

**Analysis of
Keno Bonus Wheels
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**Prepared
For
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Game Description:

Keno Bonus Wheels is a novel way of increasing the payouts for Keno by varying the amounts paid for certain outcomes using a random number generator.

This Analysis covers three specific outcomes, but the concept could be used for numerous other outcomes as well. The three specific outcomes are when the Player selects and hits 3 number, 4 numbers or 5 numbers. Thus, if a Player selects 5 numbers and only 4 numbers are selected as part of the regular Keno game, the Player does not win anything when he makes this wager. He will only win if ALL the numbers he selected are chosen.

After the usual 20 numbers are selected, a wheel with 50 slots will be displayed on the screen. This will correspond to the 3 for 3 prize. The wheel will spin and using a Random Number Generator, it will stop in one of the 50 slots. The amount that corresponds to this slot will be the amount won by each Player who made the Keno Bonus Wheel wager, picked 3 numbers and had all 3 numbers selected during the base Keno game. This process will then repeat with the 4 for 4 wheel and the 5 for 5 wheel. All the payouts are FOR 1. When all 3 wheels have completed their spins, the screen will display each of the three wheels, the prize amounts selected by each and the 20 numbers selected in the base Keno game.

Several paytables have been created for Keno Bonus Wheels allowing for a variety of paybacks. As the operator can modify the paybacks by altering the number of slots on the wheel for each payout amount (i.e. the probability of paying that amount), the number of slots is a critical component of the payable as well. These combinations of payout, slots and probability are shown in the tables below:

Paytable 1			Paytable 2			Paytable 3			Paytable 4		
3 for 3 Bonus- 70.07%			3 for 3 Bonus- 74.93%			3 for 3 Bonus- 80.48%			3 for 3 Bonus- 72.85%		
Payout	Freq.	Slots									
600	2%	1	600	2%	1	600	2%	1	600	2%	1
150	2%	1	200	2%	1	200	4%	2	150	2%	1
100	4%	2	150	2%	1	150	4%	2	100	4%	2
75	6%	3	100	4%	2	100	6%	3	75	8%	4
50	22%	11	50	34%	17	50	20%	10	50	26%	13
25	64%	32	25	56%	28	25	64%	32	25	58%	28
4 for 4 Bonus- 70.46%			4 for 4 Bonus- 75.36%			4 for 4 Bonus- 80.57%			4 for 4 Bonus- 72.60%		
Payout	Freq.	Slots									
1500	2%	1	2000	2%	1	2000	2%	1	1500	2%	1
1000	4%	2	1000	2%	1	1000	4%	2	1000	4%	2
600	6%	3	750	4%	2	750	6%	3	600	6%	3
300	8%	4	600	8%	4	600	6%	3	250	10%	5
200	20%	10	200	24%	12	200	20%	10	200	28%	14
100	60%	30	100	60%	30	100	62%	31	100	50%	25
5 for 5 Bonus- 70.30%			5 for 5 Bonus- 75.20%			5 for 5 Bonus- 80.36%			5 for 5 Bonus- 72.62%		
Payout	Freq.	Slots									
5000	2%	1	5000	2%	1	5000	2%	1	5000	2%	1
2500	4%	2	2500	4%	2	2500	4%	2	2500	4%	2
2000	6%	3	2000	6%	3	2000	6%	3	2000	6%	3
1500	10%	5	1500	10%	5	1500	10%	5	1500	10%	5
1000	38%	19	1000	38%	19	1000	38%	19	1000	38%	19
600	40%	20	600	40%	20	600	40%	20	600	40%	20

All Payouts are For 1

Paytable 5		
3 for 3 Bonus- 59.66%		
Payout	Freq.	Slots
600	2%	1
150	2%	1
100	2%	1
75	2%	1
50	6%	3
25	86%	43
4 for 4 Bonus- 60.04%		
Payout	Freq.	Slots
1000	2%	1
600	4%	2
400	6%	3
300	8%	4
200	24%	12
100	56%	28
5 for 5 Bonus- 59.85%		
Payout	Freq.	Slots
5000	2%	1
2500	6%	3
1500	10%	5
1000	18%	9
600	28%	14
500	36%	18

Paytable 6		
3 for 3 Bonus- 90.19%		
Payout	Freq.	Slots
600	2%	1
150	6%	3
100	10%	5
75	16%	8
50	22%	11
25	44%	22
4 for 4 Bonus- 90.06%		
Payout	Freq.	Slots
1500	2%	1
1000	4%	2
600	10%	5
400	18%	9
200	26%	13
100	40%	20
5 for 5 Bonus- 89.77%		
Payout	Freq.	Slots
5000	4%	2
2500	8%	4
2000	14%	7
1500	20%	10
1000	22%	11
600	32%	16

Paytable 7		
3 for 3 Bonus- 90.19%		
Payout	Freq.	Slots
600	2%	1
250	4%	2
150	6%	3
100	8%	4
50	24%	12
25	56%	28
4 for 4 Bonus- 90.06%		
Payout	Freq.	Slots
1500	4%	2
1000	6%	3
600	6%	3
400	10%	5
200	24%	12
100	50%	25
5 for 5 Bonus- 90.29%		
Payout	Freq.	Slots
5000	4%	2
2500	6%	3
2000	16%	8
1500	22%	11
1000	22%	11
600	30%	15

Paytable 8		
3 for 3 Bonus- 95.05%		
Payout	Freq.	Slots
600	2%	1
150	6%	3
100	14%	7
75	18%	9
50	20%	10
25	40%	20
4 for 4 Bonus- 94.97%		
Payout	Freq.	Slots
1500	2%	1
1000	6%	3
600	10%	5
400	18%	9
200	24%	12
100	40%	20
5 for 5 Bonus- 94.80%		
Payout	Freq.	Slots
5000	4%	2
3000	10%	5
2000	14%	7
1500	18%	9
1000	24%	12
600	30%	15

All Payouts are For 1

Paytable 9		
3 for 3 Bonus- 95.05%		
Payout	Freq.	Slots
600	4%	2
150	6%	3
100	6%	3
75	10%	5
50	14%	7
25	60%	30
4 for 4 Bonus- 94.97%		
Payout	Freq.	Slots
1500	4%	2
1000	6%	3
600	8%	4
400	14%	7
200	18%	9
100	50%	25
5 for 5 Bonus- 94.93%		
Payout	Freq.	Slots
5000	6%	3
3000	8%	4
2000	12%	6
1500	16%	8
1000	26%	13
600	32%	16

All Payouts are For 1

Analysis Methodology:

The payback of each payable can be computed mathematically. The details are shown in the Results section below.

Results:

To calculate the payback for each payable, the frequency of qualifying for the bonus payout is multiplied by the product of the frequency of each payout and the payout and these values are summed.

So, the first calculation is the probability of achieving 3 out of 3, 4 out of 4 or 5 out of 5 in a standard Keno game.

These probabilities can be computed mathematically.

$\text{Combin}(X,Y)$ is the mathematical expression for the number of ways to select Y items from a total population of X . It translates mathematically into $(X! / ((X-Y)! * Y!))$ (where $!$ means factorial). Thus, $\text{combin}(80,3) = (80! / (77! * 3!)) = 82,160$. This is the number of ways you can pick 3 numbers from 80. So, if a Player wanted to select every possible 3 number combination in Keno, he would have to play 82,160 different combinations.

There are $\text{combin}(80,3)$ or 82,160 ways to draw 3 numbers out of 80. The player must pick all 3 numbers from the casino's 20 drawn numbers to win the 3 for 3 Wager. There are $\text{combin}(20,3)$ or 1140 ways to do this. So the probability of catching all 3 is $1140/82160 = 1.3875365\%$.

