

Software to Calculate Odds (Probabilities) For Any Lotto, Powerball, Mega Millions, Euromillions, SuperLotto Plus, Keno, Horse Racing

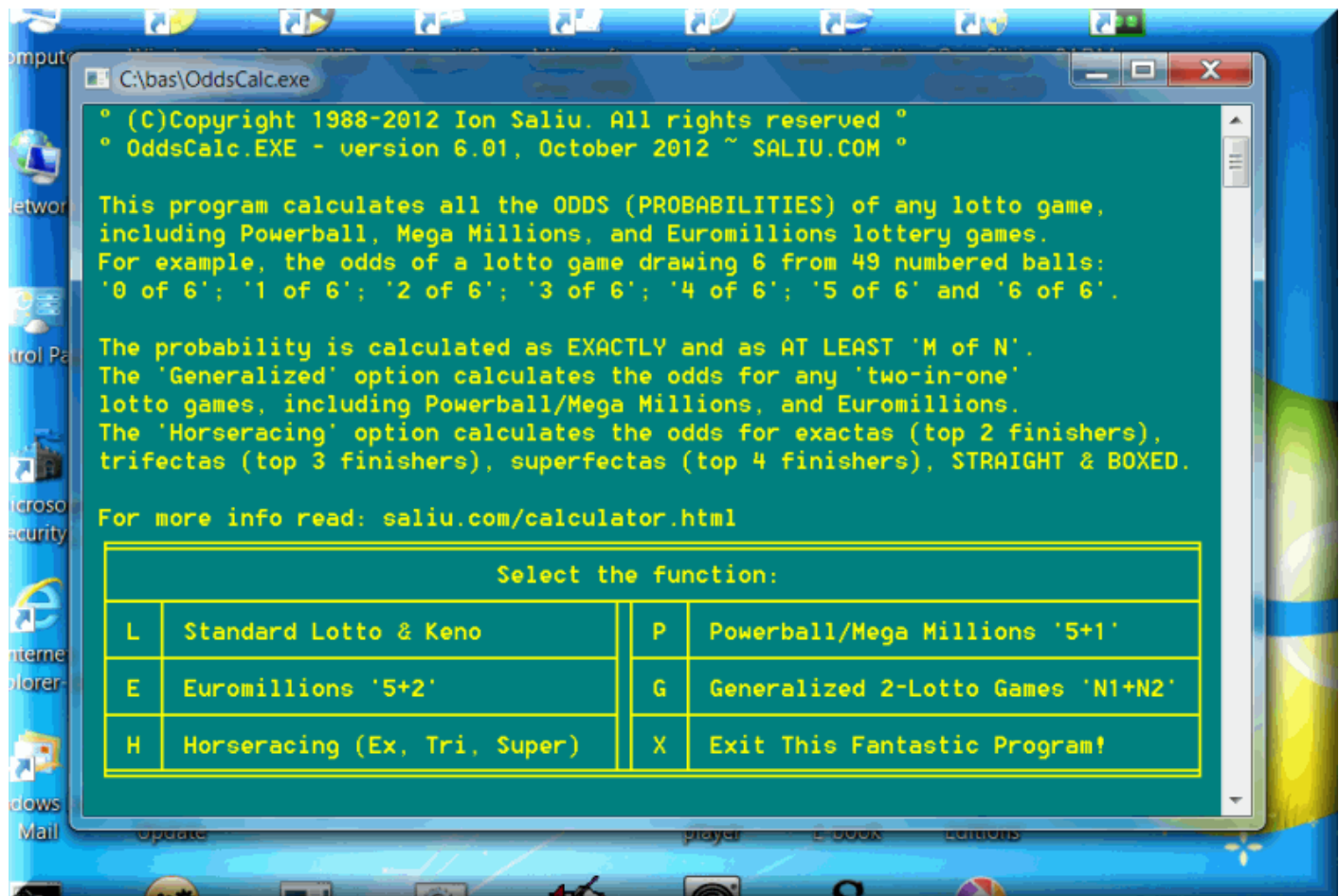
By Ion Saliu, Probability Master At-Large

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• **OddsCalc.EXE** ~ version 6.01, October 2012 ~ free software to calculate odds (probabilities) for any lotto, Powerball, Mega Millions, Euromillions, CA SuperLotto, Keno, Horse Racing.

- This program is totally free, including the download:
 - [Ion Saliu's Special Freeware.](#)
- There is more probability software that I wrote, especially worth mentioning **SuperFormula.EXE**. There are also the famous ActiveX controls that anyone can run freely on most pages at SALIU.COM. Look for **Random Generator, Odds Calculator** in the footer.
 - This great application is not free to download, however. Like most of my software titles, **SuperFormula.EXE** requires paid membership (a very reasonable fee). You can check it out any time:

- [Download Great Software, Source Code: Paid Membership Required.](#)



2. Calculating Lottery Odds Based On Hypergeometric Distribution Probability

Two decades ago, I started writing software to calculate the odds or probabilities for many situations. I had never found what I wanted out there. Doing it manually, even using a handheld calculator was tedious and testing. Even if knowing most formulas, it is NOT an easy task! Not to mention that some situations have no formulas! Just think of situations like *probability to win at least or at most M in N trials* or *probability NOT to win*. I honestly believe I cover the largest territory in this domain!

OddsCalc.EXE calculates the probabilities (odds) of any lotto game, including Powerball, Mega Millions, CA SuperLotto, Euromillions, Keno, and even horse

racing. If the game draws 6 winning numbers, the program calculates the odds from 0 of 6 to 6 of 6. Furthermore, the probability is calculated from two perspectives: as *exactly* and as *at least*.

The software calculates the lotto probability using the *hypergeometric distribution probability*. The odds are calculated as *k of m in p from N*. More clearly, let's suppose a lotto 6/49 game. The lottery draws 6 winning numbers. The player must play exactly 6 numbers per ticket. But the player can choose to play a pool of 10 favorite numbers. What is the probability to get 4 of 6 in 10 from 49? The odds: 1 in 90.

The general hypergeometric formula for the *as exactly* case:

$$P(\text{m of k in s from n}) = \frac{C(n, k)}{C(s, m) * C(n-s, k-m)}$$

The hypergeometric distribution probability formula has restrictions. Some cases are impossible; e.g. exactly 1 of 6 in 10 from 10.

My software “runs” the extra mile and puts together multiple cases and does calculate precisely the *odds as at least* situations.

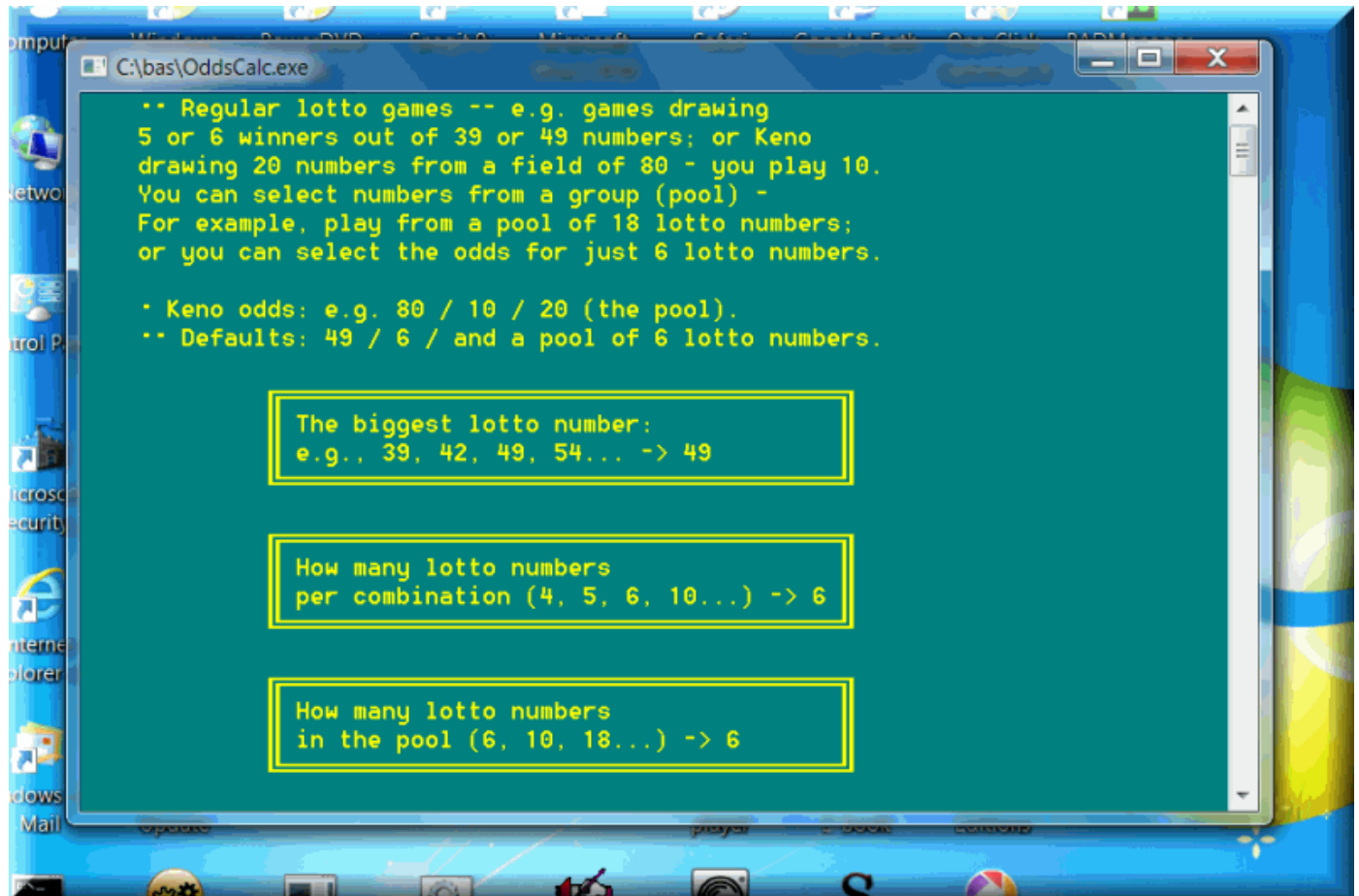
3. Calculating the Probabilities (Odds) of Regular Lotto Games and Keno

Most common lotto games draw 6 winning numbers most commonly from a field of 49 numbered balls. **OddsCalc.EXE** does handle such lottos, plus games that draw 4 winning numbers, or 5, or 7 winning numbers, etc. You can calculate the odds for countless situations, such as 39 from 49 or 50 from 55, etc.

Again, there are situations when the players select pools of numbers which are larger than the amount of winning numbers drawn in the game. There are lottery syndicates that can afford to play 18 or 20-number pools. In fact, they asked me to calculate the odds for a lotto game in Australia that allowed the players to mark 20 numbers on their play-slips (instead of 6). Of course, that play requires huge amounts of money (there are 38760 lotto combinations to play!) Nonetheless, this incredible lotto software can easily calculate the odds for all possible situations.

The program requires just a few parameters. They are easy to understand and explained in detail on the input screens. Say, you want to calculate all possible odds

for a 6-49 lotto game, with no pool of extra numbers (i.e. calculate the odds for a 6-number pool, exactly the number of winning lotto numbers drawn by the lottery commission). *The biggest lotto number: 49; How many lotto numbers per combination: 6; How many lotto numbers in the pool: 6.*



The calculations are saved to disk files only. All names start with *Od*; the text files can be opened in Notepad or any text editor. In this case: *OdL49-6.6*; easy mnemonics!

