

An Analysis of a Lottery Master Guide

People spend millions of dollars every year on lotto tickets, hoping to choose the numbers that will win the jackpot. Many of those people have created systems for winning the lottery and publish these systems for others to buy. One such person is Gail Howard. She has written a book entitled *Lottery Master Guide* (\$24.50 paperback), complete with ways to choose numbers and what lotteries to play in. Howard tells us that there are three methods to winning the lottery: game selection, number selection, and balanced wheeling systems. This paper will focus on the second area of her book, number selection, which is based on the belief that patterns can be found in the random drawing of lotto numbers. It will explain and then analyze the systems she puts forth under the section Short Term Lotto Trends. These strategies are then applied to the New York Lotto, with the outcome recorded.

Two logical fallacies recur frequently within Howard's book and should be noted up front: the gambler's fallacy and the special rare event fallacy. The gambler's fallacy is the belief that because some event has digressed in recent outcomes from the expected long-term outcome, that outcome will be corrected in the short term. An example of this occurs when a penny has landed heads up nine tosses in a row and one believes this signifies that the probability that the penny will land heads up again is very small, when in actuality the probability of its landing heads up is $1/2$. The special rare event fallacy is where one mistakes *some* rare event for a *special* rare event, such as believing that a license plate with your birthday on it is unique and special, when in actuality every

license plate is unique and special. In this fallacy each of these events is equally likely and one of them must occur; while the event itself may be rare (your seeing a license plate with your birthday on it), the actual happening of that event (the license plate with your birthday on it) is common.

According to Howard, the best way to choose numbers for the lottery is to analyze what has happened in the past, as that will reveal which numbers have a higher probability of showing up in the future. All of Howard's strategies involve the gambler's fallacy; we will first look at those strategies that are based solely on the gambler's fallacy and follow with those based both on the gambler's fallacy and the special rare event fallacy.

Gambler's Fallacy

The gambler's fallacy is based on the belief that numbers follow a Poisson distribution, i.e., that within a specific number of games a lotto number should appear a precise number of times. Thus in the case of the New York lotto (6/58), in the past ten drawings every number should have appeared at least once, with two numbers appearing more than once. With this in mind, it is easy to understand that a number appearing more than once creates excitement in the mind because it is not expected—it is not as it should be. In general, as the number of games goes to infinity, the ration between the appearances of the numbers should even out so that each number appears in a proportional rate with the other numbers. However, one of the criteria for the Poisson distribution is that the probability that an event will occur in a given short interval is approximately proportional to the length of the interval. Any analysis will show that this is not true for the hits of lotto numbers.

Odd-Even Bias Tracker. Howard's solution for choosing odd or even numbers is based on the idea of "due" numbers. From analyzing the last ten games one can determine whether even or odd numbers are due by finding the difference between the number of even numbers hit and the number of odd numbers hit. The one with the least hits becomes due to hit; Howard terms this being due as containing a "bias" (that area which is biased to be hit next) (Howard, 35). By finding the difference between the odds and the evens one can know which combination of odd and even numbers to place. As Howard explains, discovering that there were 18 more odds than evens drawn in the last ten lottos "tells you to play more Even Numbers because the last ten games had 18 more Odd than Even numbers....A BIAS IN THE HIGH TEENS OR 20s may be good for playing ALL Odd or ALL Even Numbers [sic]" Howard states. She cautions to "keep in mind that all Odd or all Even happens in only 2% of all drawings, so be sure the Bias is high enough" (35).

Assuming randomness in lotto drawings, future winning numbers are independent of past winners. The probability, then, of an even number being drawn given that 15 more odds have been drawn in the last ten games is the same as the probability of an even number being drawn no matter what was drawn before. Thus for the New York lotto, where there exist the same number of evens as odds, the $P(\text{even number drawn} | \text{the bias for even numbers is 15}) = P(\text{even number drawn}) = \frac{1}{2}$. (Either an even number is drawn or an odd one—there is a 50-50 probability.) This determines only if an even number is more likely to be drawn than an odd based on past drawings. Calculating the bias of evens to odds will not determine the outcome of evens and odds in the next drawing,

The average sum for the drawings between February 12 and March 15 was 180. This becomes the standard from which the deviations of the other sums are recorded. One can see that the winning sum for the March 15th drawing was 153. Thus in filling out the chart, one would mark an x for every place until one reached the 153rd spot. If one x counted for every 2 numbers' deviation from the average, one would mark 13 xs to the left of the center line. Upon completion of the chart one "will see how quickly a bias compensates by swinging to the opposite side. It does not take long for one side to balance to the other" (38). From the noted sums of the New York lotto above one can see that the sum of the first game is 153, the second is 216, and the third is 133. The sums seem to be swinging from one side of 180 to the other. This is what Howard is describing when she speaks of the "compensation" of the numbers. Howard does not suggest how to choose a specific winning sum from the chart. It is assumed by the author that one must look at the overall picture of the chart and guess approximately where the bias for the next sum lies.

The actual distribution of the sums will be a normal distribution with the top of the bell curve at 156. This means that while there is one way of choosing the lowest sum of 21 ($1+2+3+4+5+6$) and one way of choosing the highest sum of 333 ($53+54+55+56+57+58$), 156 has the most different ways of being chosen.

Number Groups Bias Tracker. Here Howard suggests you divide the numbers of the lotto game you wish to play into groups such as tens, twenties, thirties, or 0-5, 6-10, 11-15, etc., making a chart to record each division. The more charts created signifies the more analysis of the numbers that can be done, hence the easier it will be to choose

numbers that are due. Below is the chart for the same New York lotto drawings listed above. These drawings have been divided up by tens.

Number Groups	Game1	Game2	Game3	Game4	Game5	Game6	Game7	Game8	Game9	Game10	Totals
01-09	1	1	-	-	-	-	2	1	-	2	7
10-19	1	-	3	3	1	1	-	-	1	-	10
20-29	2	-	2	-	1	1	-	2	2	1	11
30-39	1	2	-	2	1	1	2	1	-	1	11
40-49	1	2	1	1	2	2	1	-	2	2	14
50-58	-	1	-	-	1	1	1	2	1	-	7

Since 10 does not divide evenly into 58 there will be an obvious skew in the first and last bracket, because these brackets do not contain the same number of number choices as the others. In creating another chart Howard suggests dividing the chart up by a number that divides evenly into the total number of number selections (to avoid the skew or under-bias)—such as the 6/49 lotto could be divided into tens, as above with skew, as well as into sevens without skew. According to Howard, “the smaller the groups the lotto numbers are divided into, the longer a group can go without a hit. Divided into groups of ten, even three games without a win can make a group due for a hit. Divided into groups of five, a group may not be due for a hit for five or six games” (40). In the New York lotto chart, it does not appear that any one group of numbers is due to hit because every bracket has been hit within the last two games. In forming another chart, because only two and 29 divide evenly into 58 and two is too small whereas 29 is too large to be of benefit in narrowing our choices for number selection significantly, the author randomly chose 6 as a divisor for the New York Lotto.

Number Groups	Game1	Game2	Game3	Game4	Game5	Game6	Game7	Game8	Game9	Game10	Totals
1-06	1	1	-	-	-	-	-	1	-	2	4
7-12	-	-	2	1	1	1	2	-	-	-	5
3-18	1	-	-	2	-	-	-	-	-	-	2
9-24	-	-	1	-	1	-	-	1	2	-	4
5-30	2	-	1	-	1	1	1	1	1	1	8
1-36	1	2	-	2	1	1	-	1	-	-	6
7-42	-	1	-	-	-	2	2	-	1	2	6
3-48	1	1	1	1	1	-	-	-	1	1	7
9-54	-	-	-	-	-	-	-	1	-	-	1
5-58	-	1	-	-	1	1	1	1	1	-	6

One can see that while no number groups appeared to be due from the division of the winning numbers into tens, from the division into sixes it is clear that numbers from the 49-54 group are *very* due as they have not been hit for seven games, while all other brackets have been hit at least once within the past three games. Thus the gambler would be sure to include a number from this bracket on their next lotto ticket.

The mathematics of the fallacy behind this philosophy is the same as that of the others under this section. Each drawing is independent, and thus the idea of “due”-ness has no valid logic.

Special Rare Event Fallacy

The systems under this section contain both the gambling fallacy and the special rare event fallacy. Although it can be shown that the systems above contain aspects of the special rare event fallacy, the author felt that the gambler’s fallacy was more prevalent in those systems. The following systems are listed here so that the reader may more fully understand how the special rare event fallacy is used in Howard’s systems and what the effects of this fallacy have in number selection. There is no mathematical

distribution for the belief of the special rare event fallacy as there was for the gambler's fallacy.

Skips Due Bias Tracker. Howard has created a chart to determine which skips are due, where “a skip is the number of losing games between two wins, or the number of games out since the last hit,” noting that “skips of up to only five games out are the most significant” (45). This chart is used to find patterns of a number's hit schedule so as to determine when the number will hit next. Below is a skip chart for the New York Lotto. Step one is to categorize the number of games skipped (or not hit) by winning numbers before they hit again (charting only skips up to 5, as Howard suggested above). Step two is to total the number of numbers that have skipped under each category. In step three the categories are rearranged so that the number of skips that are most due is placed on top. Step four is to record what the lotto numbers are that fall under skip pattern that is do so as to determine which lotto numbers will hit in the next drawing.

Skips Due Table:

Step One	Step Two	Step Three
0-x	0-1	4-0
1-xxxxxx	1-6	5-1
2-xxx	2-3	3-1
3-x	3-1	0-1
4-	4-0	2-3
5-x	5-1	1-6

There were no numbers with skips of four, so that skip is the most due. Five, Three, and Zero all have only one number, so those three are the next skips that are most due. From the New York lotto, the numbers out 4 games are 13, 14, 31, and 48. Thus, according to

Howard, these should be the numbers most due to hit. 8, 30, 32, 10, 12, 20, 47, 5, 16, 25, 28, 34, and 45 are all the numbers that are next due according to skips of 5, 3, and 0. Howard suggests that “to target and refine your skips due picks, you should make a separate analysis for each of the last 5 games, 6 games, 7 games, 8 games, 9 games, and 10 games....because most of the time it really does increase the accuracy of the results” (46).

One can see the gambler’s fallacy evident in the expectation of a skip pattern being due. However, the special rare event fallacy is also found in this system through the defining of patterns from the last five games and determining that those patterns are special. A number hitting at least twice in the last five games (or six games or ten games) will of necessity have a characteristic number of non-hits between, whether that be zero or 8. What Howard bases this system on is the belief that there is import to these random hits, and that those hits can help determine future hits. In actuality the choosing of a certain number in lotto can be related to a hypergeometric distribution because the sample of numbers to choose from is finite, we are looking at two groups of numbers, those that were chosen before and those that have not been chosen, and 6 of those combined two groups are chosen at random without replacement. Thus for the case of finding the probability of exactly one number drawn that was hit in the previous drawing we use $h(1; 6, 6, 58)$, meaning $((6 \text{ choose } 1) * (52 \text{ choose } 5) / (58 \text{ choose } 6))$. Thus the probability of at least one number being chosen two games in a row is .39. However, this is roughly the same probability of any number hit within the last 10 games being hit again. Thus one can see that there is no bias towards a number hitting whether it has skipped once or more times. It will always be the same probability.