There are $\text{combin}(80,4)$ or 1,581,580 ways to draw 4 numbers out of 80. The player must pick all 4 numbers from the casino's 20 drawn numbers to win the 4 for 4 Wager. There are $\text{combin}(20,4)$ or 4845 ways to do this. So the probability of catching all 3 is $1140/82160 = 0.3063392\%$.

There are $\text{combin}(80,5)$ or 24,040,016 ways to draw 5 numbers out of 80. The player must pick all 5 numbers from the casino's 20 drawn numbers to win the 5 for 5 Wager. There are $\text{combin}(20,5)$ or 15,504 ways to do this. So the probability of catching all 3 is $1140/82160 = 0.0644925\%$.

The payback calculation for each payable is shown in the tables below

Paytable 1 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
150	1.387537%	2.0000%	4.1626%
100	1.387537%	4.0000%	5.5501%
75	1.387537%	6.0000%	6.2439%
50	1.387537%	22.0000%	15.2629%
25	1.387537%	64.0000%	22.2006%
Total			70.0706%

* Payout is FOR 1

Paytable 1 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1500	0.306339%	2.0000%	9.1902%
1000	0.306339%	4.0000%	12.2536%
600	0.306339%	6.0000%	11.0282%
300	0.306339%	8.0000%	7.3521%
200	0.306339%	20.0000%	12.2536%
100	0.306339%	60.0000%	18.3804%
Total			70.4580%

* Payout is FOR 1

Paytable 1 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	2.0000%	6.4492%
2500	0.064492%	4.0000%	6.4492%
2000	0.064492%	6.0000%	7.7391%
1500	0.064492%	10.0000%	9.6739%
1000	0.064492%	38.0000%	24.5071%
600	0.064492%	40.0000%	15.4782%
Total			70.2968%

* Payout is FOR 1

Paytable 1 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	70.0706%
4 for 4	0.306339%	70.4580%
5 for 5	0.064492%	70.2968%

Paytable 2 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
200	1.387537%	2.0000%	5.5501%
150	1.387537%	2.0000%	4.1626%
100	1.387537%	4.0000%	5.5501%
50	1.387537%	34.0000%	23.5881%
25	1.387537%	56.0000%	19.4255%
Total			74.9270%

* Payout is FOR 1

Paytable 2 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
2000	0.306339%	2.0000%	12.2536%
1000	0.306339%	2.0000%	6.1268%
750	0.306339%	4.0000%	9.1902%
600	0.306339%	8.0000%	14.7043%
200	0.306339%	24.0000%	14.7043%
100	0.306339%	60.0000%	18.3804%
Total			75.3595%

* Payout is FOR 1

Paytable 2 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	2.0000%	6.4492%
2500	0.064492%	4.0000%	6.4492%
2000	0.064492%	8.0000%	10.3188%
1500	0.064492%	18.0000%	17.4130%
1000	0.064492%	32.0000%	20.6376%
600	0.064492%	36.0000%	13.9304%
Total			75.1982%

* Payout is FOR 1

Paytable 2 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	74.9270%
4 for 4	0.306339%	75.3595%
5 for 5	0.064492%	75.1982%

Paytable 3 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
200	1.387537%	4.0000%	11.1003%
150	1.387537%	4.0000%	8.3252%
100	1.387537%	6.0000%	8.3252%
50	1.387537%	20.0000%	13.8754%
25	1.387537%	64.0000%	22.2006%
Total			80.4771%

* Payout is FOR 1

Paytable 3 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
2000	0.306339%	2.0000%	12.2536%
1000	0.306339%	4.0000%	12.2536%
750	0.306339%	6.0000%	13.7853%
600	0.306339%	6.0000%	11.0282%
200	0.306339%	20.0000%	12.2536%
100	0.306339%	62.0000%	18.9930%
Total			80.5672%

* Payout is FOR 1

Paytable 3 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	2.0000%	6.4492%
2500	0.064492%	6.0000%	9.6739%
2000	0.064492%	10.0000%	12.8985%
1500	0.064492%	16.0000%	15.4782%
1000	0.064492%	40.0000%	25.7970%
600	0.064492%	26.0000%	10.0608%
Total			80.3576%

