Using Probability to Work Out How Many People Try A Lotto

If you look at a Lotto Website, it tells you the odds of the Lotto prizes. If you multiply that probability by the number of people who pay for a ticket for the lottery, it will give you an estimate of how many winners there might be. The formula looks like this:

Estimated Number of Winners = Probability × Number of Tickets

A few months ago, a newspaper article caught my attention that there were far fewer winners of the BC Lotto than the Lotto 6-49, in British Columbia. This, in spite of the fact that the odds of winning were the same. Now, if you rearrange the equation above, you can estimate how many people bought tickets. Here is the new formula:

$$\text{Estimated Number of Tickets} = \frac{\text{Number of Winners}}{\text{Probability}}$$

Below is a spreadsheet that illustrates the results of these two lottos, last night (Aug 26, 2009):

Lotto 6-49 Estimate of number of bettors (Aug 26, 2009)

Combination	Probability	Number of Winners	Estimated # of bets		Probability of no Winner
6 out of 6	7.15112E-08	1	13,983,816		
5/6 plus bonus	4.29067E-07	2	4,661,272		
5 out if 6	1.80206E-05	148	8,212,816	Median	
4 out of 6	0.000968054	8,126	8,394,158	7,739,096	57.50%
3 out of 6	0.017636684	136,492	7,739,096		
2/6 plus bonus	0.012315271	90,713	7,365,896		
Any Prize	0.030959752	235,482	7,606,069		
No Prize	0.969040248				

BC 49 Estimate of number of bettors (Aug 26, 2009)

Combination	Probability	Number of Winners	Estimated # of bets		
6 out of 6	7.15112E-08	0	0		
5/6 plus bonus	4.29067E-07	0	0		
5 out if 6	1.80206E-05	8	443,936	Median	
4 out of 6	0.000968054	349	360,517	384,628	97.29%
3 out of 6	0.017636684	6,800	385,560		
2/6 plus bonus	0.012315271	4,751	385,781		
Any Prize	0.030959752	11,908	384,628		
No Prize	0.969040248				

I have used the median, as the outlier for the top two Combinations will skew the results. So you can see that the number of people who are estimated to have played the Lotto 6 – 49 is about 20.12 times the number who are estimated to have bought tickets on the BC 49. Base on these estimates, the probability of no winner in the Lotto 6 – 49 is about 57.50%, while the probability of no winner in the BC 49 is about 97.29%.

Thus we have a reason why the BC 49 is not won as often as the Lotto 6 – 49 even though they have the same probabilities of winning. Its all about the numbers!