

# Introductory Limit Texas Hold'em Poker Theory

## Abstract

This mini-course is explained in the title. First, it is an introductory series. You do not need to have any experience playing poker to understand the content, but experience will be incredibly helpful. Second, the focus of these lectures will be on the game of “Limit Texas Hold'em” (often called “Limit Hold'em”). This is a common game in many cardrooms and casinos and is (in a sense) the simplest game to play. Finally, this is a lecture of theory. Poker is a complex game of incomplete information. The theory will help you learn what to think about in many situations and if you think about these things you will often arrive at the proper play. However, there are not many aspects of poker where it can be said “always do this” or “never do that”. So it will rest on you to bring all the ideas together and make the right play at the table.

Poker is a highly complex game; most people do not understand the depth of strategy that exists when playing the game at the highest levels. The lowest level of understanding is that poker is a game of “What do I have?”. But as one progresses in poker ability, you will find that other questions start to show up: “What are the odds of drawing the cards I need?” and “How much money is in the pot?”. Even further along you even get questions such as “What does he think I have?” and “What does he think I think he has?” and so on. At the highest level of play, these questions are thrown out for mathematical game theory because the complexity is so great. But in this text, we will not worry so much about the deep levels of thinking. This is only an introductory text. However, understanding the concepts presented here (and reading the “classical poker literature” in the list at the end), you will be well on your way to reaching a high level of poker expertise.

You may be wondering, “Why poker? Why not blackjack or craps?” Most casino games are rigged so that you will lose. Craps, roulette, slots, and keno are all designed so that players will be long-term losers. If you calculate the expected value (this process is explained later), then you will find that they are all losing games. Blackjack is better, in that if you know how to count cards effectively, you can play a winning blackjack. The problem is that your edge is incredibly small and high and low swings are huge relative to the size of the bet. This means that you will need to have a lot of money and a lot of patience to beat blackjack in the long term.

Poker is different. In all the games mentioned before, the game is you against the house. In poker, it is you against the house and a bunch of other people. This sounds like it should be harder as you have more opponents. The difference is that your edge on the other players can be large enough to offset the edge that the house has on you. Here is an oversimplified analogy:

Suppose there is a gaming company with a gambling game you can play at the cost of \$2 an hour. If you played this game against someone who is the same skill level as you (meaning that you earn \$0 an hour against him), it would be silly to play against him for monetary gain (the value of the entertainment is a different, non-quantifiable idea). If there is someone against whom you have a slight edge, say \$1.50 an hour, it is still better not to play for profit. Now suppose you read some strategy and study the game carefully and find a player over whom you have a \$5 an hour advantage. Now you can play this game profitably (at \$3 an hour). Even though you are playing against two opponents (the gaming company and the poor player), you can still make money.

# 1 The Mechanics of Hold'em Poker

The basic idea of poker is simple. You want to win money. How do you win money? Your hand is better than anyone else's at the showdown or everyone else folds. What is the showdown? What is a fold? If you are asking these questions, then you should go through this section very carefully. If you do not understand how the game works, then you stand little chance of playing it well. The following notation will be used throughout.

Card ranks:

Highest to lowest: A (Ace), K (King), Q (Queen), J (Jack), T (Ten), 9, 8, 7, 6, 5, 4, 3, 2

Generic cards: An "x" represents a card of irrelevant (often small) rank

Card suits:

Referring to specific suits: ♣ (Clubs), ♦ (Diamonds), ♥ (Hearts), ♠ (Spades)

Referring to multiple cards: "s" stands for suited (same suit), "o" stands for off-suit (different suits)

It should be noted that there is no ranking of suits. While at some point in history this may have been true, in all casinos you will find that the suits are not ranked. Also, when the suit is irrelevant, then it will be omitted. For example, Q-T-7-6-3 is a hand that consists of a Queen, a Ten, a 7, a 6, and a 3, and the suits are arbitrary. Also, AK means an Ace and a King, either of the same suit or not. Here are a few examples to help you understand the notation:

A♠ (Ace of spades)	Q♥ (Queen of hearts)
K7s (King and 7 of the same suit)	J2o (Jack and 2 of different suits)
Axs (Ace and some other card of the same suit)	xxo (Any two cards of different suits)

## 1.1 Hand Ranks

A poker "hand" is a subset of 5 cards of the 52 cards in the entire deck. In Hold'em you will have 7 cards. Your hand is the best of the 21 possible 5 card subsets of the 7 cards you have. The following list is a ranking of the hands from the best to the worst.

1. Straight Flush: A straight is a run of 5 cards with consecutive ranks, and a flush is 5 cards of the same suit. A straight flush has both of these. The highest straight flush (known as the "royal flush") is a straight from A to T. (For some reason, people like to think of this as a separate class of hands. It is only the highest straight flush.) The lowest straight flush is from 5 to A. (Yes, an Ace can be low in a straight, but it cannot be both; ie Q♠ K♠ A♠ 2♠ 3♠ is not a straight flush.)
2. Four of a kind: "Quads" is another common term for this hand. It is as simple as it sounds: four cards of the same rank. These hands are compared by the rank of the card in the four of a kind, then by the remaining card (the "kicker"). The hand 6-6-6-6-4 is a four of a kind sixes (or quad sixes) with a four kicker. This hand beats 3-3-3-3-A.
3. Full House: This is a three of a kind and a pair (a two of a kind). The hand 9-9-9-3-3 is a full house, nines full (of threes). These are ranked first by the three of a kind, then the pair. So 3-3-3-2-2 is a stronger hand than 2-2-2-A-A since 3 is ranked higher than 2.
4. Flush: As already described, a flush consists of 5 cards of the same suit. Flushes are compared by the rank of the cards (not the suits). First compare the highest card, then the next, and continue down to all 5 cards. For example, a K-Q-J-T-8 flush loses to an A-6-5-4-3 flush since the high card of the first (King) is lower than the high card of the second (Ace). Also, an A-Q-9-5-3 flush beats an A-Q-9-5-2 flush.

5. Straight: Again, a straight is a run of 5 cards with consecutive ranks. The suits of the cards (as long as they are not all the same suit, making it a straight flush) are irrelevant. The determining factor for the value of a straight is the rank of the high card. Notice that with a straight from 5 to A, A is a low card, so that this is a 5-high straight (this is sometimes called the “wheel”). The hand J-T-9-8-7 is a Jack-high straight.
6. Three of a Kind: This is also known as “trips” or a “set” (actually, these words refer to a specific way of getting a three of a kind, but do not worry about the distinction). These hands are ranked first by the rank of the three of a kind, then by the two remaining cards. As an example, 7-7-7-A-T is a better three of a kind than 7-7-7-K-Q.
7. Two Pair: When ranking two pairs, you rank it by the high pair first, then the low pair, and then the remaining card. The hand Q-Q-4-4-8 is sometimes called “Queens up” or “Queens over fours” (you can make the appropriate adjustments for any other hand). The hand K-K-7-7-9 is better than K-K-6-6-A, and both of these are worse than A-A-2-2-3.
8. One Pair: If you have understood the ranking of the other hands, this one should be almost intuitive. First compare the rank of the pair, then compare the other cards from highest to lowest. So the hand 9-9-A-7-3 is worse than T-T-A-7-2.
9. High Card: This is the category for everything that is not listed above. Identical with the flush, these are ranked by the comparing the highest card, then the next highest, continuing to the lowest card. The hand 7-5-4-3-2 is the worst possible hand with 5 cards.

### Exercises:

1. Determine what each of the following expressions means.

A♠      KJo      Qxs      4♦ 5♦      A-3-6-T-5      TT

2. Determine the name of each of the following hands and rank them in order from highest to lowest.

A♠ Q♣ T♥ J♥ K♦      T♣ T♠ 8♥ 3♣ 8♦      J♦ 9♦ 3♦ 5♦ Q♦  
 T♦ 2♠ 6♣ 7♠ 9♠      4♠ 5♣ 4♣ 3♥ 4♥      J♠ 2♣ 2♦ A♦ 7♥

3. Determine the best possible hand that can be formed from taking a pair and combining it with the five cards. Which hand is the best?

6♦ K♠ 8♥ 7♠ 9♠

Q♠ K♥      3♦ T♦      2♣ 2♦      2♠ 4♣      J♥ 3♥  
 9♥ 7♥      K♦ 5♦      K♣ 8♠      6♠ 7♣      7♣ 5♥

## 1.2 Hold'em Poker

Hold'em is a 10 person game when the table is full but can be as small as 2 people. In a casino, you will probably play with 7 to 10 players. There are many types of betting structures: (fixed) limit, no limit, pot limit, and spread limit. We will be focusing on (fixed) limit games (I will drop the “fixed” from this point onward as the game is known more commonly as limit). The reason for this is that it greatly simplifies the decision-making process. At any point, there will be at most three decisions that can be made. While the names of these actions are slightly different, the basic actions are the same: Put no money into the pot (check or fold), put the same amount of money in the pot as the previous player (call), and put more money into the pot than the previous player (bet or raise). The size of the bet is fixed by the betting round. We

will be working specifically with \$2-\$4 Hold'em. This means that for the first two rounds, the bet size is \$2 and for the last two it is \$4.

A betting round consists of the players making such decisions. Each betting round follows essentially the same pattern (the first is slightly different, but the change is easy enough to understand). One player is the designated as the dealer (in casinos, this is done by a plastic disk called the "button"). This does not mean that you actually deal the hand, but it acts as a place keeper so that everyone gets to be the dealer in turn. The first person to play is to the left of the button and play proceeds around the table to the left. If no one before the player has put money into the pot, his options are either to check (put no money in) or to bet (put in the amount specified by the round). In both cases the player is still active in the hand. If another player has put money in before him then he has three options. He can fold (put no money and give up trying to win the hand), call (put in as much money as the previous player), or raise (put in more money than the previous player in the amount specified by the round). If the player folds, he is out of the hand and cannot win the pot; in the other two cases, the player remains active. The betting round ends when all players have had a chance to act and when all active players have entered the same amount of money into the pot.

The exception to this is in the first round. The person to the immediate left of the button is required to put out \$1 (called the "small blind", and the size depends on the game) and the player two seats to the left of the button is required to put out \$2 (called the "big blind", and the size of this also depends on the game). This is similar to the ante, if you know what it is. (Don't worry, the button moves to the left at the end of each hand so that everybody pays both the big and small blinds). This money can be thought of as bets by these players. When the action returns to the big blind, if the pot has not yet been raised, he has the option of raising. (This is because he has not had the opportunity to make a decision on his own. His "bet" was forced.)

The first four seats to the left of the button are referred to as "early position". The next three seats after that are "middle position". Finally, the remaining 3 seats (which includes the button) are "late position". These naming conventions are used to help ease discussion about poker hands, as almost always the 6th and 7th seats (for example) are essentially the same. (There is no standard convention for these seats. I am using something very close to the one Lee Jones uses in his book *Winning Low Limit Hold'em*.)

Now that we know how the betting rounds work, we can discuss how the game itself is played. First the blinds put their money into the pot. Each player is dealt 2 cards (the "hole cards") and we have the first betting round ("pre-flop" betting). Once the betting round is over, three cards are dealt face up in the middle of table (the "flop") and there is another betting round. These cards are community cards; all players can use these cards in their hand (the collection of community cards is often called the "board"). Once the betting round is completed, another community card is added (the "turn") and another betting round begins (recall that the bet size is now bigger). When this is completed, one final card (the "river") is added to the community cards and there is the last betting round. At the conclusion of this betting round, if there is more than one player, they show their cards and the person with the best hand wins the pot; this is the "showdown". (If there is only one player, he wins the pot by default).

### Exercises:

1. It is to your benefit to be able to look at the 5 community cards (the "board") and determine the best possible hand that can be formed by the addition of two cards (the "nuts"). Look at the following boards and determine the nuts for each (and the next few best hands).

7♥ A♥ 7♠ Q♦ K♣    Q♠ A♠ 7♥ T♠ 2♥    3♥ 7♣ 4♥ A♠ 5♦

2. Now go back to the previous set of exercises and pretend that the 5 card hands are boards. Determine the nuts and next few best hands for those boards.

## 1.3 Cardroom and Casino Etiquette

When you go play in a cardroom or casino, be sure the read and understand all the rules. For example, the blind structure given above is not universal. Some places have a third blind on the dealer button. At

another casino, you might find the small blind is only  $1/4$  of a bet and the big blind is  $1/2$  of a bet. If you have any questions concerning the rules, then ask the floor manager or the dealer for help (but not for help on how to play a specific hand, of course).

When you put money into the pot, do not put the money directly into the pot. Put it out in front of you far enough so that it is clearly meant to be in the pot (some casinos actually have a “betting line”). The reason for this is that the dealer must be sure that all the players are “square” (have all put in the same amount) and he does this by comparing the stacks before he scoops them together into the main.

When you play at a casino or cardroom, you play for “table stakes”. This means that if someone bets more than you can afford with the money you have out on the table, it’s okay. Do not reach into your wallet and pull out more money. Simply put as much money in as you can and say that you are “all-in”. The dealer will make a separate pot for the rest of the players as they keep playing. Your hand is still active, but can only win the part of the pot to which you have contributed. Further, when you win a pot, be sure to tip the dealer. Toss a chip or two in his direction and say “thank you”. The reason for this is that the casino or cardroom does not pay dealers very much, so that they make a large part of their wages on tips (much like waiters and waitresses at restaurants).

Another important aspect of the game in casinos and cardrooms is that there is no “I call and I raise”. This is called a “string bet” and is prohibited everywhere I know. The reason for this is that if this were allowed, you would be able to call, observe how people react, then raise if they react negatively. It also reduces arguments because the action moves quickly, and if you say “I call” the people behind you will start to take their turn. The same principle applies to putting money in the pot. If you are going to raise and are not planning to announce it verbally, then all the money needs to go in the pot at the same time. To keep things easy on yourself and others, if you are new to the game, state what you are intending to do first, then do it. That way, if you make a mistake, everyone knows what you had intended to do and will be able to help correct your error. If you do not announce your action and get it wrong, there is nothing you can do about it.

Be sure to protect your cards by keeping your hand or some chips on them. If you do not, and they accidentally get scooped into the “muck” (the pile of discarded cards), you lose that hand. There is no argument that can be made to recover those cards.

Do not act out of turn. Be sure to watch the action as it goes around the table so that you know when it is your turn. If you act early, you give other players an unfair advantage because they know what you want to do (of course, you can purposely act out of turn and do something different than what you want to do, but this is blatantly rude and the other players will get quite upset at you).

Finally, be friendly at the table. This does not mean that you need to be the most talkative person at the table, but it does mean that you need to be courteous to people. Do not get mad when they beat you or berate them for playing poorly. For some reason, people do not mind losing money to friendly people as much as they do losing it to jerks. This is to your benefit.

## 2 The Mathematical Background

### 2.1 Odds and Probability

As with any other gambling game, the outcome of a given situation is determined by random chance. Even though in the end we will be discussing a card game, this section is about the mathematical ideas of odds and probability, so we will use simpler devices such as coins and dice in the examples. I will assume that you are already familiar with probability (total number of desired outcomes divided by the total number of outcomes).

I will briefly discuss odds. Odds are often avoided in math classes because they are more cumbersome for many calculations. However, in poker (and sports betting) it is easier to discuss odds rather than probability because of the direct investment and return nature of the game (for example, spending \$10 to win \$100). One way of expressing odds is as follows: If the probability of something happening is  $p$ , then the odds of the event happening are  $p$  to  $(1 - p)$  (this is written  $p : 1 - p$ ). You can multiply terms by any positive

factor and the odds will be the same, so 2:1 is the same 4:2 (exercise). Because of this, you will almost always see the second term chosen to be a 1. The confusing part is that people talk about odds in favor and odds against. If the odds of an event are 9:1 against, then it happens only 10% of the time; if the odds of an event are 9:1 in favor, then it happens 90% of the time. When you talk about odds, you must say which event you are referencing.

Here are two simple examples. The odds of a coin landing with heads up are 1:1. Since the odds are the same in either direction, it is not necessary to specify whether this is in favor of it or against. The odds of a single die coming up 3 are 5:1 against; equivalently, the odds are 0.2:1 in favor.

### Exercises:

1. Prove that if the odds of an event happening are  $a : b$  in favor (or against), then the odds are also  $ca : cb$  in favor (or against) for  $c > 0$ .
2. Compute the probability and the odds of each of the following events:
  - (a) Being dealt a pair in two cards.
  - (b) Being dealt a pair of aces in two cards.
  - (c) Being dealt two cards of the same suit in two cards.
  - (d) The flop coming all spades assuming that you are holding two spades.

## 2.2 Expected Value

The idea of the expected value of a decision is the main factor on which to base a gambling decision. There are all sorts of assumptions that go into the calculation of expected value, such as the utility of money is linear. If you do not know what this means, do not worry.

The expected value of a decision is the sum over all the possible outcomes of the probability of the outcome multiplied by the return of the outcome. The number represents the average amount of money that will be made or lost for a given decision.

A couple examples will make this more clear. Suppose you and a friend decide to play the following game: A coin is flipped. If it comes with heads up then you win \$1 from him and if it comes with tails up then you lose \$1 to him. Assuming the coin is fair, what is the expected value of playing the game? Half the time you win \$1 and half the time you lose \$1, so the expected value of the game is

$$\$1 \cdot (1/2) + (-\$1) \cdot (1/2) = \$0.$$

This means that the game is break even. If you play this game for a long time, you would expect to be even money.

Now suppose that you have a different game with someone else. You pay him \$3 for the opportunity to roll a die. You win \$1 times the number on the die (for example, if you roll a 3 then you get \$3 to break even overall). Is this a good game to play? Compute the expected value of the game. For each outcome, there is a loss of \$3 plus some amount of money won back, and each outcome is equally likely:

$$(-\$3 + \$1) \cdot (1/6) + (-\$3 + \$2) \cdot (1/6) + \dots + (-\$3 + \$6) \cdot (1/6) = \$0.50.$$

You should play this game with this person. In fact, you should play it as many times as he will let you. Every time you play, you will average a \$0.50 profit. While you may hit a bad streak and be down a few dollars, you are making the correct choice to play the game, for after a large number of games, you expect to be far ahead.

This is the critical distinction that causes people problems in poker. While results are an indicator of good play, good play does not always return immediate results. Being “results oriented” is a quick way to lose money. Suppose your first two cards are T3o and you fold it at your first opportunity. The flop comes

3-3-3 giving you a four of a kind. Some people will get upset at this and vow never to throw away T3o. This is silly. By all reasonable measures, T3o is a weak hand. It has a large negative expectation when you play it. It is as if you pay \$1 for a 1 in a million chance to win \$10. You might get lucky and end up with \$10, but it was not an intelligent bet to make.

I mentioned that it is easier to discuss poker in terms of odds instead of probabilities, yet I have only used probabilities so far. I will now show you why. Here is a hypothetical situation: Heads up (you against one other person) and he bets at you on the river. The pot after he bets is \$42. You think you only have a 10:1 chance of beating him. Do you call this bet? I will compute this using probabilities first. You win \$42 only 1/11 of the time and you lose \$4 the rest of the time.

$$\$42 \cdot (1/11) + (-\$4) \cdot (10/11) = \$0.18$$

Therefore, calling has a positive expectation. I performed that calculation with the aid of a calculator. Very few people will be able to do that in their head (as will be required at the poker table). Instead, I will use odds. The bet is \$4 to win \$42 and this is 42:4 equivalent to 10.5:1. Your odds of winning are 10:1 against. Therefore, calling is the appropriate play since the return (\$10.50 for each \$1 invested) is larger than the risk (10 losses for 1 win). While you do not have an exact expected value, you know that it is positive, and that is the important information.

Of course, if poker were this easy, there would be no reason to have a mini-course on it. The truth is that you will hardly ever know what your odds of winning are exactly, and so all these calculations are merely approximate. This is where experience and instinct help, as these will also help guide your decisions.

If you have a discerning mind, you will object to the analysis given above. I have shown that calling has a positive expectation, but to be complete, I should compare this expectation to the expectation of your other option, which is to fold. If you fold, then you have an expectation of exactly \$0. You do not win money and you do not lose money (that is, any money from the time of this decision). In poker, all of your options will all have an associated expectation. You will need to think a little harder and pick the one with the largest expectation.

If you have a really discerning mind and you are wondering about the option of raising, read the next section.

## Exercises:

1. Determine whether or not the following bet is profitable or not: You pay \$7 to play this game. You draw one card from a full deck. Face cards and aces are worth \$10 and all other cards are worth the number of dollars as the rank.
2. You are trying to draw a flush on the river. There is only one opponent who bets \$4 into you. You have 4 hearts (say 2 on the board and 2 in your hand) so that there are 9 hearts remaining. You also have 2 cards which are not hearts (both on the board), so that there are 34 non-hearts that remain. If you draw your flush, you will win the pot plus an extra bet from your opponent (because he is "willing to pay to see it"). If you miss your flush, you will fold and not lose any more money. Suppose there is \$25 in the pot. How should you play? What if there is \$30? \$40?

## 2.3 Game Theory

In the first two calculations of expected value, there was only one decision. Do I play the game or not? In the poker example, there were three decisions. The two that I discussed were easy because they only involved your decision. If you raise, your outcome is now based on how your opponent plays. If he folds when you raise, then your best play changes from simply calling to raising, because then you win the pot regardless of whether or not you actually make your flush. But if he will re-raise you every time, then you are actually losing money by raising. What happens is that you are no longer investing \$4 to win the \$42 pot, but rather you are investing \$12 to win a \$50 pot (you stand to win an extra \$8 when you win). The odds have dropped to about 4.2:1, which is short of the 10:1 odds against you winning (also, if he re-raises you, you would

want to reduce your odds of winning because this many bets usually means a monster hand). What if he raises 40% of the time, folds 40% of the time, and calls 20% of time? Is raising more profitable than calling? What if you do not know what percent of the time he will raise, call, or fold? Is there a meaningful way of calculating an expected value and determining a strategy?

Instead of looking at the theory, we will work with some examples to portray the essential ideas. You and a friend are playing a series of games. Both of you pick a number for each game, either zero or one. The chart below shows a series of payout tables; your choice is along the top row and his choice is along the left column (values are given relative to you; if the number is +1 then you win \$1, and if the number is -1 then you lose \$1)

	0	1		0	1		0	1		0	1
0	3	-2		0	3	2		0	3	4	
1	2	-1		1	-1	-2		1	-2	-3	

For example, in the first game, if you pick zero and your friend picks one, then you win \$2.

If you played the first game, what is your best strategy? If you pick zero, then no matter what your friend does, you will win money from him. If he picks zero, then you win \$3; if he picks one, you win \$2. If you choose one, then you will lose money no matter what he picks. Therefore, the smarter choice is to pick zero.

In the second game, you do not have a guaranteed win. However, if you look at the payout table a little, you see that you should pick zero. This is not because you are guaranteed to win money, but you will do better in every case. If your friend picks zero, then you win \$3 instead of \$2; if your friend picks one, then you will lose only \$1 and not \$2.

In the third game, things get a little trickier. If you pick zero, then you might win \$3 (if he picks zero) or lose \$2 (if he picks one). However, by picking one, you can win \$4 or lose \$3. You might win more, but you might also lose more. What is the better play? Do you want to maximize your profit when it comes, or do you want to minimize your losses when it comes? Are you a gambler? If you are, then you need not think any further and you can just pick one according to whatever scheme you want.

However, you can play this game a little better if you think a little deeper. Stop thinking about just your play, but think about how your friend would play. If he picks zero, he is guaranteed to lose money (since you gain money in each of these cases). But if he picks one, then he will win money. What is he going to do? Obviously (if your friend plays intelligently), he will pick one. Therefore, what do you pick? If you want to play intelligently, you will want to pick zero.

Finally, we get to the fourth game. Things here are really difficult. Neither you nor your opponent has a guaranteed winning option. How then, can you decide how to play? Well, suppose you decide you want to minimize your losses. Then you would pick zero all the time. But if your opponent knew that, then he would pick one all the time, and consistently win \$2 from you. But if you knew that he knew you would pick zero all the time and that this would entice him to pick one all the time, you would pick one all the time, and win \$4 all the time. Of course, if he knew that you knew that he knew what you knew, he would again change his strategy again.

You can see that this analysis is not going to get very far. The problem is that the strategy that you want to employ is different from the previous games. The idea is what is called a *mixed strategy*. The idea is exactly as it sounds. You pick zero sometimes and you pick one the rest of the times. What does this mean if you play this game only once? It means your choice will be random, but weighted in a certain way (perhaps 70% zero and 30% one). This can be accomplished by flipping a coin, using a random number generator, opening a book to a random page and looking at the page number, or in many other ways.

On what basis do you determine a certain mixed strategy to be the best? The answer is that you want to play it in such a way that even if your opponent knew what your strategy was, he would not be able to lower your expected value. That is, you want your play to be so that even in the worst case (he knows exactly what you are going to do), you will still win the most. Why is this a good strategy? This means that he cannot figure out your strategy and use his knowledge to exploit you. You may do better (if your opponent plays less than optimally), but you will never do worse. Another way to say this is that you are playing the



best way assuming that your opponent is playing the best way. While it is not difficult to work this out in detail, it is beyond the scope of these lectures, and the result is not directly applicable to poker (with the exception of game theoretical bluffing, which will be discussed later).

A couple comments need to be made. First, you are expecting to lose money in the second and third games. You may not have noticed this, which is your friend's advantage (and analogously, your advantage over other poker players). If your friend simply picks one in both these games, he will make money every time. This may seem unfair. In fact, it is. But if you did not notice this, you might have participated in such a game. This is where profit is made at the poker table. Your opponents may be playing a losing game, and not even know it. And if you want to keep winning money, you will do your best to try to keep them from knowing it. Second, in the analysis, we assumed that your opponent has some rational thought. We assumed he would pick the better option in the third game. In real life, people are not rational. Sometimes they make bad plays, even knowing that it was a bad play. This is why, some say, that you do not need to think a whole lot to be a winning player at low limit Hold'em. You hardly ever need to think more than a couple levels deep (levels in terms of you know that he knows that you know...) because it turns out that he does not know these things, thus breaking the chain.

### 3 The Fundamental Theorem of Poker

David Sklansky in his book *The Theory of Poker* presents the Fundamental Theorem of Poker. While it is not quite universal, it applies in so many situations that it is worthy of being called a "Fundamental Theorem" and it is worthy of study.

#### 3.1 The Statement of the Theorem

Every time you play a hand differently from the way you would have played it if you could see all your opponents' cards, they gain; and every time you play your hand the same way you would have played it if you could see all their cards, they lose. Conversely, every time opponents play their hands differently from the way they would have if they could see all your cards, you gain; and every time they play their hands the same way they would have played if they could see all your cards, you lose.

#### 3.2 Comments About the Theorem

You may read this and wonder why it is such a critical idea. It seems somewhat silly to play poker if you can see all your opponents' cards. But this is the central idea. Poker much less of a game if you always knew what everyone had. If you this omniscient player, you could know the correct play every time, regardless of how your opponents play (either correct in terms of game theory or correct with respect to how your opponents play). This means calling when you are behind and the pot is offering sufficient odds for you to catch up, raising when you have the best hand, and folding when you are beat.

This is simple and obvious. What, then, is the value of this theorem? There is abstract value in that it provides the measure of a right and a wrong play, not only for you, but for your opponents. It also sets the entire framework of understanding the what the right play is in any given situation. Without this theorem, you would have no basis on which to determine the correctness of a play. It is here where the situation becomes more subtle. Poker is not played with all the cards face up, so you usually do not know what your opponents have. The goal is to try to fill in the missing details based on how your opponent plays. The better you are at filling in the gaps in information, the better poker player you can become. This information comes in two main forms: the pattern of betting and physical tells.

Assuming that you could play to the game theoretic optimal strategy, is this the strategy you should employ? The answer is only sometimes, but probably rarely. Does this answer surprise you? The reason for this is simple and obvious. The game theoretic optimum is playing so that even if your opponent knew your strategy, he cannot negatively affect your expected value. However, in real life, your opponents do not know your strategy and will not be playing their own game theoretic optimum, either. This is not to say that the

game theoretic strategy is not a winning play. While I do not know of any proof of it, I strongly believe that it is profitable to play the game theoretic optimum. However, deviations from this optimum may be even more profitable (strictly due to the poor play of your opponents).

How can this be? Consider the example given at the beginning of section 2.3. According to the hypothesis for the Fundamental Theorem, you know whether or not you will win the showdown since you know what your opponent holds. Therefore, the correct play is to either raise or to fold, depending on who has the better hand. But if you know that your opponent plays sub-optimally, by always folding to your raise, then it would be more profitable to raise your losing hands, because he will fold. Then, according to the Fundamental Theorem, he loses. This is an example where the mistake of your betting with the worse hand combined with his mistake of folding with the best hand makes the wrong play more profitable than the correct play. Notice that if you play the optimal strategy and fold, you fold knowing confidently that your hand was beat and knowing that you are not losing any money.

