JEFFREY ROSENTHAL'S NEW ANALYSIS OF ALL OF THE DURANT LOTTERY WINS

* Penny Durant is recorded as winning 74 PICK4 lottery prizes, each of $832 or more, between July 2011 and December 2017.

* The web page https://vtlottery.com/games/pick-4 lists five different "4-Number Plays" to win different amounts at PICK4. In each case, the listed prize is for betting $1, but actually the player can bet any amount from $0.50 to $5.00, which correspondingly multiplies the value of the prize. (It also lists some "2-Number Plays" and "1-Number Plays", but the prizes for them are too small to win $832 or more, so we ignore them.)

* The question is: How much would Durant have had to spend on lottery tickets, to have at least a one percent (1%) chance of winning 74 PICK4 prizes each of $832 or more?

* In general, if you buy "N" tickets each with probability "p" of winning, then the probability of winning at least "w" of them can be computed by the "R" command:
  
  \[ \text{pbinom(w-1, N, p, lower.tail=FALSE)} \]

  Then, the number of purchases required to have a one percent chance of winning at least "w" of them, is equal to the smallest value of "N" for which the above command gives at least 0.01. And, the amount of money required is equal to the amount spent per ticket, times the above number of purchases required.

* We consider different possible strategies to generate at least w=74 PICK4 wins each of $830 or more, depending on the bet type chosen.

  * Strategy #1: "Straight". Suffices to bet the minimum $0.50, to get a prize of $2,500. Here p=1/10,000. For the above command to give more than 0.01, N has to be more than 550,000, at a cost of $275,000.

  * Strategy #2: "Box 4-way". Suffices to bet $1.00, to get a prize of $1,250. Here p=1/2,500. For the above command to give more than 0.01, N has to be more than 130,000, at a cost of $130,000.

  * Strategy #3: "Box 6-way". Suffices to bet $1.00, to get a prize of $834. Here p=1/1,667. For the above command to give more than 0.01, N has to be more than 92,000, at a cost of $92,000.

  * Strategy #4: "Box 12-way". Suffices to bet $2.00, to get a prize of $832. Here p=1/833. For the above command to give more than 0.01, N has to be more than 46,000, at a cost of $92,000.

  * Strategy #5: "Box 24-way". Suffices to bet $4.00, to get a prize
of $832. Here \( p = 1/417 \). For the above command to give more than 0.01, \( N \) has to be more than 23,000, at a cost of $92,000.

* SUMMARY SO FAR: To have at least a 1% chance of winning 74 or more PICK4 prizes each of more than $832, Durant would have had to spend at least $92,000 on PICK4 lottery tickets.

* And what about her other lottery wins, besides PICK4?

* Durant is listed as winning 37 lottery prizes at other games besides the PICK4 ones, over the period February 2011 to December 2017. These prizes include 12 different PICK3 of at least $830 each, plus 25 others on such games as VIP CLUB, FAST PLAY, ROYAL CASINO, and ULTIMATE BANKROLL, with prizes each at least $500.

* These other games appear to have similar spending requirements and odds. For example, 6 of her prizes are for $830 at PICK3. According to https://vtlottery.com/games/pick-3 to win $830 at PICK3 by betting $5 on BOX (3-way) has odds of 1/333 and cost of $5. To have at least a 1% chance of winning 74 or more prizes that way would require buying at least 18,400 tickets, at a total cost of $92,000, exactly the same as before. Meanwhile, 5 of her prizes are for $500 at FAST PLAY (plus one for $1,000 at FAST PLAY), and the web page at https://vtlottery.com/games/fast-play does not appear to provide odds of winning that game, but probably the spending requirements and odds to win large prizes are similar to the other games.

* If we assume that these 37 other VT lottery wins (besides PICK4) are all similar to PICK4 in terms of the spending requirements and odds to obtain large payoffs, then we can extrapolate the above formula by replacing \( w=74 \) by \( w=111 \). Then, with say the "Box 24-way" strategy, with \( p = 1/417 \), for the above command to give more than 0.01, \( N \) would have to be more than 36,500, at a cost of $146,000.

* CONCLUSIONS:

  - To have at least a one percent chance of winning at least 74 different PICK4 prizes each of at least $832, would require spending at least $92,000 on PICK4 lottery tickets.

  - Assuming the spending requirements and odds of the other lottery games are similar to those of PICK4, then to have at least a one percent chance to win at least 111 different VT lottery prizes each of at least $500, would require spending approximately $146,000 on lottery tickets.