



MATHEMATICAL ANALYSIS OF "MATCH BET"
PREPARED FOR LUCKY GAMES L.L.C.

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An analysis of the mathematics and statistics inherent to a proposed new casino table game.

DICEY 21 “MATCH BET” MATHEMATICAL ANALYSIS

Prepared by Charles Mousseau, B.Sc. on 30 June 2008

Introduction:

1. This report deals specifically with an analysis of the Match Bet in Dicey 21, which is a proprietary casino game marketed by Lucky Games L.L.C.
2. Players make the Match Bet by playing a wager on a field of numbers marked from one to six.
3. Players may make one, two or three Match Bets on each round.
4. During the course of the game, three standard six-sided dice will be rolled and revealed to all players.
5. For each number wagered on with a Match Bet,
 - a. If none of the three dice match that number, that Match Bet is lost.
 - b. If exactly one of the three dice match that number, the player has scored a Single.
 - c. If exactly two of the three dice match that number, the player has scored a Double.
 - d. If all three dice match that number, the player has scored a Triple.
6. Players may also make the Ante/Raise Bet; if they do so, they will be eligible for extra payouts on the Match Bet, as follows:
 - a. If all three dice match a number the player has wagered on, and the player's hand contains two cards of the same rank as the selected number, the player has scored a Hi-Five.
 - b. If all three dice match a number the player has wagered on, and the player's hand contains exactly one card of the same rank as the selected number, the player has scored a Quad.
 - c. If all three dice match a number the player has wagered on, and the player's hand contains at least one King or Queen, the player has scored a Royal.
7. N.B.: Only one hand type may be scored with each Match Bet. For example, if all three dice match the selected number and the player's hand contains one King or Queen and one card of the same rank as the selected number, the player does **not** score both a Quad and a Royal.

Methodologies:

1. A spreadsheet was created analyzing all possible outcomes to determine the player's expectation on both the lone Match Bet, and the Match Bet as played with the Ante/Raise Bet.
2. A computer program was created in the C# programming language (VS 2008 standard) to simulate 2,000,000,000 hands of play and verify the results within the reported tolerance.
3. In all cases, the player is assumed to be playing with the optimal strategy on all bets wagered.

Results:

1. For the recommended payable (hereafter referred to as Paytable 1), the following results were calculated:
 - a. When the Match Bet is played by itself, the House will win, on average, **6.48% of all money wagered** on the Match Bet.
 - b. When the Match Bet is played in conjunction with the Ante/Raise bet, assuming the player employs optimal strategy, the house will win, on average, **3.34% of all money wagered** on the Match Bet.
2. For alternate paytables and their respective House Edges, please see the Appendix.

Report completed on 30 June 2008 by Charles Mousseau, B.Sc.

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Results are deemed reliable.

DICEY 21: APPENDIX OF TABLES

Table #1: Calculation detail for Paytable 1:

"Match Bet", played alone:				
<u>Result</u>	<u>Occurs</u>	<u>P(Occur)</u>	<u>Payout</u>	<u>Value</u>
No Match	125	0.578704	-1	-0.578704
Single	75	0.347222	1	0.347222
Double	15	0.069444	2	0.138889
Triple	1	0.004630	6	0.027778
SUM	216	1		-6.48%

"Match Bet", played with Ante / Raise Bet				
<u>Result</u>	<u>Occurs</u>	<u>P(Occur)</u>	<u>Payout</u>	<u>Value</u>
No Match	125	0.578704	-1	-0.578704
Single	75	0.347222	1	0.347222
Double	15	0.069444	2	0.138889
Triple(*)	1	0.004630	12.779924	0.059166
SUM	216	1		-3.34%

(*) Calculations for value of "Triple Match"				
.. When player stands pat:				
<u>Result</u>	<u>Occurs</u>	<u>P(Occur)</u>	<u>Payout</u>	<u>Value</u>
Royal	48	0.153846	20	3.076923
Quad	24	0.076923	40	3.076923
Other	240	0.769231	6	4.615385
SUM	312	1		10.769231

.. When player draws:				
<u>Result</u>	<u>Occurs</u>	<u>P(Occur)</u>	<u>Payout</u>	<u>Value</u>
Royal	25296	0.260698	20	5.213950
Quad	13824	0.142468	40	5.698739
Hi-Five	552	0.005689	500	2.844422
Other	57360	0.591145	6	3.546871
SUM:	97032	1		17.303982

<u>Draw?</u>	<u>P(Occur)</u>	<u>W(Payout)</u>	<u>Value:</u>
No draw:	0.692308	10.769231	7.455621
With draw:	0.307692	17.303982	5.324302
SUM:	1		12.779924

Table #2: List of possible paytables.

	<u>Paytable 1</u>	<u>Paytable 2</u>	<u>Paytable 3</u>	<u>Paytable 4</u>
No Match	-1	-1	-1	-1
Single	1	1	1	1
Double	2	2	2	2
Triple	6	7	8	8
Royal	20	20	20	20
Quad	40	40	40	40
Hi-Five	500	500	500	100

Table #3: House edge per payable

	<u>Paytable 1</u>	<u>Paytable 2</u>	<u>Paytable 3</u>	<u>Paytable 4</u>
No Ante/Raise	-6.48%	-6.02%	-5.56%	-5.56%
With Ante/Raise	-3.34%	-3.01%	-2.68%	-3.01%