The odds calculated as EXACTLY in a lotto game '49/6/6':

0 of 6 in 6 from 49	= 1 in 2.29
1 of 6 in 6 from 49	= 1 in 2.42
2 of 6 in 6 from 49	= 1 in 7.55
3 of 6 in 6 from 49	= 1 in 56.66
4 of 6 in 6 from 49	= 1 in 1032.4
5 of 6 in 6 from 49	= 1 in 54200.84
6 of 6 in 6 from 49	= 1 in 13983816

The odds calculated as AT LEAST in a lotto game '49/6/6':

```

0 of 6 in 6 from 49 = 1 in 1
1 of 6 in 6 from 49 = 1 in 1.77
2 of 6 in 6 from 49 = 1 in 6.62
3 of 6 in 6 from 49 = 1 in 53.66
4 of 6 in 6 from 49 = 1 in 1013.03
5 of 6 in 6 from 49 = 1 in 53991.57
6 of 6 in 6 from 49 = 1 in 13983816

```

And here is that *Tattslotto* case when the players are allowed to mark 20 numbers on the playing cards: 45/6/20 (we never use the bonus numbers — bonus, bogus!)

The odds calculated as EXACTLY in a lotto game '45/6/20':

```

0 of 6 in 20 from 45 = 1 in 45.99
1 of 6 in 20 from 45 = 1 in 7.67
2 of 6 in 20 from 45 = 1 in 3.39
3 of 6 in 20 from 45 = 1 in 3.11
4 of 6 in 20 from 45 = 1 in 5.6
5 of 6 in 20 from 45 = 1 in 21.01
6 of 6 in 20 from 45 = 1 in 210.14

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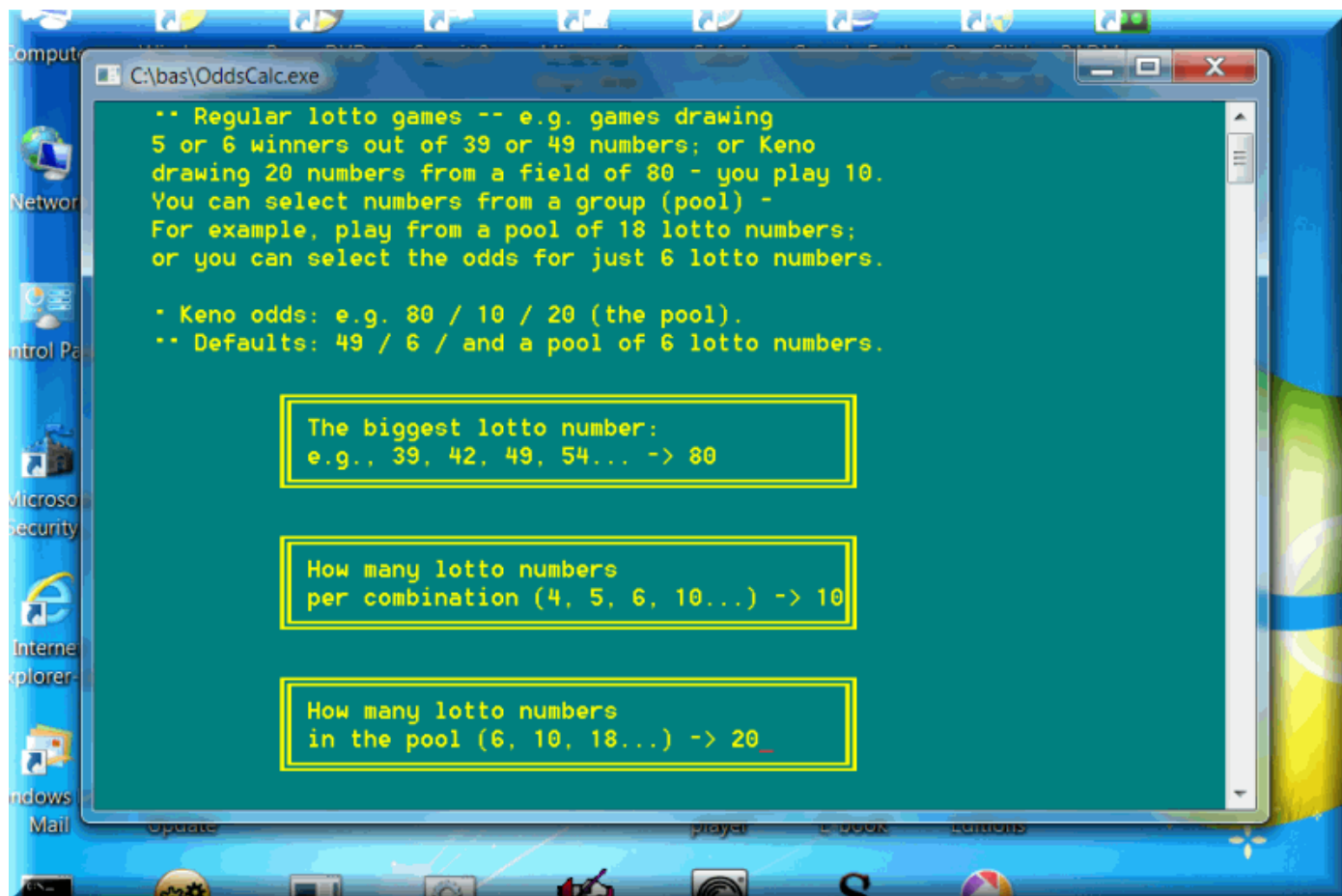
The odds calculated as AT LEAST in a lotto game '45/6/20':

