got $36,000 a year for the next 20 years.

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**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**


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**Congratulations!**

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