ESSENTIAL POKER MATH

Fundamental No Limit Hold'em Mathematics You Need To Know

ALTON HARDIN

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By

ALTON HARDIN

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WHY I WROTE THIS BOOK

This poker book came to life for several different reasons. First and foremost, it is designed to be supplemental reading material for my **Udemy Essential Poker Math** Course. Secondly, it is designed to be an introductory poker mathematics resources for No Limit Hold'em poker players looking to implement essential and simple poker math into their poker game. Lastly, I enjoy teaching, writing and helping fellow poker players. I hope you enjoy and find this book beneficial to your poker game!

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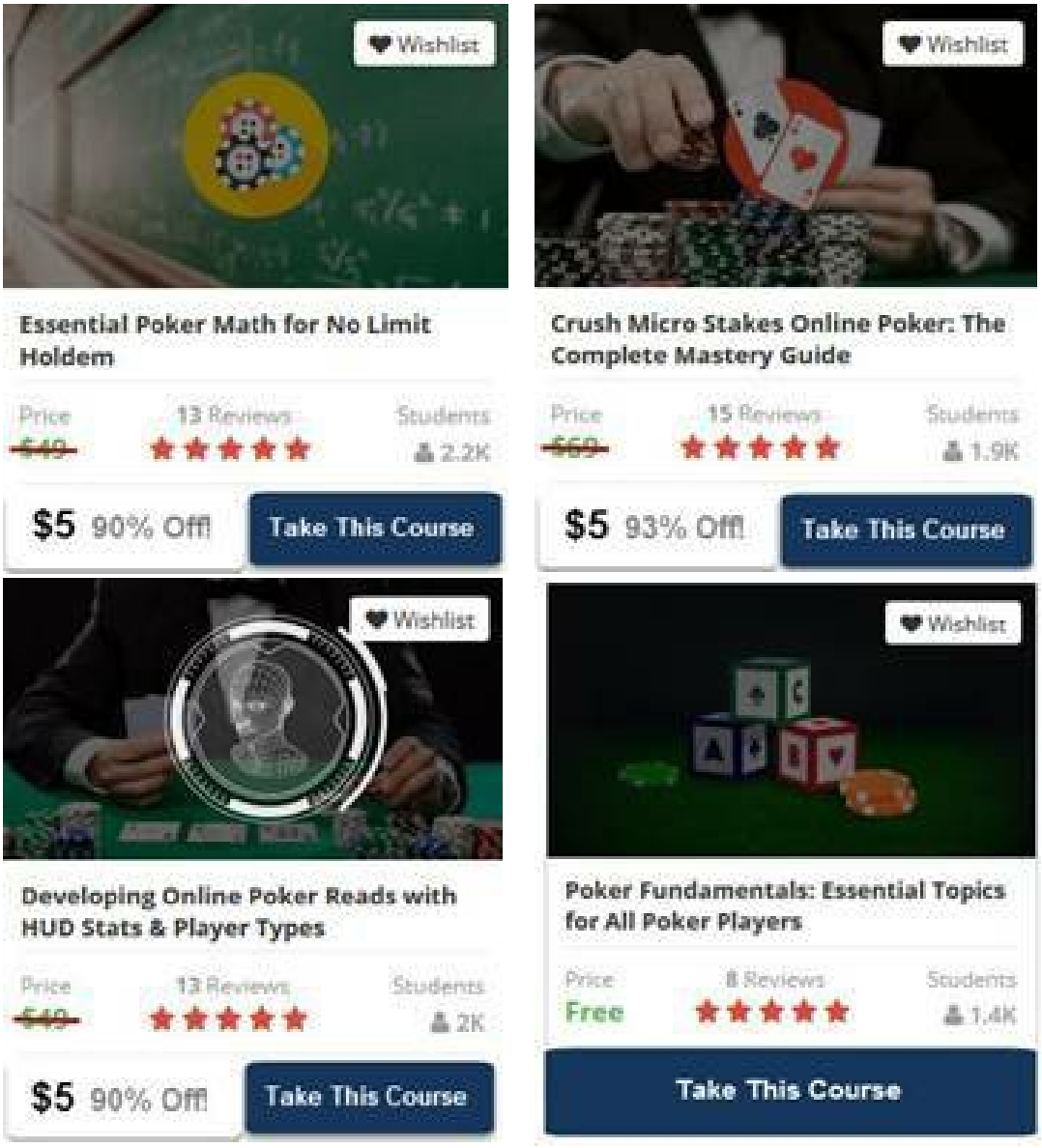

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WHY YOU SHOULD READ THIS BOOK

You should read this book if you are looking to take your poker game to the next level. If you are a new or experienced poker player that has struggled with understanding No Limit Hold'em mathematics or never implemented poker mathematics to your game, then this book is for you.

Poker mathematics in No Limit Hold'em, while easy to understand and implement is often overlooked in many poker players' games, which causes many poker players to make the mathematically incorrect move. While this may seem somewhat insignificant, over the long run it can cause both good and bad poker players to win significantly less and lose significantly more money than they would if they understood basic poker mathematics.

I guarantee you that you do not need a PhD in mathematics to implement essential math into your No Limit Hold'em poker game, in fact a basic understanding of arithmetic and algebra is all you will need. I'm excited to have you here and look forward to taking you on a journey, where by the end of this book you will have a vastly deeper understanding of poker mathematics and will be a much better poker player.

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PREFACE: BOOK OVERVIEW

INTRODUCTION

This book was written with all poker players in mind, both beginner and experienced players alike. In my many years of playing poker, one area that I noticed most poker players lacked and needed improvement in was basic poker mathematics. Why? Mainly due to a stigmatism against mathematics from many poker players. Many poker players erroneously believe poker mathematics is a difficult skill set to master.

I'm here to tell you that the essential poker mathematics of No Limit Hold'em requires nothing more than a fundamental understanding of basic arithmetic and algebra. In this book, I am going to take you on a step-by-step journey that will easily allow you to master essential No Limit Hold'em Mathematics that you'll be able to implement into your poker game in a fast and painless manner. I will cover everything you need to know to make the correct mathematical and profitable moves at the poker table, which will in turn give you a drastic advantage over your opponents that lack a fundamental understanding of poker mathematics.

By the end of this book, my goal is for you to be able to quickly and easily use the mathematical tools I'm about to teach you both on-the-table during live poker sessions and off-the-table to perform off-table analysis of your previous play. Are you excited? I hope so because I am. Let's go ahead and get started and kick off our journey of poker mathematics discussing the importance of mathematics in poker in Chapter One.

CHAPTER 1. IMPORTANCE OF MATH IN POKER

INTRODUCTION

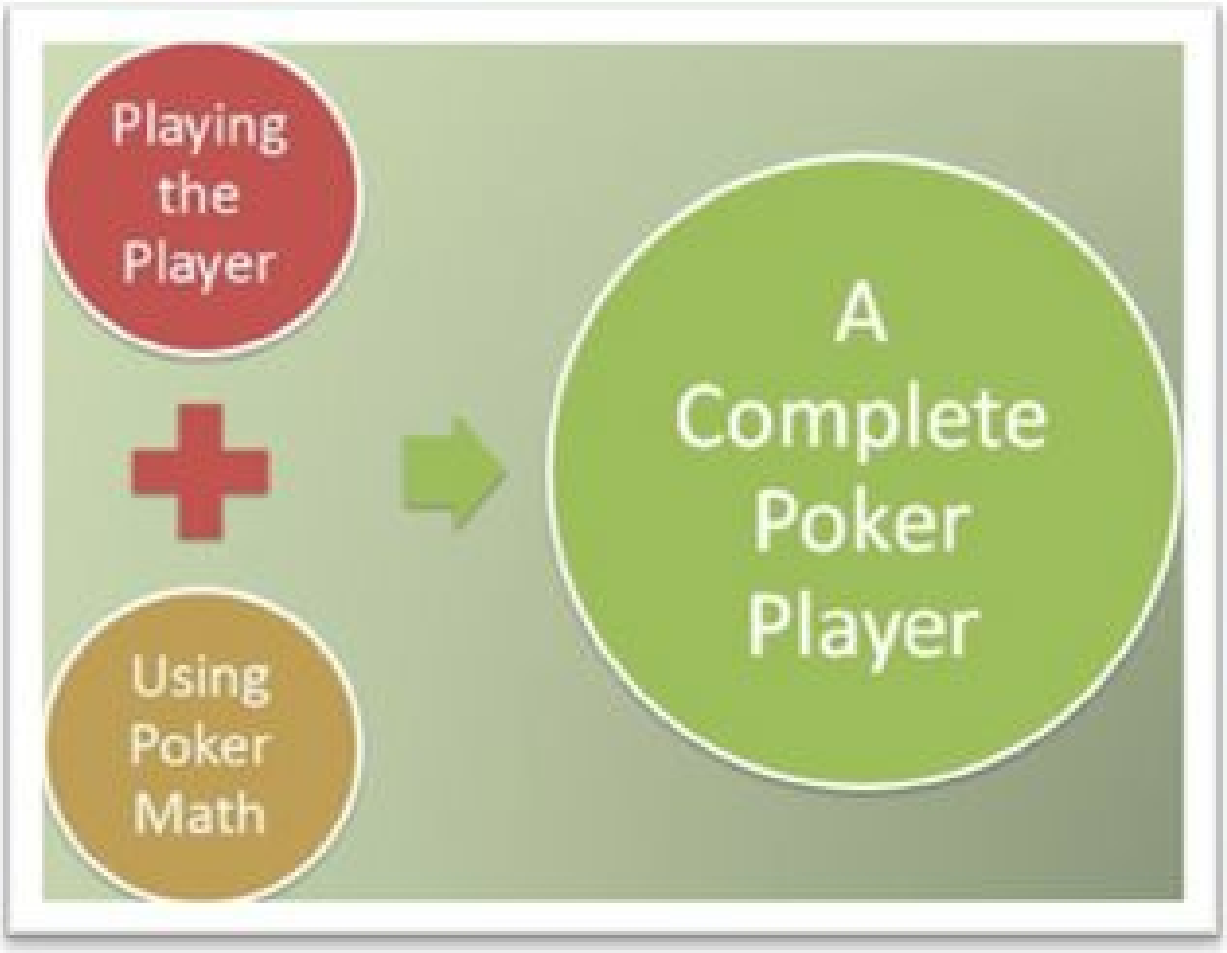
When we watch poker on television we often hear comments such as “what a great call” or “that was a sick bluff”, as well as “what a great read that was”, but we rarely, if ever hear any discussion about the mathematics behind calls, bluffs and bets in the game. So, of course many poker players purely base their decisions on “tells” and “reads” at the poker table.

If you have been playing poker for some time, especially live, you have probably heard someone say, “You play the player, not the cards”. In fact, I have heard this myself time and time again, especially with beginner and live low stakes poker players. You rarely hear things such as, “I called because I had good equity and you gave me great pot odds to call” or “It was an easy call getting 3:1 pot odds and with some many outs and equity in the hand.” Unfortunately, math tends to be the red-headed step-child to tells and reads in poker, when it is arguably just as important, if not more important than reads and tells in poker. In fact, the two go together like two peas in a pod, which I will discuss further in the section below.

THE TWO ASPECTS OF POKER

There are two aspects of analysis in poker. The first is reading our opponents at the poker table and the second is using mathematics at the poker table to ensure we make the correct mathematical move based upon our reads and tells. When we read our opponents, we are getting reads, tells, and opponent tendencies that helps us to understand the "range" of hands our opponent can have in a hand, which in turn tells us how likely our opponent has a made hand or a drawing hand, as well as how strong it is.

We then use basic poker mathematics to supplement our reads and tells. Our goal with poker math is to ensure we are maximizing how often we make profitable moves and minimizing unprofitable ones. In poker, we call profitable moves +EV plays and unprofitable ones –EV plays. So we want to do our best to make as much +EV plays as possible at the poker player.



As you can see from the image above, a complete poker player is one that both reads their opponents but also uses math at the poker table to make correct mathematically +EV moves. A poker player that focuses solely on reading their opponents and not using math is an incomplete poker player. Conversely, a poker player that does not read their opponents but bases all of their moves on math alone is also an incomplete poker player. The best and most profitable poker players in the world are both excellent at reading their opponents and well-versed in poker mathematics. So, as you can see, math in poker is essential to your long-term success in poker.

SOME SIMPLE EXAMPLES

To highlight the importance of understanding basic poker mathematics, we can analyze three example scenarios and questions that poker players often face.

ARE WE GETTING THE RIGHT POT & IMPLIED ODDS TO CALL WITH THE FLUSH OR STRAIGHT DRAW?

We have all been in this situation before, where we are behind in a hand with a strong draw and our opponent is betting in the hand. A good poker player will know when they are getting a "good price to call" with a drawing hand, meaning they have good pot or implied odds based upon the likelihood that they will make their draw by the river. However, lots of poker players that don't use basic poker math will neglect this all together and call with a draw based upon their gut feelings even if they are getting a really bad price to call, aka a long-term losing –EV call.

HOW MUCH SHOULD I BET TO GIVE MY OPPONENTS' A BAD PRICE TO CALL WITH A DRAW?

Another common scenario that is often misplayed is betting with the best hand on wet board textures, where your opponents can have lots of outs to hit a strong drawing hand on the turn or the river. When we have the best hand, we want to give our opponents a bad price to call, meaning we need them to invest more into the pot than the likelihood of them hitting their draw.

A good poker player will be able to evaluate their opponents' range of possible hands and draws based upon the board texture and bet an amount to make their opponents make a –EV call, whereas poker players that are clueless to the math behind betting the best hand will often erroneously give their opponents a good price to call and suck out on them by betting too little.

HOW OFTEN DO I NEED TO WIN IF I CALL MY OPPONENT'S RIVER BET WITH A HERO CALL?

If we are making very light hero calls on the river to try to catch bluffs, we should know how often we need to win before we make a call. With basic pot odds analysis, we can easily determine this, but if we don't know how to calculate pot odds then we'll be blindly making hero calls with mediocre hands not knowing how often we need to win for our hero calls to be profitable. