WHAT DOES IT COST TO PLAY THE LOTTERY?

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My education in the economics of the lottery business really started when I was introduced to M., by a mutual friend. That was four years ago. M. is rich in the way of money. He is also rich in the way of paradoxes. The first paradox he presented was this: he is a highly educated man, yet he likes to play the lottery. This made me hope that I might be able to learn something from him. I work for a lottery, trying to understand why people play and how to help them play more.

I arranged to meet M. for lunch one fine day. As we strolled toward the park, I asked him right away why he played the lottery.

"I suppose it keeps me from taking everything to do with money so seriously," he said. M. in fact has a very serious job. "You want to play some scratch tickets?"

I reminded him that as a lottery employee I could not play, but I was hoping to have some fun vicariously by watching him.

"OK, watch and learn," he said. "First of all, I only buy the cheap tickets."

We went into a place where we could get carry-out teriyaki and lottery tickets. He stepped up to the counter, threw down two hundred- dollar bills, and said, "Give me twenty of the Royal Flush."

"That's a ten-dollar game", I said.

"Yes."

"I thought you said you played the ones and twos".

"I said I played the cheap tickets. The ones and twos are more expensive".

I must have looked uncomfortable, and he must have thought this was because of the other customers who were looking hard at the ones and twos. "Don't worry, I'll explain outside".

The weather was fine and we sat outside with food and scratch tickets.

"So, let me give you my perspective on this. What does the Lottery sell?"

"We give everybody a chance to dream", I recited. I like to stay in step with the marketing department.

"Ah! And what does that cost you?"

"Well, we give some people money, of course."

"So you sell prizes, right?"

"Well to individuals we sell chances. But some of those chances are worth money, so I suppose yes, we sell prizes."

"What do you charge for prizes?"
"Well, there are all sorts of prices, from one dollar up to twenty at least".

"Now", he said, raising his right finger in a gesture that I have come to associate with moments of enlightenment, "I might agree that those are your prices for chances. But for prizes, you are charging the inverse of the prize expense".

He looked at me as if he had named a mutual acquaintance and I looked back at him with a neutral expression, as I do when someone says something that makes no sense at all to me, hoping to fill in the meaning later from context. However he said no more, evidently thinking that he had made the matter clear to me. I let my eyebrows creep up to reveal that I was not acquainted with the entity he had named.

"That's to say," he said, "you take the percentage of the face price that goes to pay prizes, and invert it" (here a counterclockwise rotation of the hand, as if he had grasped the prize expense and set it on its head)" by dividing it into one. That's a number bigger than one, and that is what you are charging players for every dollar of prizes you pay out."

I had not at that time turned very many numbers on their heads, but I remember that I recovered my footing and said, "So, in Mega Millions we charge $2 for every dollar of prizes." For we are all proud of that 50% prize expense.

"Right. And in this game" (waving a Royal Flush ticket) "you are charging only $1.37. So this game is a lot cheaper than Mega Millions. It's also a lot cheaper than those little tickets that are priced at one or two dollars. Those cost more like $1.75 for every dollar of prizes."

"You don't buy Mega Millions?"
"Sure I do, and Powerball too. Expensive is not necessarily a bad deal. Those games have prizes that you don't see anywhere else. There is no other decision I am likely to make that has the slightest chance of bringing me $100 million dollars. I'm happy to pay $2 on the prize dollar for those games, even if I don't see a lot of it coming back. "

He smiled in a confiding way.

"On the other hand, I don't care to play Pick 3. The cost is the same as Mega Millions: $2 per dollar of prizes. But I don't care about $500 prizes; they are commonplace for me. I don't care if they do come back."

"And by "coming back" you mean…"

"Suppose you are playing in a moderate way in Pick 3," he said. "If you spend $1,000, that's 1,000 plays at odds of 1 in 1,000. It's not certain, of course, but you are more likely than not to win a $500

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prize. So it's more likely than not that you actually receive one dollar in prizes for every two dollars you pay in, as a moderate individual player. That money is coming back to you."

Each time he repeated "more likely than not" he made a peculiar gesture that I later came to realize corresponded to a precise mathematical construct that he was invoking. The gesture was the same one I have seen speakers of French say when they say, "Comme ci, comme ca".

"On the other hand if you spend $1,000 in Mega Millions, you don't expect to see half of that coming back. Not even a tenth. It's going somewhere to make a really interesting prize."

I said I was glad to hear that he thought it moderate to spend $1,000 on one of these games.

"But that's my point – have I really spent it if I'm sure it's coming back to me? We were talking about the cost to players being the inverse of the prize expense (again the corresponding hand gesture), but that's to players in general. And that's the same in Mega Millions and in Pick 3. But to me in particular, as a moderate player, it's very different in Mega Millions and in Pick 3 – in Mega it's well and truly spent."

"Now these," he said, spreading a fan of Royal Flush, "only cost $1.37 per dollar of prizes to start with. And I know that I can expect more than half what I spend to come back to me if I'm playing enough. So these are a bargain if you like this sort of thing."

Game	Lottery Prize Expense (PE)	Players' Collective Cost, $ per $1 prize (1/PE)	Individual Likely Cost to Play $1000 Worth *($1000 less expected value of prizes with >=50% chance of winning)*
Mega Millions	50%	$2.00	$917
Pick 3	50%	$2.00	$500
Royal Flush ($10)	72.9%	$1.37	$366
Royal Eights ($1)	58.5%	$1.71	$455

"And you know that how?"

"The prize structures are published on your Web site".

I was familiar with those tables that show the prizes and so forth, but this was the first time I had heard them called "prize structures". M. can make some interesting conclusions from seeing a prize structure.

"Actually, I have been meaning to put together a metric for the actual cost of playing a lottery game."

He spoke as if this were an act of hospitality, like inviting people over for dinner.

"I'm thinking that the amount of money a thousand-dollar player is more likely than not to win might serve pretty well."

Having settled on what to serve for the main course, M. evidently had no worries about how to produce it. He folded the Royal Flush into a pocket of his jacket and we went on to talk about other things as we ate.

A week or so later I got an e-mail from M. at work that included the table above.

That was four years ago. At my lottery we now produce a table that shows every game we sell with "metrics" like this. It has helped us to understand some of the differences among our products. And it has helped us frame some questions that we have not yet answered, like why, within the instant game portfolio, we maintain this paradox: The games that look cheaper are more expensive to play.

It has been typical of my conversations with M. that his gestures are often shorthand for mathematical operations, and his e-mails often have tables in them. Despite these peculiarities I have learned a lot from him. I hope to relate some more of what I have learned in a future article. ■

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