* Payout is FOR 1

Paytable 3 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	80.4771%
4 for 4	0.306339%	80.5672%
5 for 5	0.064492%	80.3576%

Paytable 4 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
150	1.387537%	2.0000%	4.1626%
100	1.387537%	4.0000%	5.5501%
75	1.387537%	8.0000%	8.3252%
50	1.387537%	26.0000%	18.0380%
25	1.387537%	58.0000%	20.1193%
Total			72.8457%

* Payout is FOR 1

Paytable 4 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1500	0.306339%	2.0000%	9.1902%
1000	0.306339%	4.0000%	12.2536%
600	0.306339%	6.0000%	11.0282%
250	0.306339%	10.0000%	7.6585%
200	0.306339%	28.0000%	17.1550%
100	0.306339%	50.0000%	15.3170%
Total			72.6024%

* Payout is FOR 1

Paytable 4 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	2.0000%	6.4492%
2500	0.064492%	4.0000%	6.4492%
2000	0.064492%	6.0000%	7.7391%
1500	0.064492%	14.0000%	13.5434%
1000	0.064492%	38.0000%	24.5071%
600	0.064492%	36.0000%	13.9304%
Total			72.6185%

* Payout is FOR 1

Paytable 4 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	72.8457%
4 for 4	0.306339%	72.6024%
5 for 5	0.064492%	72.6185%

Paytable 5 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
150	1.387537%	2.0000%	4.1626%
100	1.387537%	2.0000%	2.7751%
75	1.387537%	2.0000%	2.0813%
50	1.387537%	6.0000%	4.1626%
25	1.387537%	86.0000%	29.8320%
Total			59.6641%

* Payout is FOR 1

Paytable 5 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1000	0.306339%	2.0000%	6.1268%
600	0.306339%	4.0000%	7.3521%
400	0.306339%	6.0000%	7.3521%
300	0.306339%	8.0000%	7.3521%
200	0.306339%	24.0000%	14.7043%
100	0.306339%	56.0000%	17.1550%
Total			60.0425%

* Payout is FOR 1

Paytable 5 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	2.0000%	6.4492%
2500	0.064492%	6.0000%	9.6739%
1500	0.064492%	10.0000%	9.6739%
1000	0.064492%	18.0000%	11.6086%
600	0.064492%	28.0000%	10.8347%
500	0.064492%	36.0000%	11.6086%
Total			59.8490%

* Payout is FOR 1

Paytable 5 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	59.6641%
4 for 4	0.306339%	60.0425%
5 for 5	0.064492%	59.8490%

Paytable 6 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
150	1.387537%	6.0000%	12.4878%
100	1.387537%	10.0000%	13.8754%
75	1.387537%	16.0000%	16.6504%
50	1.387537%	22.0000%	15.2629%
25	1.387537%	44.0000%	15.2629%
Total			90.1899%

* Payout is FOR 1

Paytable 6 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1500	0.306339%	2.0000%	9.1902%
1000	0.306339%	4.0000%	12.2536%
600	0.306339%	10.0000%	18.3804%
400	0.306339%	18.0000%	22.0564%
200	0.306339%	26.0000%	15.9296%
100	0.306339%	40.0000%	12.2536%
Total			90.0637%

* Payout is FOR 1

Paytable 6 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	4.0000%	12.8985%
2500	0.064492%	8.0000%	12.8985%
2000	0.064492%	14.0000%	18.0579%
1500	0.064492%	20.0000%	19.3477%
1000	0.064492%	22.0000%	14.1883%
600	0.064492%	32.0000%	12.3826%
Total			89.7735%

* Payout is FOR 1

Paytable 6 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	90.1899%
4 for 4	0.306339%	90.0637%
5 for 5	0.064492%	89.7735%

