

# Mississippi Stud



**Information Manual**

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## Establishing Limits on Bets & Aggregate Payouts

Casino management may choose to adhere to the following:

- ✚ Define and post separate minimum and maximum wagering limits for both the base game and side bet (if applicable).
- ✚ Define and post (for side bet wagers only) an aggregate limit for payouts (maximum allowed total payout to winning players wagering on the side bet, during a single round of play). Posting an aggregate limit protects your establishment from excessive liability in any one round of play, while allowing the player a wider range of betting options, subject to posted aggregate limits.

## Basics of Mississippi Stud

Mississippi Stud is a five-card poker game that lets you bet up to 10 units on a single hand. In Mississippi Stud, you compete against a payable, not against the dealer, and you win if your hand is a pair of jacks or better. The top payout is 500 to 1 for a royal flush- and it pays on all bets! It also features an optional 3 Card Bonus bet.

### Getting Started

Make an ante bet to receive your first two cards . The dealer will place three community cards face down in the middle of the layout.

### Play or Fold?

At this point, you may either fold or make the 3<sup>rd</sup> Street bet of 1x-3x your ante. The dealer then reveals the first community card. Once you see the first community card, you have a choice: fold or make the 4<sup>th</sup> Street bet of 1x-3x your ante. The dealer then reveals the second community card. Once again, you can fold or stay in the game by making the 5<sup>th</sup> Street bet from 1x-3x your ante.

**Note:** When you fold, you forfeit your ante and any additional main game bets placed. The three card bonus bet remains in action until the three community cards are exposed.

### Winning and Losing

After the dealer turns over the final community card, he resolves all wagers left in action. You win if your five-card hand is a pair of jacks or better (pairs of 6's-10's push). See payable for odds

### 3 Cards Bonus Optional Side Bet

You may make the optional 3 Card Bonus bet in addition to your standard Mississippi Stud wager and optional progressive wager. At the casino's discretion, you may bet more on this bonus than on the base game wagers. If the three community cards contain a pair or better, your 3 Card Bonus bet wins. See posted payable

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# Rules and Dealing Procedures

1. Shuffle Master recommends using an iDeal™ shuffler. When using the iDeal, contact your Scientific Games service technician to set up the appropriate mode.
2. To begin the game, players must make an Ante bet.
3. Working from left to right, the dealer places three community cards – face down – in the assigned area.
4. The dealer then gives each player two starting cards, face-down.
5. After looking at their two cards, players have a choice:
  - a. Fold (and surrender their ante); or
  - b. Make a 3<sup>rd</sup> street bet of 1x to 3x their ante.
6. The dealer then reveals the first community card.
7. Players have a choice:
  - a. Fold (and surrender their ante and 3<sup>rd</sup> street bets); or
  - b. Make a 4<sup>th</sup> street bet of 1x to 3x their ante.
8. The dealer then reveals the second community card.
9. Players have a choice:
  - a. Fold (and surrender their ante, 3<sup>rd</sup> street and 4<sup>th</sup> street bets); or
  - b. Make a 5<sup>th</sup> street bet of 1x to 3x their ante.
10. The dealer then reveals the third community card.
11. Working from right to left, the dealer reveals each player's two-card starting hand and combines it with the three community cards. The dealer will also resolve the 3 Card Bonus side bet wagers at this time.
12. The dealer pays according to the posted paytable. All winning bets receive the same odds payouts.
13. The 3 Card Bonus side bet is based on the three community cards **ONLY**.  
The 3 Card Bonus will receive action regardless if the player folds their hand. If the player has placed a wager on the 3 Card Bonus side bet and folds, the dealer will remove the original MS Stud wager/s, and tuck the folded cards under the players 3 Card Bonus side bet. Players win with at least pair or better. See paytable for odds.



All bets must be  
1x to 3x the Ante

## **PAYOUTS**

Royal Flush .....	500 to 1
Straight Flush .....	100 to 1
Four-of-a-Kind .....	40 to 1
Full House .....	10 to 1
Flush .....	6 to 1
Straight .....	4 to 1
Three-of-a-Kind .....	3 to 1
Two Pair .....	2 to 1
Jacks or better .....	1 to 1
Pair of 6s to 10s .....	Push



# Paytables

## Mississippi Stud

Hand	MS-01
Royal Flush	500 to 1
Straight Flush	100 to 1
Four of a Kind	40 to 1
Full House	10 to 1
Flush	6 to 1
Straight	4 to 1
Three of a Kind	3 to 1
Two Pair	2 to 1
Pair of Jacks or better	1 to 1
Pair of 6s to 10s	Push
House advantage	1.58%
Expected hold	24%

## 3 Card Bonus

Paytable 1

Straight flush	40 to 1
Three of a kind	30 to 1
Straight	6 to 1
Flush	4 to 1
Pair	1 to 1

Paytable 2

Straight flush	40 to 1
Three of a kind	30 to 1
Straight	5 to 1
Flush	4 to 1
Pair	1 to 1

Paytable 3

Straight flush	40 to 1
Three of a kind	30 to 1
Straight	6 to 1
Flush	3 to 1
Pair	1 to 1

Paytable 4

Mini Royal	50 to 1
Straight flush	40 to 1
Three of a kind	30 to 1
Straight	6 to 1
Flush	4 to 1
Pair	1 to 1

Paytable 5

Mini Royal	50 to 1
Straight flush	40 to 1
Three of a kind	30 to 1
Straight	5 to 1
Flush	4 to 1
Pair	1 to 1

Paytable 6

Mini Royal	50 to 1
Straight flush	40 to 1
Three of a kind	30 to 1
Straight	6 to 1
Flush	3 to 1
Pair	1 to 1

## Mississippi Stud Progressive

Hand	MS Stud-01		MS Stud MG-01		MS Stud MG-02	
	Pays*	Envy	Pays*	Envy**	Pays*	Envy**
Royal Flush	100%	\$1,000	100%	\$1,000	100%	\$5,000
Straight Flush	10%	\$300	10%	\$300	10%	\$1,500
4 of a Kind	300 for 1		300 for 1		300 for 1	
Full House	50 for 1		50 for 1		50 for 1	
Flush	40 for 1		40 for 1		40 for 1	
Straight	30 for 1		30 for 1		30 for 1	
3 of a Kind	9 for 1		9 for 1		9 for 1	

<b>MS Stud MG-03</b>		
<b>Hand</b>	<b>Pays*</b>	<b>Envy**</b>
Royal Flush - Spades	100%	\$1,000
Royal Flush - Other	10%	\$300
Straight Flush	1000 for 1	
4 of a Kind	300 for 1	
Full House	40 for 1	
Flush	30 for 1	
Straight	20 for 1	

<b>MS Stud Quick Hit 01</b>		
<b>Hand</b>	<b>Pays*</b>	<b>Envy</b>
Straight Flush	100%	\$500
4 of a Kind	10%	\$25
Full House	50 for 1	
Flush	40 for 1	
Straight	30 for 1	
3 of a Kind	9 for 1	

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# Math Report

## Analysis Methodology:

Because only a total of five cards are dealt, it is possible to analyze Mississippi Stud by reviewing every possible deal and draw. In total, there are nearly 156 Million unique deals and draws that need to be looked at. A series of programs were developed to review each decision point and determine the best play for the Player by simulating every possible result. This process allowed for the development of an Expert Strategy that was also a perfect strategy so that the Player can maximize his payback.

Mathematically speaking, there is no reason for a Player to ever bet 2 times his original wager. If the Player has an advantage at the point of decision, that is to say, he expects to win more than he will lose, he should wager as much as the game will allow, or 3 times his original wager. Conversely, if at any decision point, the player will lose less by Folding than by Playing, he should Fold. At any time he is between these two points, he should bet 1 times his original wager. Although these are net losers, he will lose less by Playing 1 times his original wager as opposed to Folding.

In order to understand the methodology and results, it will be necessary to define a few terms. The first is 'expected value' or EV. The expected value is the total number of wagers returned to the Player when all possible outcomes are considered, divided by the number of possible outcomes and the number of coins wagered. So for example, if after 4-cards the player has the following hand:

2♦    6♦    10♦    Q♦

There are 48 ways to draw to this hand. Six of these draws will result in a Medium Pair (6's or 10's), three will result in a High Pair (Q's) and 9 will result in a Flush. When we add up the total amount paid to the Player for the 18 winning hands, assuming a total of 4 coins wagered (one initial wager plus an additional one unit at each decision point), we find that the player would get back a total of 300 coins. We divide this by the number of possible hands (48) and the number of units wagered (4) and find that the expected value is 1.56. As we will see shortly, the Player should wager 3 coins, not 1 at this point. The expected value will remain the same, but it will carry more weight in the determination of the overall payback of the game.

Because in Mississippi Stud, there are different payouts for different Ranks of Pairs, we need to keep track of which cards are of which category of Rank. For the purposes of this report, a High Card will be a J, Q, K or A. A Medium Card will be a 6, 7, 8, 9 or 10. A Low Card will be a 2, 3, 4 or 5.

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## Results:

When making the determination to Play 1 or 3 times the original wager, all that matters is the expected result at that point in time. Future wagers do not impact the decision making process. When deciding to Fold or Bet 1x, the wagering pattern of the future wagers must be taken into consideration in order to determine what the proper strategy is. Because of this, the results will be presented from the last wager decision back to the first wager decision.

### 4-CARD HANDS

There are 270,725 unique 4-card hands that the Player may have been dealt. In reality, the Player may have already Folded many of these possible hands in early rounds. However, this is immaterial in determining what is the right strategy at this point, as it is possible that the Player may have made an erroneous decision earlier that can still be corrected for at this point. It should be understood, however, that the strategy developed here is based on having made proper strategy decisions earlier. If the Player chooses to bet 3x after 2 cards when he should have bet 1x, this may change what he should do after 4 cards, as he would be forfeiting more coins at this point.

For each of these 270,725 hands, the resulting 48 draws were simulated and the results tabulated to determine the expected value of the hand. If the expected value was greater than 1.00, the hand warrants being played with a bet of 3x.

The decision to Play 1x or Fold is a bit more complex. Because the Player may have wagered anywhere from 3 units to 7 units in the previous wager, the decision to Play or Fold is based on the total amount previously wagered because this will affect how much is won on a winning hand. As these units have already been wagered, the only question is whether by Playing, we can at least win back the extra unit we would now wager. If so, the decision is to Play. If not, the decision is to Fold. The results of the simulation program led to the following strategy determinations:

#### Bet 3x

- If the Player has any winning pat hands (Pair of 6's or Better, Three of a Kind, Two Pair, Four of a Kind).
- If the Player has a 4-Card Flush or 4-Card Straight Flush
- If the Player has a 4-Card Straight (not Inside) with an 8-high or better

#### Bet 1x

- If the Player has a 4-Card Straight or Inside Straight that did not warrant a 3x bet
- If the Player has a Low Pair
- If the Player has 1 High Card and 2 or more Medium Cards
- If the Player has 2 or more High Cards
- If the Player has wagered 5 coins or more to this point and has 1 High Card and 2 Medium Cards or 3 Medium cards

#### Fold

- All other hands

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## 3-CARD HANDS

There are 22,100 unique 3-card hands, and a total of 1176 possible draws for each one. As in the previous case, a program was developed to review the results of each initial deal and each possible result. Again, if the expected value of the initial deal was greater than 1.00, the hand warrants a bet of 3x.

The calculation to Fold or Play 1x is far more complex as it must take into account how often the Player will Fold or Bet 3x based on the next community card. The simulation program did this by keeping track of the results of all 4-card hands from the previous step and using them to determine if the Player was better off Folding or Playing 1x. In the end, the decision was still based on the same criteria. That is, would the Player lose less by Folding or by Playing 1x.

In the end, the following strategy was developed based on the results of reviewing every possible scenario:

### Bet 3x

- If the Player has a Three of a Kind
- If the Player has a Pair of 6's or better
- If the Player has a 3-Card Royal
- If the Player has a 3-Card Straight Flush (not Inside) that contains 2 or more Medium Cards (i.e. 6-7-8, 5-6-7)
- If the Player has a 3-Card Straight Flush or 3-Card Inside Straight Flush with 1 High Card that is not an Ace (i.e. 8-9-J)
- If the Player has a 3-Card Straight Flush or 3-Card Inside Straight Flush or 3-Card Double Inside Straight Flush with 2 High Cards (i.e. 8-J-Q)

### Bet 1X

- If the Player has a Pair of 2's – 5's
- If the Player has a 3-Card Flush
- If the hand contains at least 1 High Card and 1 Medium Card
- If the hand contains at least 2 High Cards
- If the hand contains 3 Medium Cards
- Unsuit hand, containing any of the following combinations:
  - 4-6-7
  - 5-6-7
  - 5-7-8
  - 5-6-8
  - 4-5-6

### Fold

- All other hands

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## 2-CARD HANDS

There are 1326 unique initial 2-card deals with each having 19,600 possible 3-card draws. As with the other wagers, if the expected value of the initial 2-card deal is greater than 1.00, the Player should wager 3x. The decision to Fold or Play 1x is again based on the decisions that will eventually be made on 3-card hands and 4-card hands. In the end, the strategy developed is as follows:

### Bet 3x

- If the Player has a Pair

### Bet 1x

- If the Player has at least 1 High Card
- If the Player has 2 Medium Cards
- If the Player has a suited 5-6

### Fold

- All other hands

### Additional Comments

As stated earlier, wagers made earlier on can impact the strategy chosen later on. Obviously, once the Player folds, there are no additional choices. Also, once the Player has a guaranteed Push or better, the strategy is rather obvious as well (Play 3x). However, if there may be circumstances in which the Player Plays 3x at one of the early decision points which may affect a later decision. By wagering more coins early, the calculation of the expected value is not impacted but the value at which the Player will choose to not fold WILL be impacted. In the end, however, there is only one slight change to the strategy as a result of this possibility. If the Player has wagered a total of 5 coins or more and has 1 High Card, 2 Medium Cards or 3 Medium Cards after four cards are dealt, he should NOT Fold, and instead bet 1X. This will occur very rarely, but if the Player has a 3-Card Straight Flush that does not turn into a 4-Card Straight Flush, this may occur.