Hot-Cold Bias Tracker. Howard here describes a very common number selection strategy which is based on the belief that numbers have streaks of play, after which time they change tactics and perform the reverse play. Howard states the importance of this system in its introduction: “When it shows a clear pattern, you can use it exclusively without the aid of any other chart, limiting your play to just hot numbers” (41). Hot numbers are those numbers which have been hit within the past ten games. The idea behind this strategy is homework—finding out the average number of games a number was out before it hit again. This way, “when you see three of four drawings in a row with low averages and totals [meaning that the same numbers have been showing up fairly often in the last drawings], you’d want to play more long shot numbers than usual in the next drawing. When you see three or four drawings in a row with high averages and totals, you may want to play all hot numbers...the next drawing [because they will be due]” (43). Taking the average of all the averages tells what the historical average is; thus if a particular game had an average of numbers hit within the last ten games that is lower than the historical average, play hot numbers. If, on the other hand, the average for that particular game of numbers hit within the last ten games was higher than the historical average, more cold numbers (numbers not hit within the last ten games) should be played.

This, again, is based on the gambler’s fallacy of numbers being due. However, this strategy also stresses researching past occurrences to find significance, when in actuality every occurrence in the game is significant (or insignificant, depending on your point of view). Assuming complete randomness in the drawing of the winning numbers, again, any average that that drawing produces will be unique in relation to those before it.

Thus the idea of having five games in a row with low averages is as unique as having four low averages in a row with a switch to a high average. Each event must happen; analyzing the events and placing significance on them goes along with the special rare event fallacy.

Percentage System. This is a system for playing hot numbers; it stresses two hits within the last ten games and at least one hit in the last five games. Howard states that "...about 87 percent of all the winning numbers drawn [from the game analyzed] had had a previous hit within the past TEN games; about two thirds of all the winning numbers had had a previous hit within the past FIVE games; and about HALF of the winning numbers had had a previous hit within the past THREE games" (49). By finding the percentage of hot numbers that appear in the chosen lotto from game to game the gambler will know the number, or percentage, of hot numbers to play, choosing the rest of numbers as non-hot numbers. An analysis of the New York lotto showed that 17 out of the 58 numbers hit at least twice within the last ten games with 12 of those 17 having a hit within the last five games. Thus 21% of the numbers are hot, meaning that for the next win 2 numbers should be chosen from the bracket of hot numbers while the rest are chosen by the other means discussed.

The finding that a number has hit more than once in the last ten games and attaching significance to that is a case of the special rare event fallacy. Ten games consist of a total of sixty numbers. Thus each number has a little more than a 1% chance of being drawn. However, that does not mean that numbers will not hit more than once. In actuality, it is not impossible for one of those numbers to hit all ten games. Seeing that a number has hit five times in the last ten games is similar to noticing a license plate with

your birthday on it. The event itself is unique; but so is a number hitting only once in ten games, or not at all.

One can thus conclude that the systems laid forth by Gail Howard in her book *Lottery Master Guide* will, in actuality, not help one in choosing numbers that will win in a lotto drawing. In fact, it may actually hinder the amount of the winnings one takes home because of the probability that others will be betting on the same numbers based on their having read this or similar other books. In a random drawing of lotto numbers there is no existing system that will predict what numbers will be drawn next, and such a system will not appear until randomness can be explained as to make it not random.

New York lotto games used for this paper

All prizes must be claimed within 1 year of the drawing							
March 2003 (Click on date for payout information)							
Date	Results						Bonus Number
03/15/2003	05	16	25	28	34	45	11
03/12/2003	04	31	35	42	46	58	40
03/08/2003	10	12	16	20	28	47	02
03/05/2003	12	13	14	31	34	48	51
03/01/2003	08	20	30	32	46	58	40
All prizes must be claimed within 1 year of the drawing							
February 2003 (Click on date for payout information)							
Date	Results						Bonus Number
02/26/2003	11	27	31	41	42	56	33
02/22/2003	07	08	30	39	41	57	46
02/19/2003	01	24	27	36	51	55	18
02/15/2003	19	23	28	41	43	55	59
02/12/2003	03	05	29	39	42	43	54

Howard, Gail. 1997. *Lottery Master Guide*. Smart Luck Publishers; Revised edition.