Paytable 7 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
250	1.387537%	4.0000%	13.8754%
150	1.387537%	6.0000%	12.4878%
100	1.387537%	8.0000%	11.1003%
50	1.387537%	24.0000%	16.6504%
25	1.387537%	56.0000%	19.4255%
Total			90.1899%

* Payout is FOR 1

Paytable 7 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1500	0.306339%	4.0000%	18.3804%
1000	0.306339%	6.0000%	18.3804%
600	0.306339%	6.0000%	11.0282%
400	0.306339%	10.0000%	12.2536%
200	0.306339%	24.0000%	14.7043%
100	0.306339%	50.0000%	15.3170%
Total			90.0637%

* Payout is FOR 1

Paytable 7 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	4.0000%	12.8985%
2500	0.064492%	6.0000%	9.6739%
2000	0.064492%	16.0000%	20.6376%
1500	0.064492%	22.0000%	21.2825%
1000	0.064492%	22.0000%	14.1883%
600	0.064492%	30.0000%	11.6086%
Total			90.2895%

* Payout is FOR 1

Paytable 7 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	90.1899%
4 for 4	0.306339%	90.0637%
5 for 5	0.064492%	90.2895%

Paytable 8 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	2.0000%	16.6504%
150	1.387537%	6.0000%	12.4878%
100	1.387537%	14.0000%	19.4255%
75	1.387537%	18.0000%	18.7317%
50	1.387537%	20.0000%	13.8754%
25	1.387537%	40.0000%	13.8754%
Total			95.0463%

* Payout is FOR 1

Paytable 8 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1500	0.306339%	2.0000%	9.1902%
1000	0.306339%	6.0000%	18.3804%
600	0.306339%	10.0000%	18.3804%
400	0.306339%	18.0000%	22.0564%
200	0.306339%	24.0000%	14.7043%
100	0.306339%	40.0000%	12.2536%
Total			94.9652%

* Payout is FOR 1

Paytable 8 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	4.0000%	12.8985%
3000	0.064492%	10.0000%	19.3477%
2000	0.064492%	14.0000%	18.0579%
1500	0.064492%	18.0000%	17.4130%
1000	0.064492%	24.0000%	15.4782%
600	0.064492%	30.0000%	11.6086%
Total			94.8039%

* Payout is FOR 1

Paytable 8 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	95.0463%
4 for 4	0.306339%	94.9652%
5 for 5	0.064492%	94.8039%

Paytable 9 - 3 out of 3			
Payout*	3 out of 3 Frequency	Payout Frequency	Overall Contribution
600	1.387537%	4.0000%	33.3009%
150	1.387537%	6.0000%	12.4878%
100	1.387537%	6.0000%	8.3252%
75	1.387537%	10.0000%	10.4065%
50	1.387537%	14.0000%	9.7128%
25	1.387537%	60.0000%	20.8130%
Total			95.0463%

* Payout is FOR 1

Paytable 9 - 4 out of 4			
Payout*	4 out of 4 Frequency	Payout Frequency	Overall Contribution
1500	0.306339%	4.0000%	18.3804%
1000	0.306339%	6.0000%	18.3804%
600	0.306339%	8.0000%	14.7043%
400	0.306339%	14.0000%	17.1550%
200	0.306339%	18.0000%	11.0282%
100	0.306339%	50.0000%	15.3170%
Total			94.9652%

* Payout is FOR 1

Paytable 9 - 5 out of 5			
Payout*	5 out of 5 Frequency	Payout Frequency	Overall Contribution
5000	0.064492%	6.0000%	19.3477%
3000	0.064492%	8.0000%	15.4782%
2000	0.064492%	12.0000%	15.4782%
1500	0.064492%	16.0000%	15.4782%
1000	0.064492%	26.0000%	16.7680%
600	0.064492%	32.0000%	12.3826%
Total			94.9329%

* Payout is FOR 1

Paytable 9 Summary		
Bonus	Hit Frequency	Payback
3 for 3	1.387537%	95.0463%
4 for 4	0.306339%	94.9652%
5 for 5	0.064492%	94.9329%