## **Overall Payback Calculation**

With the strategy determined, programs were developed to calculate the overall payback of the game, as well as some other basic important information about how the game will behave and what Player's and Casino should expect.

This program cycled through every possible combination of hands (156 million), using the appropriate strategy for each hand at each decision point. From this, we are able to determine a theoretical payback, as well as gather information about how often the Player will Fold at each decision point and how many units the Player will wager on average. The results of this program are in the table below:

Action	2 Cards		3 Cards		4 Cards	
	Hands	Pct	Hands	Pct	Hands	Pct
Fold	48,451,200	31.07%	11,966,976	11.13%	7,570,368	7.93%
Play 1X	98,313,600	63.05%	78,481,536	73.02%	57,715,776	60.42%
Play 3X	9,172,800	5.88%	17,037,888	15.85%	30,233,280	31.65%
Total Hands	155,937,600	100%	107,486,400	100%	95,519,424	100%

Perhaps more important than the numbers in the table above are the specific betting patterns that occur throughout the game. The following table captures the key statistics of this, including the winning percentage and expected value for each betting pattern.

	Wagers				Frequency		Wins and pushes		Expected Value
	Ante	Bet 1	Bet 2	Bet 3	Hands	Pct	Hands	Pct	
F	1	0	0	0	48,451,200	31.07%	0	0.00%	0.00
O	1	1	0	0	11,966,976	7.67%	0	0.00%	0.00
L	1	1	1	0	7,569,216	4.85%	0	0.00%	0.00
D	1	1	3	0	1,152	0.01%	0	0.00%	0.00
P L A Y	1	1	1	1	54,938,880	35.23%	11,344,824	20.65%	0.35
	1	1	1	3	13,263,936	8.51%	12,184,644	91.86%	1.79
	1	1	3	1	343,872	0.22%	82,620	24.03%	0.44
	1	1	3	3	10,229,568	6.56%	10,140,924	99.13%	2.09
	1	3	1	1	2,433,024	1.56%	405,504	16.67%	0.54
	1	3	1	3	276,480	0.18%	276,480	100.00%	4.28
	1	3	3	3	6,463,296	4.14%	6,463,296	100.00%	2.23

In the end, the Player will fold approximately 43.60% of all hands. Just over 71% of the hands folded will be without wagering more than the original Ante. Of the hands that are not Folded, the Player will win or push 46.50% of the time, or 26.23% of all hands dealt. On average, the Player will wager about 3.59 units per hand. With the payable described at the beginning of this report and the Player utilizing Expert Strategy described in this report, the theoretical overall payback of Mississippi Stud is 98.63%. Any changes made to the payable may alter the Strategy and thus change the overall payback of the game.

Hand	Standard Distribution		Theoretical Mississippi Stud		Simulation	
	Occurs	Freq.	Occurs	Freq.	Occurs	Freq.
Royal Flush	4	0.0002%	240	0.0003%	673	0.0003%
Straight Flush	36	0.0014%	1,392	0.0020%	4,314	0.0019%
Four of a Kind	624	0.0240%	32,496	0.0457%	104,061	0.0457%
Full House	3,744	0.1441%	180,144	0.2535%	577,292	0.2533%
Flush	5,108	0.1965%	208,248	0.2930%	666,137	0.2923%
Straight	10,200	0.3925%	341,280	0.4802%	1,092,652	0.4794%
Three of a Kind	54,912	2.1128%	2,436,792	3.4284%	7,815,601	3.4291%
Two Pair	123,552	4.7539%	5,165,640	7.2677%	16,558,936	7.2651%
High Pair	337,920	13.0021%	15,420,384	21.6954%	49,462,226	21.7013%
Mid Pair	422,400	16.2527%	14,039,568	19.7527%	45,006,866	19.7465%
Low Pair	337,920	13.0021%	6,402,096	9.0073%	20,533,057	9.0088%
Nothing	1,302,540	50.1177%	26,848,584	37.7740%	86,101,391	37.7765%

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## Analysis of Three Card Sidebet

### Game Description:

Three Card Sidebet can be used for any casino game in which 3 cards are randomly drawn from a standard 52-card deck. The Player will be paid according to the payable if his hand achieves one of the hands on the payable.