```

0 of 6 in 20 from 45 = 1 in 1
1 of 6 in 20 from 45 = 1 in 1.02
2 of 6 in 20 from 45 = 1 in 1.18
3 of 6 in 20 from 45 = 1 in 1.81
4 of 6 in 20 from 45 = 1 in 4.33
5 of 6 in 20 from 45 = 1 in 19.1
6 of 6 in 20 from 45 = 1 in 210.14

```

The Keno odds are calculated by the same option: $L = \text{Standard Lotto and Keno}$. The parameters: 80/10/20 for the most common Keno format.



The odds calculated as EXACTLY in a lotto game '80/10/20':

0 of 10 in 20 from 80	= 1 in 21.84
1 of 10 in 20 from 80	= 1 in 5.57
2 of 10 in 20 from 80	= 1 in 3.39
3 of 10 in 20 from 80	= 1 in 3.74
4 of 10 in 20 from 80	= 1 in 6.79
5 of 10 in 20 from 80	= 1 in 19.44
6 of 10 in 20 from 80	= 1 in 87.11
7 of 10 in 20 from 80	= 1 in 620.68
8 of 10 in 20 from 80	= 1 in 7384.47
9 of 10 in 20 from 80	= 1 in 163381.37
10 of 10 in 20 from 80	= 1 in 8911711.18

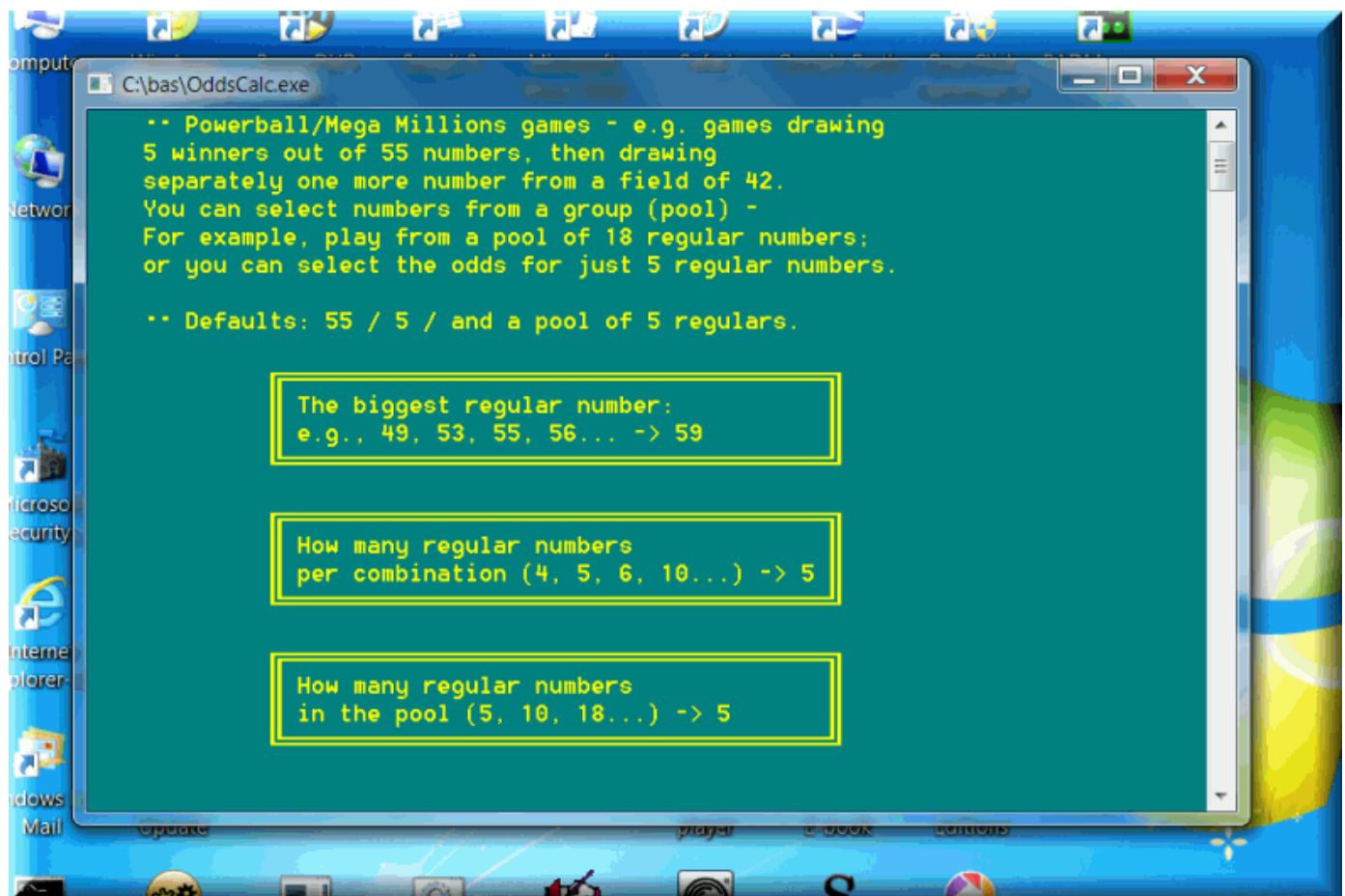
The odds calculated as AT LEAST in a lotto game '80/10/20':

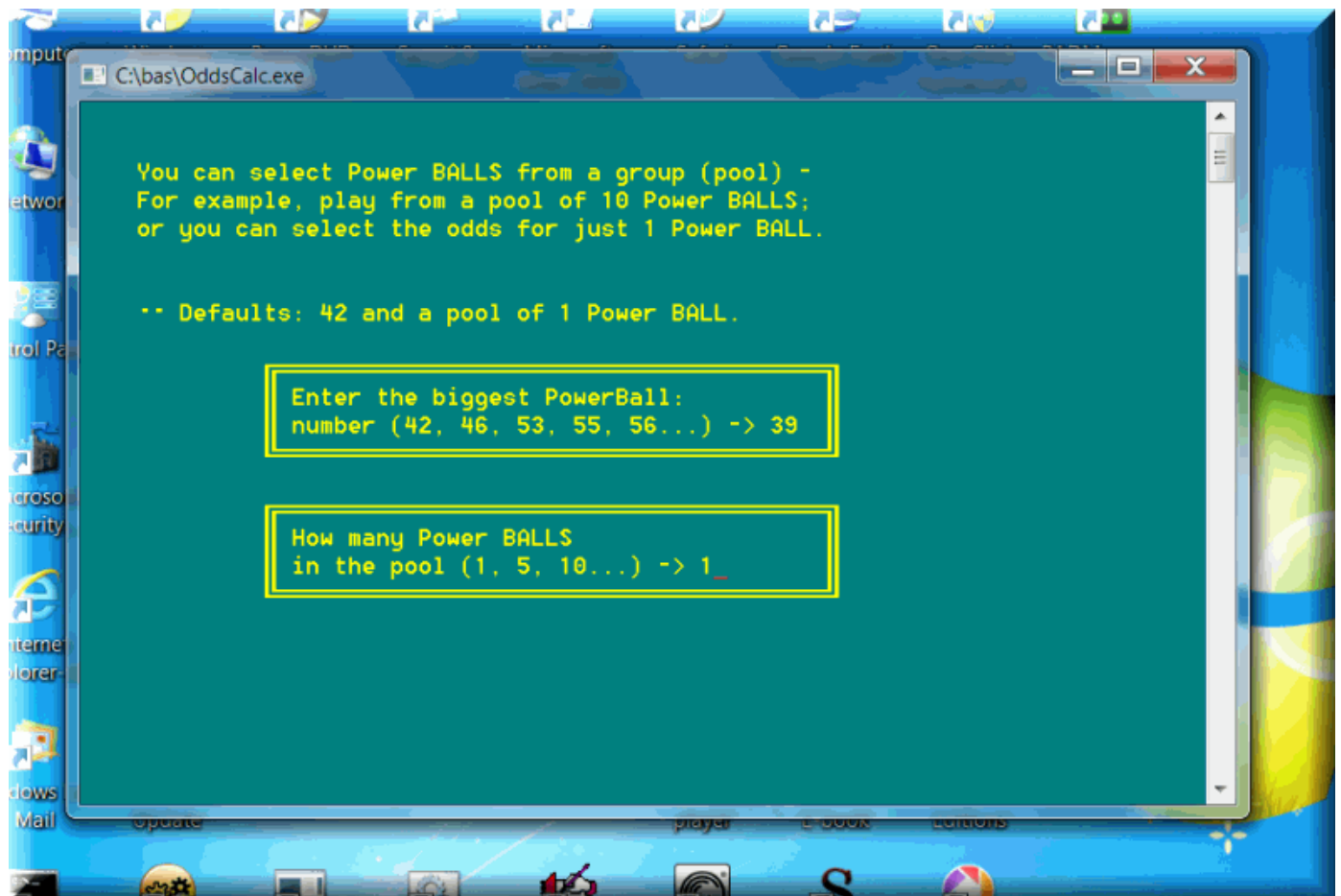
0 of 10 in 20 from 80	= 1 in 1
1 of 10 in 20 from 80	= 1 in 1.05
2 of 10 in 20 from 80	= 1 in 1.29
3 of 10 in 20 from 80	= 1 in 2.09
4 of 10 in 20 from 80	= 1 in 4.72
5 of 10 in 20 from 80	= 1 in 15.47
6 of 10 in 20 from 80	= 1 in 75.57
7 of 10 in 20 from 80	= 1 in 570.52

8 of 10 in 20 from 80 = 1 in 7059.54
9 of 10 in 20 from 80 = 1 in 160439.97
10 of 10 in 20 from 80 = 1 in 8911711.18

4. Calculating the Probabilities (Odds) of 5+1 Lotto Games: Powerball, Mega Millions, California SuperLotto

In this example, we calculate the odds for the Powerball game at the time of this writing (October 2012): 5 regular numbers from a field of 59 AND 1 Power Ball from a field of 35.





The odds calculated as EXACTLY in a Powerball game
 '59/5/5 AND 35/1/1':

0 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 1.63
0 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 55.41
1 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 3.26
1 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 110.81
2 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 20.78