### 3.3 Mistakes According to the Theorem

Mistakes according to the Fundamental Theorem are not always easy to understand. Also, mistakes of this sort do not equate to poor play. The assumption that you know your opponents' cards is a very strong assumption. In fact, you will make a mistake many times when you call a hand pre-flop. The reason for this is that very few hands have a large enough edge on the competition that the pot is offering enough odds for you to try to catch up.

Mistakes are not always wrong plays; they are only wrong plays if your opponent plays correctly in response to your mistake. Sometimes when both you and your opponent make mistakes, you make a profit. The reason is that not all mistakes are the same size. Returning to the example from section 2.3, you are making a mistake of \$8 when you raise with the worst hand (\$4 for the call plus \$4 for the raise). But when your opponent folds, he is making a \$50 mistake. This is how your mistake can become profitable. Notice that if your opponent plays correctly, then you lose \$8 (actually, it could be \$12, if he raises you back and you call), and do worse than the guaranteed no loss of money that is promised by the Fundamental Theorem. When you are the only one to make a mistake, then you will almost always lose. (Almost always? Remember that the Fundamental Theorem is not quite universal. There are some counterexamples.)

### 3.4 Some Examples of the Theorem

Before I give some examples, I should point out that there are some numbers given in the analyses that were calculated using the pokenum program online at <http://www.twodimes.net/poker/>. This is a great way to get a feel for how hands compare heads up with each other.

**Example 1:** To start, I will give a non-poker example. The reason is that the core ideas are important at this point, and the cards will make things far more confusing than they need to be. In this example, you are playing a game with a friend. You each put \$10 in the pot and then you both get a random integer between 1 and 10 (inclusively). You then have a betting round, where the bet size is \$10. The person with the higher number wins or if there is a tie, you split the money. Your friend has the first action in the betting round. This game is highly complex, as it is a game of incomplete information (just like poker). You don't always know if you have the highest number or not (with the exceptions of holding either 1 or 10).

Suppose you cheat, and you know that you had your opponent beat. What do you do? If he bets, you raise; if he checks, you bet. According to the Fundamental Theorem, you gain. Why? Because you get money no matter what happens. If he calls your bet or raise then you win the pot plus extra money; if he folds to your bet or raise you win the pot. You do not need to worry about him bluffing you out of a pot because you know you have him beat. If you fail to bet or raise, what happens? You will win less money (sometimes equal) in every situation. If he bets and you simply call, then you do not give yourself the chance to win the extra bet you would have got if he calls your raise. You can go through the argument for yourself if you know you have the smaller number. In every case, you gain by not giving your friend any extra money.

You gain by not losing any money that you might have lost if you did not know what he had. If you do anything differently, then you lose because you did not capitalize on your advantage.

Now we will turn the argument around. Suppose you do not know what he has, but he knows what you have. What happens if your friend knows that you have him beat? Then he will not call your bet and will not bet it himself. Therefore, you lose; you lose because he takes away all possibility of you winning extra money from him with the best hand. What if he knew he had you beat? Then you lose because he will bet and hope that you will call with the worst hand. You lose because the best thing that can happen is that you do not lose money; you cannot bluff him out of the pot and you cannot beat his hand.

**Example 2:** Suppose that you have  $K\heartsuit K\spadesuit$ . The most reasonable thing to do is raise pre-flop because you most likely have the best hand. Notice the language that is being used. The phrase “most likely” is not a Fundamental Theorem statement. The Fundamental Theorem works on the hypothesis that you know what your opponents have. If you knew that nobody held a pair of aces, then you are absolutely correct to raise. However, if someone does hold a pair of aces, you are a 4.8:1 underdog and the correct play is to fold your kings. But if you raised a pair of kings pre-flop and get beat by a pair of aces, no poker player will chastise you for the raise. This is an example which emphasizes the peculiar nature of the Fundamental Theorem. Plays that might be correct poker strategy may be incorrect according to the Fundamental Theorem.

**Example 3:** You are heads up on the turn, and your opponent bets at you into a pot of \$6 (making \$10 in the pot). The board is currently  $A\heartsuit J\clubsuit 9\heartsuit 8\heartsuit$  and you hold  $6\heartsuit 7\heartsuit$  (how you got into this position, I don't know). Your opponent, seeing that you are new to poker turns over  $A\heartsuit J\spadesuit$  and tells you to fold (he's playing mind games with you now). What should you do?

It turns out that the odds of you catching up are about 2.4:1 against. (You will learn how to compute this value later.) Should you call? The pot is offering you 2.5:1 odds to draw, so you should take it. If you call, you gain because you call knowing that you have proper odds to chase your hand. Suppose he didn't show you his hand. Then you cannot call quite as confidently. For example, he might have  $K\heartsuit Q\heartsuit$  in his hand, in which case all your flush cards do not help and half of your straight cards do not help. If you did not know what he held, you might convince yourself to fold because the pot is small and you are drawing to a weak flush or straight. If you did this, you lose, because the reality is that you are turning down favorable odds. (Notice that you are not considering what he says when you call. It is not about you calling to show that you have guts and will not back down to a challenge. Poker is not about your ego; it is about winning money. Forget this, and you will probably make bad plays.)

**Example 4:** Suppose that you have the button (that is, you are the dealer for the hand). Everyone else folds and you find that you have  $T\spadesuit T\clubsuit$  in the hole (that is, as your first two cards). The strategy that all good players would recommend is to raise this hand. Why? If you simply call, then the small blind needs to call \$1 for a chance to win a \$5 pot. If he had a weaker hand such as  $K\spadesuit 4\heartsuit$  is getting proper odds to call and try to beat you (it turns out that you beat his hand about 71% of the time, so that he is a 2.5:1 underdog).

If you raise and he calls, he is making a mistake; he would need to call \$3 for a chance to win \$7 (the \$1 small blind, the \$2 big blind, and the \$4 you just put in the pot), which means his odds are only 2.3:1. If he knew you had a pair of tens, he would not have called. Therefore, you gain.

Furthermore, by not raising, you are giving the big blind a free chance to beat you with any hand. He is getting infinite odds to outdraw you with a poor hand such as  $4\heartsuit 8\clubsuit$ . What does this mean? It means that even though he is over a 6:1 underdog, he is not making any mistakes by seeing the flop for free. If you raise and the small blind folds, then his call comes with 3.5:1 odds, thus making it incorrect to call.

I have cheated in this example a little. I only compared the hands heads up, and not all three hands simultaneously. This increases the complexity of the problem. I decided that I would rather deal with a clear but slightly incorrect statement than to do a heavy computation that is exactly correct. However, given the analysis above, it is a fairly straightforward exercise to do a nearly exact computation of the odds if I tell you that you win 65% of the time, the small blind wins 25.7% of the time, and that the big blind wins 8.8% of the time. (Why doesn't this add up to 100%? I'm neglecting ties! Trying to do the computation with

ties is even more difficult than this computation. Furthermore, this assumes that there is no more betting beyond this round. To perform an even more precise calculation, you need to include the betting on ensuing rounds on all flops. As you can see, this is extremely complex and the theory becomes far too fuzzy to be applicable in real life.)

This example has slightly more to teach. Notice that when I computed the odds for the small and big blinds, I did not try to compensate for the fact that some of the money in the pot came from the blinds already; I did not use the fact that the small blind had already “invested” \$1 to determine whether or not he should play the hand. The reason for this is that once the money is in the pot, it does not matter who put it there. When the money goes into the pot, it belongs to the pot and not the person who put it there.

### 3.5 A Counterexample

As mentioned before, the Fundamental Theorem is not universal. There are times when you can gain when you opponents play as if they know what you have and there are times when you lose when your opponents play as if they do not know your hand. But this can only happen you have more than one opponent.

The example will again be a non-poker example. These numbers are completely made up, but I will follow it with a similar looking Hold'em example that looks like the example given, but whose numbers are much more complicated (and will not be computed). This example is an extension of the example given in *Theory of Poker*.

Suppose that you have a 30% chance of winning a hand against two opponents and are first to act. The next player, opponent A, has a 50% chance of winning and a third player, opponent B, has 20% chance of winning. There is \$40 in the pot and the bet size is \$10. We will examine a number of cases.

Suppose that you bet and opponent A, not knowing what you have, incorrectly calls your bet, instead of raising with the best hand. Player B is getting 6:1 pot odds and therefore (correctly) calls. In this case, 30% of the time you win \$70 and you 70% of the time you lose \$10. Therefore, your expected value of this play is  $.3 \cdot \$60 - .7 \cdot \$10 = \$11$ .

Now suppose that you bet and player A, knowing you have a weaker hand, raises. Then player B is getting  $20:70 = 1:3.5$  on his call, which is short of the 1:4 that he needs. This will make him fold and you have odds to call the raise. How does your chance of winning change? Perhaps the 20% is equally distributed between you and your sole opponent (this may or may not be true, and will be examined a little later). So now you have a 40% chance of winning. Your expected value on this sequence is  $.4 \cdot \$60 - .6 \cdot \$20 = \$12$ . This is better than your expected value than if opponent A did not know what you have.

Why does this work? The net effect of your bet plus player A's raise is that it is too expensive for player B to chase the pot, and both you and player A profit from this. With fewer people playing for the pot, you have the potential to win even more. (Players can cheat in poker this way. Two players can conspire to make it too expensive for players to chase their hands, hence forcing them to fold or make bad calls.)

What about the redistribution of the chances of winning? The reason why it is not necessarily balanced between the two remaining players is that, perhaps, whenever player B was going to win the pot, you have the worst hand (if player B has a flush, then player A has a straight and you have a three of a kind, for example). In the worst case, all the equity goes to player A. If we compute the expected value of this situation, you will earn  $.3 \cdot \$60 - .7 \cdot \$20 = \$4$ , and you win much less money than before. This example serves as a warning. You do not always win more by making this play, so be sure to use it carefully.

A real poker example would be something like holding  $T\spadesuit 9\spadesuit$  with a board of  $T\heartsuit 6\clubsuit A\diamondsuit 8\heartsuit$  and your opponents holding  $A\heartsuit K\heartsuit$  (player A) and  $7\diamondsuit J\clubsuit$  (player B). Player A has the best hand, you have the second place hand, and player B has the worst hand. Since there is one card to come, you have a chance of catching up to player A and player B has a chance to overtake you both. As mentioned before, this Hold'em example has similar features to the contrived example above, but the computation is much more complicated.

### 3.6 The Value of Information

One major consequence of the Fundamental Theorem is that information has value. Again, this is obvious; if you know more about what your opponent holds, then it is easier to make decisions. But this idea is even bigger. The decisions your opponents make also reveal information about their hand. For example, if a really tight player puts in a second raise, you can be quite confident that he has a monster hand. If a player who has raised every bet the last five hands suddenly calls two bets cold (that is, calls a bet and a raise), you might wonder if he is trying to be fancy and slowplay a monster. (*Slowplaying* means playing a strong hand weakly to deceive your opponents; this is discussed in detail later). Moreover, more subtle things such as the a player's vocal tones when he bets or checks may give information of the strength of the hand. Therefore, in all of poker, the key to winning poker is to get as much information out of your opponents as possible.

## 4 Using Odds to Your Advantage

Determining how to play if you are given the pot odds and the odds of making your hands is not a very complicated task. In this case, you see if the pot is offering good enough odds relative to the odds of completing your hand. But this information is not going to be given to you at every decision of the hand. Therefore, you must determine this information for yourself. This chapter is designed to help you to do this.

### 4.1 Pot Odds

*Pot odds*, also known as *immediate odds*, refers to the amount of money that is in the pot and how much it costs to call at the time you need to make your decision. You should be considering pot odds most of the time before you act (not only for yourself, but for your opponents as well).

#### 4.1.1 Calling on the River

When all the cards are out and an opponent has bet, you need to decide what to do. If you know you have the best hand, the clearly you must raise (there is an exception to this, but discussion of this point is omitted here). But more often, you will be unsure and need to choose between calling and folding. There are many things to consider when you reach this decision: What hole cards are consistent with how your opponent has been betting? How often does he bluff? How large is the pot?

The answer to the first question comes from hand reading, which is very difficult and is probably best learned elsewhere. The second question is answered by paying attention to your opponents when you play (that is, study your opponents' betting patterns and gestures in other hands). The final question is the most important one to consider, but it relies on the previous two. When you are calling on the end, you should call because the odds that your opponent is holding a worse hand or is bluffing is better than the odds you are getting from the pot.

The analysis for this is very difficult, as it requires you to accurately gauge your opponents. This is a highly non-mathematical skill and therefore is very difficult to analyze with numbers; experience is the best teacher for this. Here is a simple rule to help guide your decisions: If the pot is large, then call; if the pot is small, then fold. This instinctive behavior is often very close to correct. The following example should show why this is true. Suppose that the pot is \$60 after an opponent bet \$4 on the river. The pot odds are 15:1, so that you only need to have the best hand once out of every 16 hands for your call to be profitable (that's only about 6.3% of the time).

#### 4.1.2 Calling on the Turn

Deciding whether or not to call a bet on the turn is a decision that can be based much more on mathematics, but it still cannot be detached from experience and your analysis of your opponents.

The first step in determining whether or not to call is to count your *outs*; an out is a card which can make you a winning hand. For example, if you have  $K\spadesuit T\spadesuit$ , the board is  $A\clubsuit 5\heartsuit 7\diamondsuit T\diamondsuit$ , and you are

certain that your opponent has an A and a weak kicker (for example,  $A\heartsuit 6\heartsuit$ ), then you have 5 outs (3 kings and 2 tens). After you have counted your outs, you need to compute the odds of one of your outs coming on the river. To do this, you use the following formula:  $(46 - \# \text{ of outs}) : (\# \text{ of outs})$  against you making your hand. This formula is easy to derive. It is simply the number of bad cards to good cards (there are 46 unseen cards, since you cannot see your opponents' cards). Now that you know the odds of completing your hand, you need to see if the pot is offering enough odds. You do this by simply counting the money in the pot and knowing how expensive it is to call the previous bets.

Here are a few common examples:

1. The odds of catching a pair on the river (assuming, of course, that you do not already have a pair) is 40:6 or 6.3:1 against.
2. The odds of drawing to an open-ended straight on the river is 38:8 or 4.8:1 against.
3. The odds of drawing to an inside straight on the river is 42:4 or 10.5:1 against. (Notice how much less often this happens relative to an open-ended straight.)
4. The odds of completing a flush draw on the river is 37:9 or 4.1:1 against.
5. The odds of drawing to an open-ended straight and flush draw is 15:31 or 2:1 against.

### 4.1.3 Calling in Other Situations

This basic idea can easily be changed to fit many other circumstances. For example, if you want to find the odds of completing your hand on the turn instead of the river, you simply take 47 to be the number of unseen cards instead. If a card is exposed (on accident or otherwise), you can subtract off the number of cards from the number of unseen cards.

In the third example of section 3.4, I told you that the odds against making a winning hand were 2.4:1. You now have enough information to figure this out for yourself. First, any T or 5 gives you a straight, which wins; this is 8 outs. Also, any heart that is not the jack of hearts is good, but you must subtract two since we have already counted the  $T\heartsuit$  and  $5\heartsuit$ ; this gives 5 more outs. (The  $J\heartsuit$  gives your opponent a full house, which will beat your flush.) Also, since you have seen your opponent's two cards, you can reduce the number of unseen cards by 2. Therefore the odds are 31:13 against, which reduces to 2.4:1 against, as claimed.

### 4.1.4 Warnings

You should be very careful when you count your odds. In example just discussed, it is easy to forget that not any heart will work and to subtract off the straight flush cards so that you do not double count them. In many circumstances, incorrectly counting your outs may cost you money.

Also, you must realize that just because you make the hand you are drawing to that you are going to win the pot. For example, if you  $J\spadesuit T\spadesuit$  and the flop is  $J\spadesuit 9\heartsuit 8\heartsuit$ , then it is harder to be happy if a T comes and gives you two pair. If the T comes, then there is a four straight on the board, meaning that only one card is needed for a straight. Further, if you catch either the  $J\heartsuit$  or  $T\heartsuit$  then you must think about the possibility that somebody has made a flush.

If there are players left to act after you, then you must be aware that there might be a raise behind you, thus lowering the odds that you are getting from the pot. This is especially important if a player to your left is very aggressive.

### Exercises:

1. Compute a table of odds based for each number of outs for both the turn and the river.
2. Try to think of examples of situations for each number of outs.

## 4.2 Effective Odds

Up to this point, we have only been concerned with drawing only one card. However, there are times when you want to think about the effects of the drawing twice. (Obviously, this is calling on the flop for Hold'em, but the idea extends to any other game where you may be facing more than one betting round.)

*Effective odds* are the odds you are getting after you consider calling more bets on future rounds. For example, suppose you have a flush draw on the flop. The odds of drawing the flush by the river is 1.9:1 against. If the pot is \$6 and you are calling a \$2 bet, you may be inclined to think you are getting proper odds (3:1). However, if you do not draw the flush on the turn, you may be faced with calling another bet while still drawing. Therefore, you need to take into account that you are really calling \$6 (= \$2 on the flop + \$4 on the turn) to win \$10 (\$6 in the pot now + \$4 on the turn). Your odds suddenly drop to 1.7:1, which is now short of the odds you need. Therefore, calling the bet is losing play.

## 4.3 Implied Odds

If you have a pocket pair, the odds against flopping a set are about 8:1. However, it is considered to be a profitable play to call if there are 4 players already in the pot. You are not getting very close to proper odds and if you miss your set on the flop you will not have odds to chase your 2 outer. Why can this be profitable? The answer is in *implied odds*.

Implied odds are the odds after taking into account the amount of money that will be made on future rounds, assuming you catch the cards you need. In the example above, if you catch a set, you stand to make up for the 4 missing small bets in the future betting rounds (and much more!).

For an actual computation of implied odds, suppose that you have  $9\clubsuit 7\clubsuit$  on a board of  $8\spadesuit A\heartsuit T\heartsuit 4\diamondsuit$  and you are faced with a decision to call \$4 with a pot of \$16. You are a 4.7:1 underdog to making the straight. On the basis of pot odds, you should not call (4:1 pot odds). But if you are certain that if you catch your straight card that you will get paid off (he will call your bet or bet into you), then you stand to win \$20 instead, and your call becomes a profitable play. (Even more, you may even get a chance to raise him if he bets into you, and make even more money!)

It is because of implied odds that weaker hands, such as 22, 75s, and Kxs become playable (profitable) in late position after several players are in the pot. Although you are surely behind at the moment, if you catch good cards on the flop, you stand to make a fairly large profit.

## 4.4 Reverse Implied Odds

Implied odds give you better odds than pot odds when you make your hand. *Reverse implied odds* have exactly the opposite effect. Suppose that you have  $A\clubsuit T\spadesuit$  and the flop brings  $T\heartsuit 2\diamondsuit 3\heartsuit$ . Right now, it is very likely that you have the best hand. But when the turn is the  $6\heartsuit$  and a tricky player bets into, you need to be worried. This card brings both a straight and a flush. If he has either hand, then you are *drawing dead* (you cannot possibly win), but if he is bluffing, it is likely that he will give up on the bluff when you call or raise, seeing that you have an actual hand.

Let's look at this mathematically. Suppose for concreteness that there is \$24 in the pot and you are heads up on the turn. If he has made his hand and you call him down to the river, you lose \$8. But if he is bluffing you only win \$4 more. Therefore, while it looks like the pot is offering you 6:1 on the call, you are really wagering \$8 to win only \$28, which is 3.5:1 (nearly twice as bad).

Reverse implied odds are a reason to throw away some mediocre hands against stronger opponents. While you may throw away the best hand on occasion, you must realize that your hand must be much stronger because of the reverse implied odds.

## 5 Position

### 5.1 Position Relative to the Button

Hold'em is a highly positional game. *Position* refers you when you act during a betting round (if you have forgotten, see section 1.2). Unlike games such as 7 Card Stud, where the first player to act is determined by the exposed cards, in Hold'em position is determined purely by the dealer button. The main reason position is important is that information has value.

Suppose you are in late position with a borderline hand such as 55. If you see that several people have already limped into the pot ahead of you, it is probably safe to call and hope to catch a set on the flop. If only a couple players are in the pot, you probably do not have the implied odds needed for this to be a profitable call, so you know you should fold. If you see that nobody has entered the pot yet, you might think about raising to try to put pressure on the blinds to fold (you probably have the best hand, and you are trying to win the pot right there). But now pretend you have the same hand in early position. Now you have no idea whether or not you will have the proper odds to try for the set.

This example is indicative of a general rule. The earlier your position, the tighter you must play.

### 5.2 Relative Position

*Relative position* is your position relative to different players at the table.

If there is a unpredictable player who acts just after you, you should not be happy with your seat. Whenever you have a borderline hand, you need to try to guess what he will do. Suppose you call and he raises; this is bad because you really did not want to play this hand for two bets (but now you are probably going to have proper pot odds to call when the action gets back to you, so you should call). Furthermore, he may be raising with complete garbage or a legitimate hand, so you still do not know what type of hand he has. But if you fold and he only folds or calls, then you are unhappy because you could have played that hand cheaply. However, if you act after him, then you will know when he is calling, raising, or folding, thus taking the guessing element out of your decision.

Conversely, if you have a straightforward player to your left, then you can play more confidently, since you will be able to predict more readily his actions. (This is also true of players who have tells, but catching tells is a much more subtle art, so I will not discuss it.)

As much as possible, you want to have the predictable players to your left and the unpredictable players to your right. This will help guide your decisions and help you to play better poker.

## 6 Deception

Since information has so much value, it follows that keeping others from getting information about your hand also has value. Sometimes, it is correct to make a play which is a “mistake” (according to the Fundamental Theorem) in order to cause your opponents to make a larger mistake. In fact, Sklansky argues that “[c]reating mistakes is, in a sense, the whole objective of the game” (*Theory of Poker*, 63).

While a whole chapter is devoted to the value of deception in *Theory of Poker*, I will only give this section a brief overview. There are several reasons to play deceptively, but the most significant factors are the abilities of your opponents and the size of the pot.

If you are playing observant players or simply good hand readers, you are always at a disadvantage if you never try to be deceptive. The reason for this is that your opponents will have a good idea of the hand you have, and are therefore much less likely to make a Fundamental Theorem mistake (and therefore, they gain). On the other hand, if you are playing against people who are not paying any attention to the game, you stand to lose more than you gain because your trickery will pass completely unnoticed.

The size of the pot is also quite significant. If the pot is very small, then you may stand to win more with a monster hand by not betting very hard on the flop and waiting for the turn to put in your bets. On the other hand, if the pot is already quite large, you should try to win the pot as soon as possible, before your opponents draw their miracles (and getting proper odds to do so!) and take the money away from you.



With this said, it is often incorrect to try to play deceptively in low limit Hold'em games. The reason for this is that your opponents are not that observant and not that great at reading hands. Furthermore, the pot is often quite large, so that deceptive play often offers your opponents proper odds to call (whether or not they realize it).

Deceptive plays come in three basic forms: slowplaying, bluffing, and semi-bluffing. Each of these will be discussed separately.

## 6.1 Slowplaying

*Slowplaying* is playing a strong hand weakly in order to disguise the strength of your hand and to collect more bets in later rounds.

There are several aspects about the hand that should be considered when you think about slowplaying. The first is that your hand must be very strong. When you slowplay, you want to keep as many players around as possible, and you want to be sure that you can beat all of them. Second, your hand cannot be vulnerable; that is, your hand must be able to stand up to whatever your opponents are trying to draw. Ideally, you want them to draw the cards they are hoping for and still lose to you. Finally, the pot must not yet be large. The reason for this is exactly the same reason as presented above: your opponents may be getting proper odds to outdraw you if you play deceptively.

Suppose you have called in late position with  $A\spadesuit 6\spadesuit$  and the flop is  $5\spadesuit 7\spadesuit J\spadesuit$ . A strong argument can be made for slowplaying this hand (although a strong argument can also be made for *not* slowplaying in this position in many games, too). Why can slowplaying be right? It gives someone holding any spade (especially the  $K\spadesuit$  and  $Q\spadesuit$ ) a cheap draw to a second best hand which they will have a hard time folding. Also, if you play weakly on the flop, your opponents may not think you have the flush when you bet on the turn if another spade does not fall.

However, if you had  $A\heartsuit K\clubsuit$  and the flop is  $A\diamondsuit T\heartsuit 9\diamondsuit$ , you do not want to slowplay. There are too many cards that can hurt your hand (your hand is vulnerable): any diamond may complete a flush and there are many cards that can make a straight for somebody (a K, Q, J, 8, 7, and 6 all potentially make straights). Of course, if one of these cards happens to fall on the turn or river, it does not automatically mean that you are surely beat, but it does mean that you need to be careful if somebody is pushing a hand pretty hard.

## 6.2 Bluffing

A *bluff* is a bet or raise when you are fairly certain you do not have the best hand. It is true that bluffing is an important tool for anyone aspiring to be a good poker player. But it is “certainly no more important than playing your legitimate hands correctly” (*Theory of Poker*, 164). Many players try to bluff far too often, and consequently they lose more money than they otherwise would. Understanding bluffing is the first step to making it a profitable play in your arsenal.

### 6.2.1 Why Should You Bluff?

Before discussing the theory behind bluffing, it is good to get an intuitive feel for what it accomplishes. Suppose you are heads up on the river and a flush card falls. Unfortunately, you were not drawing to a flush, but you also believe that your opponent was not, either. This is a bluffing opportunity. But how often should you bluff?

Look at this situation from your opponent's point of view. He does not know that you did not make your flush. However, if he knew that you would never bluff in that circumstance, he would fold whenever you bet, and therefore he would be getting the best of it (you never collect when you have the flush). On the other hand, if he knew you always bet when a flush card comes (that is, you bluff often), then he would always call you down, and probably will catch you bluffing more than enough times to make it profitable (the odds of a flush card coming on the river are around 3.5:1, and you will likely be drawing to a flush much less often than that). But if you only bluffed sometimes, then your opponent would be stuck in a difficult position. If he calls, then he runs the risk of losing money when you do have the flush. If he folds, then

he cannot be sure whether or not you really had the flush. This unhappy guessing game is where you want your opponents to be when you are bluffing.

There are two types of bluffing: intuitive bluffing and game theoretical bluffing. The first is the one that you would use against all but the best players. Against most players you can get a good “feel” for how they play and adjust your strategy accordingly. However, against good players, they will be calling close to the game theoretic optimum, and thus your only response is to bluff with the game theoretic optimum.

### 6.2.2 Intuitive Bluffing

There are many factors to consider when you bluff. I will give you two of them.

The first is your opponent. Does he tend to call with poor hands? Then you should not bluff, since if you are bluffing, you do not think that you can beat his poor hands. However, if you know that he is willing to throw away a good number of hands, then you should think about using a bluff (it does not mean that you *should* bluff). Reading your opponents effectively is the first step to deciding whether or not to attempt a bluff.

The size of the pot also matters when you are bluffing. If the pot is small, then you need to bluff to work at a high frequency in order for a bluff to be profitable. For example, if the pot is \$16 and you bluff \$4, then you need your opponent to fold more than 20% of the time to turn a profit. However, if the pot is \$100, then you only need him to fold about 4% of the time. On the other hand, if the pot is very large, you will find it very difficult to make your opponent fold by bluffing because he is getting such great pot odds on his call. Conversely, if the pot is small, you are more likely to get away with a bluff because your opponent may not want to try to protect such a small pot by calling. There is a very delicate balancing act that must be mastered to become a skilled bluffer.

### 6.2.3 Game Theoretical Bluffing

Suppose there is a pot of \$300 and your opponent bets \$100. He (truthfully) tells you that the odds against him bluffing are 4:1. Should you call his bet?

Suppose you call his bet. Then 80% of the time you lose that \$100 because he bet a legitimate hand and 20% of the time you pick off his bluff and win \$400. This gives an expected value of \$0. If you call, then you are not expecting to win anything. But if you were to fold every time, then your expected value is still exactly \$0! No matter what you do, you cannot win! Even worse, you cannot use expected values to help you decide what to do. It turns out if he deviates from this pattern then he will give you an option which is better than the other (in terms of expected value). This is an example of the optimal game theoretical bluffing strategy.

Let us look at this mathematically now, but this time you are the bluffer. Suppose the pot is  $p$ , the bet size is  $w$ , and the probability that you bluff is  $b$ . Then the expected value of your opponent for calling is given by  $b \cdot (p + w) - (1 - b) \cdot w = b(2w + p) - w$ . His expected value for folding is 0. We want to pick  $b$  so that these two are equal. This means that  $b = w/(p + 2w)$ . Fortunately, this converts to odds nicely:  $w : (p + w)$ . This says that you should bluff so that the odds against you bluffing are identical to the pot odds your opponent is getting for calling.

Why is this the desired value? If we bluff less often, so that his expected value of calling is negative, then clearly he would be correct to always fold. If we bluff more often, then clearly he would call to have a positive expected value. We want him to be playing a guessing game, so this value must be the correct one.

As mentioned before, this bluffing strategy should only be used against very good players. Most players do either call too often or not enough, and you will win less by using this method as opposed to intuitive bluffing.

## 6.3 Semi-Bluffing

*Semi-bluffing* is a bet or raise with a hand that is probably not the best at the moment, but has a good chance of drawing to the best hand if it gets called. This is substantially different from a pure bluff, because in a

pure bluff you have no chance of winning a showdown. In a pure bluff, you must win the pot immediately, otherwise you lose. With a semi-bluff, you still want to win the pot immediately, but if you get called, there is a good chance that you can outdraw whoever called you. Also, a semi-bluff cannot happen on the river, since the definition includes drawing to a better hand. The semi-bluff is one of the most powerful weapons in the poker arsenal, but it is not easy to understand.

The semi-bluff must be used with care. If you know you will be called, then a semi-bluff is a terrible play, because you lose the chances of winning the pot immediately. Also, if you have a very weak draw and a hand that is currently not the best, then your bet is much more of a pure bluff and should be treated as one.

What are the possible hands which you would be able to semi-bluff? Rereading the requirements, it needs to be a hand where you are probably not ahead, but have a good chance of catching up to your opponents. Some basic semi-bluffing hands are

1. Second pair or bottom pair with an overcard kicker:  $K\heartsuit 5\heartsuit$  with a board of  $8\clubsuit 5\heartsuit T\clubsuit$ .
2. Top pair with a weak kicker and a straight or flush draw:  $A\spadesuit 6\spadesuit$  with a board of  $T\spadesuit A\heartsuit 3\spadesuit$ .
3. Open-ended straight draw:  $7\heartsuit 6\heartsuit$  with a board of  $5\clubsuit A\heartsuit 8\spadesuit$ .
4. Flush draw:  $A\spadesuit T\spadesuit$  with a board of  $K\clubsuit 7\spadesuit 8\spadesuit$ .
5. Second pair or bottom pair with two backdoor draws:  $Q\heartsuit T\heartsuit$  on a board of  $6\heartsuit T\spadesuit A\heartsuit$ .
6. Two overcards:  $K\heartsuit Q\clubsuit$  with a board of  $T\spadesuit 3\heartsuit 8\heartsuit$ .

There are several advantages to the semi-bluff. Besides giving yourself the chance to win the pot immediately, you may also cause your opponents to misread your hand. For example, in the fifth case, a bet would cause many players to put you on a hand with an A in it. Now if any diamond, K, or J falls, they will not put you on the nut flush or nut straight draw, and probably pay you off on the river.

If you semi-bluff raise in late position on the flop, there is a chance you can buy yourself a *free card*. That is, it becomes likely that your opponents will check to you on the turn, thus allowing you a second chance on your draw if you miss. Notice that the free card is really a half-price card.

If your hand is worth a call and you think your opponent is weak (but still stronger than you), then you should probably semi-bluff bet. By doing this, you have the added bonus of possibly winning the pot immediately by making the better hand fold, which is better than if you were to check and call a bet with the worst hand. But you need to be careful when trying this play. If your opponent is stronger than you think, he may raise you, in which case you will spend two bets with the weaker hand.

## 7 Raising

### 7.1 Reasons to Raise

Sklansky gives seven principle reasons for raising (*Theory of Poker*, 121):

1. To get more money in the pot when you have the best hand
2. To drive out opponents when you have the best hand
3. To bluff or to semi-bluff
4. To get a free card
5. To gain information
6. To drive out worse hands when your own hand may be second best

## 7. To drive out better hands when a come hand [drawing hand] bets

All of these are good reasons to raise, but I will not discuss them all here (some are discussed in previous sections and the other you will have to read for yourself).

The first two reasons, at first glance, seem to be contradictory. How can you get more money in the pot if you are driving out your opponents? It seems fairly obvious that you should raise to get money in the pot with the best hand. When you do this, you will collect more at the showdown (since you have the best hand). But there are times when you have the best hand, but your hand is capable of being beat on the turn or the river. Common examples are top pair on a flop that has many straight draws or a flush draw. You have the best hand, but it is not such a bad idea to try to drive out the straight and flush draws, because if they come, you have almost no chance of winning the pot.

The final two reasons are closely related. If you raise with a second place hand, then you may drive out worse hands than yours which have better draws. For example, with a large pot, you might raise second pair with an overcard kicker to try to drive out to cut the pot odds on any straight or flush draws. Forcing these players to call two bets instead of just one nearly cuts the pot odds in half. This means that the pot must be much larger for these players to make a profitable call. (Strangely, if they call, they make a mistake and you gain; this is despite the fact that you raised to make them fold!) Even if the player with top pair re-raises, then you are getting proper odds to try to catch up.

By raising when a drawing hand bets, you are trying to drive out better hands by a combination of deception and cutting down the pot odds for the better hands. The deception comes since you are making a move to convince the other players you have a strong hand. The reason that the pot odds are cut for the better hands is that now they must have the best hand almost twice as often for a call to be correct.

## 7.2 A Reason not to Raise

Sometimes it is possible to get more money in the pot by *not* raising. Suppose someone bets into you and you are pretty sure you have the best hand on the river. If there are several players left to act after you, then you may want to go for some *overcalls*. If the players are the type who would call one bet on the river, but not two, then you can profit by calling. Instead of getting only one bet more (from the original bettor), you may get one bet each from two or three other players.

However, you must be very cautious when making this play. First, you must be pretty sure that the players behind will call one bet, but not two. If they will not call one bet, or are willing to call two, then you do not win as much money. Also, you need to be quite certain you have the best hand. If you have a second place hand and can drive out the first place hand by raising, you had better do it.

## 7.3 Check-Raising

Before I begin, I should point out that in some places, check-raising is not allowed. Be sure to read and understand all the rules at the particular casino or cardroom before entering the game.

*Check-raising* is checking when it is your turn to act, but then raising after somebody after you has bet. It is not re-raising (which is where you bet, someone raises, and you re-raise). I do not expect that there will be much confusion about the definition.

There are many reasons to check-raise. In fact, you can check-raise for all the same reasons as raising (except for getting a free card). However, check-raising has a much different effect than simply betting or raising.

First, you are adding deception by checking. If you simply checked when you have a weak hand, then your opponents will know approximately how strong your hand is depending on whether you check or bet. Second, you can trap weaker opponents for more bets than just one. Suppose that you check and the next player bets. Lots of players may be willing to call that single bet. But when you raise when the action gets back to you, unless the original bettor re-raises, most of the players will be willing to call the second bet (although they will not be happy about it). If they were faced with two bets at once (you bet and somebody raises), they will be much less likely to call. Third, you can also make drawing hands fold because they are

not getting the correct odds to call (this is mostly true if the bet comes in late position). There are probably other reasons, too, but I think this should be enough to show the importance of check-raising.

There are three major considerations when you choose to check-raise. The first is the strength of your hand. Your hand must be strong enough that you are willing to put two bets in the pot for it instead of just one. Second, you need to be certain that somebody will bet after you check. If this does not happen, then you miss some bets. The final consideration is who will make the bet. If you have a monster hand and want many people to be in the hand, then you want the bet to come from early position, so that many people will call the first bet. But if you want to drive out your opponents, then you want the bet to come in late position, so that many people will be forced to call two bets at once.

Check-raising is not slowplaying. Slowplaying is playing a hand weakly for the entire betting round to trap players in later rounds. Check-raising is playing a hand weakly early in the round to make your opponents pay more in the same round. Also, your hand must be much stronger to slowplay than to check-raise.

## 8 Hold'em Strategy

Hold'em is an incredibly fascinating game. There are many instances where Hold'em experts cannot agree on what should be the "correct" play. Sometimes the correct answer is simply, "it depends." There are far too many variables involved in Hold'em for there to be a single pure strategy for all games. This section is merely an overview of the ideas that are involved in Hold'em strategy.

### 8.1 Pre-Flop Basics

Play before the flop is not nearly as difficult as play after the flop. One reason for this is that there is a (relatively) limited number of possibilities for your hole cards; there are only 169 of them (13 pairs, 78 unsuited non-pairs, and 78 suited non-pairs). There are a few attributes to look for when you have your hand:

1. **Big cards:** Combinations where both your cards are big, such as AQ and JT, are a good quality to have. However, if only one card is big, like K4 or A6, then the value of this hand is greatly diminished. These cards tend to play well with fewer people in the pot.
2. **Connectors:** Hands where the two cards are near to each other in rank have value because they can form straights. If they are actually connected (JT and 87, for example), then they can form a total of 5 straights. One gaps (or one gappers), like T8 or 64, can only make 4 straights; consequently, these are less valuable than connectors. This pattern continues similarly, with the value decreasing faster as the cards become separated more. (Notice that hands like KJ, AK, and A2 cannot make as many straights as the other one gappers and connectors.) These hands play well in a multi-way pot.
3. **Suited:** Suited combinations have increased value due to the flush possibility. These hands also play well in a multi-way pot.
4. **Pocket Pairs:** Pocket pairs have good deception value, because it sometimes takes opponents a while to read you for them. This is especially true if you flop a set or an overpair (your pair is bigger than the highest card on the board). There are three types of pocket pairs: big pairs (AA - JJ), medium pairs (TT - 77), and small pairs (66 - 22). (As usual, there is no standard convention on this, but it should give you a good feel for them.) Pocket pairs can play well with both few and many opponents, but they must be played carefully.

Of course, if the cards have two or more of these qualities, then they are even better. (Some combinations, such as suited pocket pairs are impossible.) For example, Lee Jones recommends not playing any non-suited connectors below JT, but will go as low as 54s given the proper conditions.

As mentioned before, position is another major consideration for deciding your play before the flop. Since this was already discussed in a previous section, I will not reiterate everything. The basic idea is that you play tighter in early position and play looser in late position.

## 8.2 The Importance of the Flop

While you may have the best hand preflop, this can change dramatically on the flop. *Winning Low Limit Hold'em*, by Lee Jones, has a nice table comparing the hands A♠ K♠ and 8♣ 7♦. I will not reproduce the whole chart here, but I will point out some particularly interesting examples:

Before the flop:	A♠ K♠ is a 2:1 favorite
Flop is Q♦ 8♥ 2♣:	8♣ 7♦ is a 3.2:1 favorite
Flop is Q♠ 8♠ 2♣:	Even money (1:1 odds)
Flop is A♦ K♣ 2♥:	A♠ K♠ is a 164:1 favorite

The point of the chart is the following: Although you may have the best hand preflop, it may not be the best hand after the flop. You must be willing to let go of your better preflop hands if the flop is unfavorable (this includes big pairs such as KK and QQ sometimes). In order to be successful, you need to learn to figure out if you are a favorite or an underdog. This requires experience and an understanding of your opponents. If you know that several of your opponents will play any hand with an A in it, then you should be more willing to give up on your KK if an A falls on the flop. If you hold AK and an A falls on the flop, then you are probably a heavy favorite (especially if there are no straight or flush draws), and you should play your hand accordingly (getting the most money that you can in the pot).

I will give a final warning to end this section. Any time you call a bet or a raise with a second place hand without proper odds (immediate or implied), then you are giving your money away. This is not how one becomes a winning poker player. If you are pretty sure that you do not have the best hand, and the pot is not offering you enough odds to chase your draw, then fold. This can be very hard to learn, but it is an essential skill for any successful poker player.

## 8.3 Low Limit Games

The most interesting (and annoying) aspect of low limit games is that most of your opponents are terrible Hold'em players. One would think that this makes the game much easier to beat. However, there is an idea called *implicit collusion* which makes beating the game more difficult.

*Collusion* is a form of cheating. Two (or more) players secretly inform each other of their cards. Consequently, they have more information than their opponents, giving them an unfair advantage. Implicit collusion is when all your opponents play poorly enough so that the net effect is as if they are ganging up on you.

For example, you have Q♥ J♠ and the flop comes 8♦ J♣ 7♣. In a higher level game, you like your hand quite a bit, as you have top pair with an overcard kicker. Most of your opponents will drop out on the flop unless they have a fairly good hand or a great draw. However, in low limit games, the opponents that would have stayed in the hand in higher games will still stay, but you will also have a good number of other players hanging around. For example, a player holding A♣ 4♥ would have folded preflop (and will almost definitely fold to your bet) in a higher level game, but at low limits he will more likely hang around hoping to catch an A (even though the pot odds are very unlikely to be giving him the proper odds). Of course, if a hand like that might hang around, so might K♥ 6♥. In other words, all sorts of strange hands might stay in the hand another round.

Why is this such a bad thing? In a higher limit game, you can expect that players holding nothing but single overcard or a gutshot straight draw would fold. But in low limit games, they stay in the pot longer than they should. This means that more cards can fall that give you a second place hand. While you may not worry about a 5♠ falling on the turn in a higher level game. But in a low limit game, be aware that some opponent may be holding 6♦ 4♠ and has just “sucked out” on you (he drew a long shot to beat you). Any hand you can conceive has a decent chance of being around (or the player holding A♣ 4♥ in the paragraph above). Even a 2 can be a scary card because the player three to your left loves to play all pocket pairs and now you are drawing two a 2 outer against his set.

This makes the game more interesting and less interesting simultaneously. It is more interesting in that you can watch the terrible plays that people try to make and the crazy hands they play. This can be very

amusing to a good player, because you recognize that these players are exactly the ones making the game profitable. (These are also the players that will make you very unhappy (temporarily) when your set of aces gets beat when a 3 falls on the river, giving some lucky person holding 24o a straight.)

At the same time the game is less interesting because it turns out that the most straightforward play is almost always the most profitable. You must be careful not to fall victim to FPS, or “fancy play syndrome”. This happens to players who pick up a good book (such as *Hold'em Poker for Advanced Players*) and who immediately try all the plays that the book recommends. They quickly discover (as I did) that they often do not work. The reason for this is that many of the plays that you might want to make only work on players who are paying attention to what is going on.

My best analogy is that it is like a head fake in basketball. The main purpose of this play is to get the opposing player to jump, thus allowing you to get a good look at the basket while he is on his way down. However, if your opponent does not play good defense, then he will stand perfectly still when you head fake, thus defeating your move (notice that his ability to defeat your move is not that he reads you for a head fake, but rather that he simply does not respond to it). Instead of trying to do this, you are probably better off beating him with something fundamental, like beating him with a give and go.

One example of this is trying to “steal the blinds”. What this means is that when nobody has yet limped into the pot, a person in late position may raise and expect the blinds to fold. However, in low limit games, players will often “defend their blinds” (call a raise in the blind) with almost anything. (Of course, in a low limit game, there will hardly ever be a time where everyone folds to a player in late position.)

## 9 Poker Resources

I do not claim to be an expert in poker. Most of the information presented here have been from books and websites, but not without my own scrutiny. However, I do not claim that the information I have provided is without error and I cannot guarantee that understanding the content will make you a winning poker player. For these reasons, if you really want to be a winning poker player, I strongly urge you to obtain the following books and read (and participate in) the discussions on the following websites.

### 9.1 Poker Books

All the books in this list are considered to be standard texts in most poker communities. While I only own three of them (*Winning Low Limit Hold'em*, *Theory of Poker*, and *Hold'em Poker for Advanced Players*), I am basing my recommendations on what I have read and heard about the books from reliable sources.

*Winning Low Limit Hold'em*, by Lee Jones: This book is a good starting point for playing Hold'em poker. When you first start playing, you will most likely find yourself in a low limit game where the ideas presented in this book will apply.

*Poker for Dummies*, by Richard Harroch and Lou Krieger: While I like to make fun of the “for Dummies” books, apparently lots of people like this one.

*Hold'em Excellence*, by Lou Krieger: I know nothing about this book, except that Lee Jones recommends it for beginning players.

*Theory of Poker*, by David Sklansky: Most of the ideas presented here are from this book. His book goes into much more detail (and many more topics) than what I presented here. This is a standard text for all poker games.

*Hold'em Poker for Advanced Players*, by David Sklansky and Mason Malmouth: Although this book is aimed at mid-limit (\$20-\$40 to about \$100-\$200) the ideas presented in this book are essential to know and to understand if you want to become a true Hold'em player.

*Mike Caro's Book of Tells*, by Mike Caro: The “mad genius of poker” teaches you how to gain an extra edge on your opponents by learning to pick up on their tells. It is a book that gets you thinking a lot about your own play and what information you might be giving away.

*Super/System*, by Doyle Brunson: Even though everybody says that this information is out of date (due to changes in the games and the blind structures), for some reason, it is still a must read for any serious

poker player.

## 9.2 Poker Webpages

The following websites are all great sources for poker information. Some have message boards and others have downloadable lectures and videos. This is a very short list because I have not had the time to really get deep into the online poker world.

<http://www.twoplustwo.com>: This is where I do most of my online poker reading. Two Plus Two Publishing is the company that produces *Theory of Poker* and *Hold'em Poker for Advanced Players*. The authors, David Sklansky and Mason Malmouth both participate in the discussions.

<http://www.conjelco.com>: There is less poker reading here and more general gambling information, but it has an incredible list of links to poker related sites.

<http://www.posev.com>: Abdul Jalib is a known name in the poker community, and this is his website. Most of the simulations and strategies he gives are for higher levels of poker play, but they can be interesting to look at and read through anyway.

<http://www.pokerpages.com>: You can read Mike Caro's lectures (or listen to some of them) to gain further insight into the game on this site. There are also videos that you can view.

## 10 Poker and Life

I am including this brief section because I think it is important to have proper perspective (I got the idea from a section from Lee Jones's book). Poker is a great game. I think poker is a wonderful form of entertainment while also being an academic pursuit. I know that if you are reading this, it is very unlikely you are even legally able to enter a casino and play poker. This fact does not diminish my point at all.

One thing that I really want to stress is that you pay very close attention to the bottom line if you choose to play poker or engage in any other gambling venture. This is not so that you can be proud of how well you are doing, but rather it is to make sure that you keep your spending under control. Very often, losing players do not realize they are losing because they can only remember the nights that they had big wins; they forget all the losses in between.

In my records, I treat my bankroll like a bank account. I make deposits when I have some extra money to put into it and I make withdraws when I go play. I keep track of how much time I play and how much I spend on books and other learning tools. All of this is just to make sure that the gambling stays under control. I advise that you do something similar if you ever think of taking poker seriously.

This quote from Chirs Ferguson, the 2000 World Series of Poker Champion, puts a nice perspective on the game of poker:

*Surely you have something better to do with your time than play poker. I suggest a walk outside, volunteering at a homeless shelter, or listening to Bach.*

While those things listed above are good things, in my life, I have my own motivation to keep perspective:

*Do not store up for yourselves treasures on earth, where moth and rust destroy, and where thieves break in and steal. But store up for yourselves treasures in heaven, where moth and rust do not destroy, and where thieves do not break in and steal. For where your treasure is, there your heart will be also. (Matthew 6:19-21)*

If you ever consider taking up poker seriously, be sure to find something to help you maintain proper perspective.