The paytables that have been created are in the tables below:

Hand	3CS-01 Pays*	3CS-02 Pays*	3CS-03 Pays*
Straight Flush	40	40	40
Three of a Kind	30	30	30
Straight	6	5	6
Flush	4	4	3
Pair	1	1	1
Payback	97.6833%	94.4253%	92.7240%
House Advantage	2.3167%	5.5747%	7.2760%

\* Original wager is returned as well. All payouts are X TO 1

Hand	3CS-04 Pays*	3CS-05 Pays*	3CS-06 Pays*
Royal Flush	50	50	50
Straight Flush	40	40	40
Three of a Kind	30	30	30
Straight	6	5	6
Flush	4	4	3
Pair	1	1	1
Payback	97.8643%	94.6063%	92.9050%
House Advantage	2.1357%	5.3937%	7.0950%

\* Original wager is returned as well. All payouts are X TO 1

To calculate the payback of the sidebet, a computer program was created which tabulated the rank of all 3-card hands from a 52-card deck. This distribution of 3-card hands is shown in the table below:

3-Card Hand Distribution		
Hand	Occurs	Frequency
Royal Flush	4	0.0181%
Straight Flush	44	0.1991%
Three of a Kind	52	0.2353%
Straight	720	3.2579%
Flush	1096	4.9593%
Pair	3744	16.9412%
Other	16440	74.3891%

The payback for each payable can be calculated by multiplying the payouts of each winning hand by the frequency of that hand and summing up these values. It should be noted that for paytables that do not pay specifically for a Royal Flush, Royal Flushes are included in the frequency of the Straight Flushes. The calculations for each of the above paytables can be found in the following tables:

Payback Calculation - Paytable 3CS-01			
	Frequency	Pays*	Contribution
Straight Flush	0.2172%	41	8.9050%
Three of a Kind	0.2353%	31	7.2941%
Straight	3.2579%	7	22.8054%
Flush	4.9593%	5	24.7964%
Pair	16.9412%	2	33.8824%
<b>Total</b>	25.6109%		97.6833%

\* Includes the return of the original wager

Payback Calculation - Paytable 3CS-02			
	Frequency	Pays*	Contribution
Straight Flush	0.2172%	41	8.9050%
Three of a Kind	0.2353%	31	7.2941%
Straight	3.2579%	6	19.5475%
Flush	4.9593%	5	24.7964%
Pair	16.9412%	2	33.8824%
<b>Total</b>	25.6109%		94.4253%

\* Includes the return of the original wager

Payback Calculation - Paytable 3CS-03			
	Frequency	Pays*	Contribution
Straight Flush	0.2172%	41	8.9050%
Three of a Kind	0.2353%	31	7.2941%
Straight	3.2579%	7	22.8054%
Flush	4.9593%	4	19.8371%
Pair	16.9412%	2	33.8824%
<b>Total</b>	25.6109%		92.7240%

\* Includes the return of the original wager

Payback Calculation - Paytable 3CS-04			
	Frequency	Pays*	Contribution
Royal Flush	0.0181%	51	0.9231%
Straight Flush	0.1991%	41	8.1629%
Three of a Kind	0.2353%	31	7.2941%
Straight	3.2579%	7	22.8054%
Flush	4.9593%	5	24.7964%
Pair	16.9412%	2	33.8824%
<b>Total</b>	25.6109%		97.8643%

\* Includes the return of the original wager

Payback Calculation - Paytable 3CS-05			
	Frequency	Pays*	Contribution
Royal Flush	0.0181%	51	0.9231%
Straight Flush	0.1991%	41	8.1629%
Three of a Kind	0.2353%	31	7.2941%
Straight	3.2579%	6	19.5475%
Flush	4.9593%	5	24.7964%
Pair	16.9412%	2	33.8824%
<b>Total</b>	25.6109%		94.6063%

\* Includes the return of the original wager

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Payback Calculation - Paytable B7S-06			
	Frequency	Pays*	Contribution
Royal Flush	0.0181%	51	0.9231%
Straight Flush	0.1991%	41	8.1629%
Three of a Kind	0.2353%	31	7.2941%
Straight	3.2579%	7	22.8054%
Flush	4.9593%	4	19.8371%
Pair	16.9412%	2	33.8824%
<b>Total</b>	25.6109%		92.9050%

\* Includes the return of the original wager

The win frequency for the Three Card sidebet is 25.6109%