2 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 706.43
3 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 360.14
3 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 12244.83
4 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 19087.53
4 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 648975.96
5 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 5153632.65
5 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 175223510

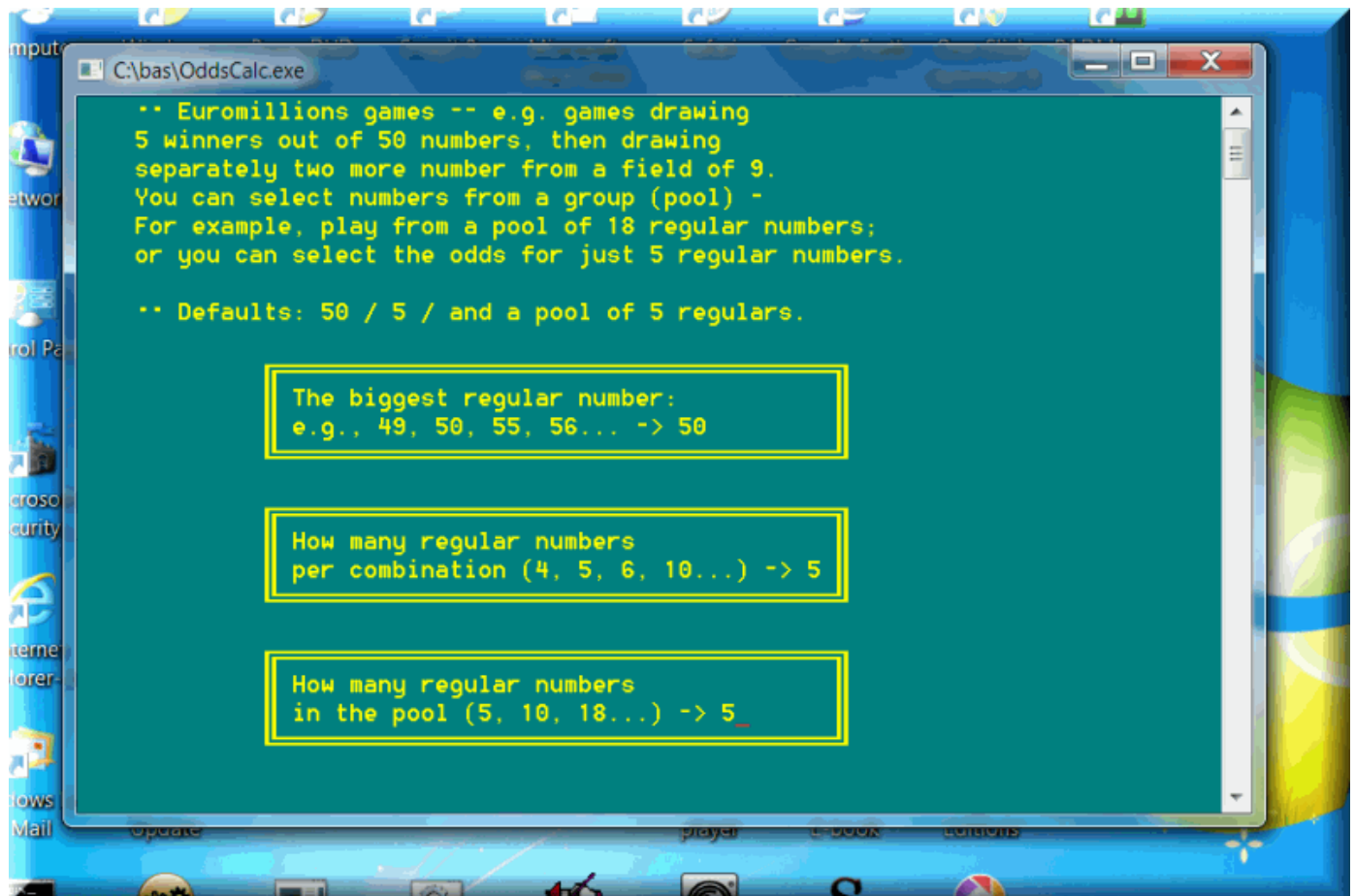
The odds calculated as AT LEAST in a Powerball game
 '59/5/5 AND 35/1/1':

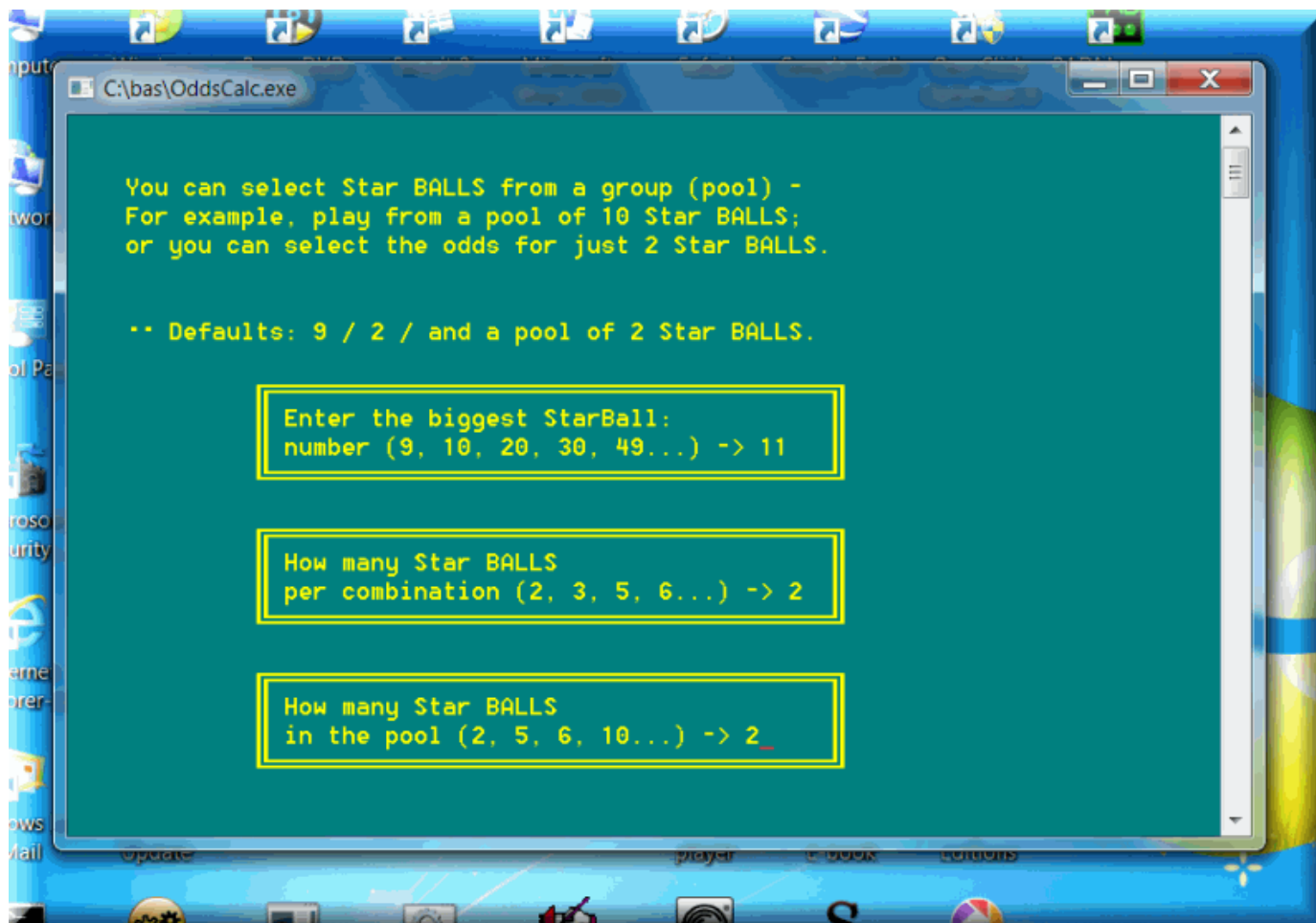
0 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 1
0 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 35
1 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 2.72
1 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 95.03
2 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 19.06

2 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 667.21
3 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 343.35
3 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 12017.25
4 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 18473.75
4 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 646581.22
5 of 5 in 5 from 59	AND	0 of 1 in 1 from 35	= 1 in 5006386
5 of 5 in 5 from 59	AND	1 of 1 in 1 from 35	= 1 in 175223510

5. Calculating the Probabilities (Odds) of 5+2 Lotto Games: Euromillions

In this example, we calculate the odds for the Euromillions game at the time of this writing (October 2012): 5 regular numbers from a field of 50 AND 2 Star Numbers from a field of 11.





The odds calculated as EXACTLY in a Euromillions game
'50/5/5 AND 11/2/2':

0 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 2.65
0 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 5.3
0 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 95.38
1 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 4.35
1 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 8.69
1 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 156.42
2 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 22.81
2 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 45.62
2 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 821.22
3 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 326.97
3 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 653.94
3 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 11770.89
4 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 14386.64
4 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 28773.28
4 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 517919.11
5 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 3236994.44
5 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 6473988.89
5 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 116531800

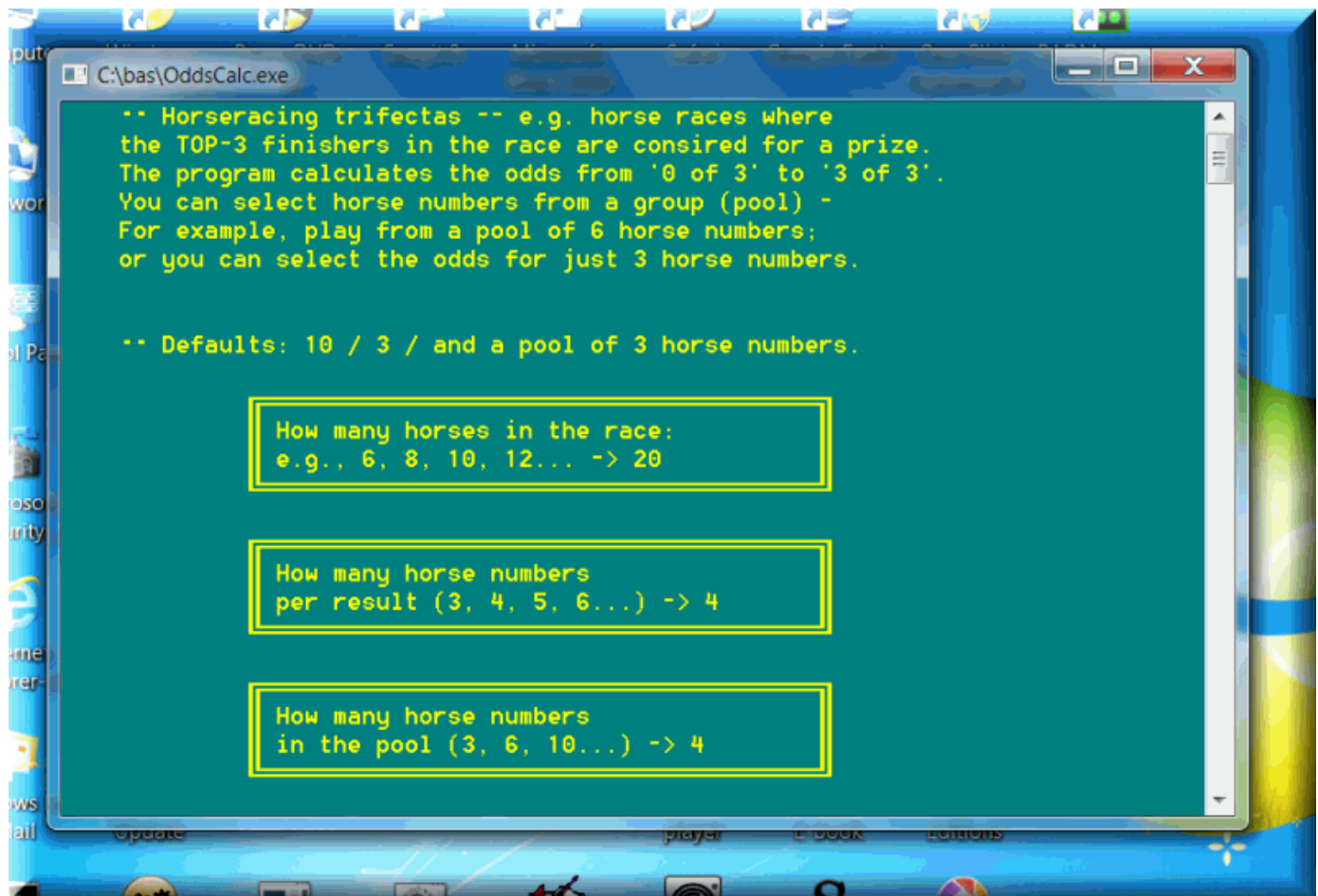
The odds calculated as AT LEAST in a Euromillions game

'50/5/5 AND 11/2/2':

0 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 1
0 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 2.89
0 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 55
1 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 2.36
1 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 6.84
1 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 129.91
2 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 13.94
2 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 40.34
2 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 766.53
3 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 209.24
3 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 605.69
3 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 11508.18
4 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 9375.04
4 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 27138.29
4 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 515627.43
5 of 5 in 5 from 50	AND	0 of 2 in 2 from 11	= 1 in 2118760
5 of 5 in 5 from 50	AND	1 of 2 in 2 from 11	= 1 in 6133252.63
5 of 5 in 5 from 50	AND	2 of 2 in 2 from 11	= 1 in 116531800

6. Calculating the Probabilities (Odds) of Horse Racing

In this example, we calculate the odds for the most famous horse race: The Kentucky Derby. We do the calculations for superfectas (top 4 finishers) and a field of 20 horses.



1.a. The odds calculated as EXACTLY in horseracing - STRAIGHT bet '20/4/4':

0 of 4 in 4 from 20	= 1 in 63.89
1 of 4 in 4 from 20	= 1 in 207.64
2 of 4 in 4 from 20	= 1 in 969
3 of 4 in 4 from 20	= 1 in 7267.5
4 of 4 in 4 from 20	= 1 in 116280

1.b. The odds calculated as EXACTLY in horseracing - BOXED bet '20/4/4':

0 of 4 in 4 from 20	= 1 in 2.66
1 of 4 in 4 from 20	= 1 in 8.65
2 of 4 in 4 from 20	= 1 in 40.38
3 of 4 in 4 from 20	= 1 in 302.81
4 of 4 in 4 from 20	= 1 in 4845

2.a. The odds calculated as AT LEAST in horseracing - STRAIGHT bet '20/4/4':

0 of 4 in 4 from 20	= 1 in 46.2
1 of 4 in 4 from 20	= 1 in 166.83
2 of 4 in 4 from 20	= 1 in 848.76
3 of 4 in 4 from 20	= 1 in 6840
4 of 4 in 4 from 20	= 1 in 116280

2.b. The odds calculated as AT LEAST in horseracing - BOXED bet '20/4/4':

0 of 4 in 4 from 20 = 1 in 1.92
1 of 4 in 4 from 20 = 1 in 6.95
2 of 4 in 4 from 20 = 1 in 35.36
3 of 4 in 4 from 20 = 1 in 285
4 of 4 in 4 from 20 = 1 in 4845

7. The Reversed Problem: Probability to *NOT-Win*

All the calculations above referred to the *odds to win* or the *probabilities to win*. How about the probabilities to *NOT-Win*? The answer is simple in simple cases. For example, coin tossing. The probability to win with *heads* is 0.5; the probability to *NOT-Win* with *heads* is $1 - 0.5 = .5$.

In lotto games, however, the situations are much more complex. Therefore, the calculations are more complicated. Let's use a common example, as it refers to “the most famous lotto wheel in the world”: 49 numbers, *3 of 6 minimum guarantee*, in 163 lines (combinations). That wheel guarantees at least 1 combination with a *3 of 6 win* — no denial about that. On the other hand, if we generate 163 random 6-number lotto combinations, we are NOT guaranteed to win *3 of 6* every time. In fact, if we randomly generate 13,983,816 combinations for a 6-49 lotto game, the degree of certainty to get the winning combination is 63.2%. The phenomenon is known as *Ion Saliu's Paradox of N Trials*.

Let's say we randomly generate 100 combinations for a 6-49 lotto game. What is the degree of certainty that *none of the combinations will contain 3 or more winning numbers*? In the first step, we run **OddsCalc.EXE**. The odds calculated as AT LEAST in a lotto game 49/6/6:

3 of 6 in 6 from 49 = 1 in 53.66;

In the next step, we need to run **SuperFormula.EXE** function $M = \text{At Most } M$ *successes in N trials*. Parameters: 2 = *The program calculates p*, then 1, then 53.66, then 0, and then 100. We can see that the opposite of *at least 3 of 6* is *at most 3 of 6*, *0 successes in 100 trials*. That is, every combination in our 100-line block will register 0, or 1, or 2 winning lotto numbers — but no 3 or more winners. Or, we can get the same result for *1 in 53.66 for exactly 0 successes in 100 trials*. Either way, the degree of certainty is 15.24% or *1 in 6.56 trials*. We'll notice that, on average, we will not hit 3 or more winning numbers every 7 lottery drawings or so IF we play 100 random combinations.

These calculations are valuable in conjunction with the *LIE elimination* function in my lotto software.

8. Resources in Theory of Probability, Mathematics, Statistics, Odds, Software.

See a comprehensive directory of the pages and materials on the subject of theory of probability, mathematics, statistics, combinatorics, plus software.

- Download [software](#) to calculate formulas, odds, probabilities.
 - [Theory of Probability](#): Best introduction, formulae, algorithms, software.
 - [Caveats in Theory of Probability](#).
 - [SuperFormula.EXE](#): The Definitive [Probability, Statistics, Gambling Software](#).
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 - [Probability, Odds, Formulae, Algorithm, Software Calculator](#).
 - [Official Lotto Odds Are Correct](#).
 - [Calculate Lotto Odds, Probabilities with Hypergeometric Probability Formula](#).
 - [Combination 1 2 3 4 5 6: Probability, Reality](#).
 - [Probability of Perfect Shapes in Nature](#).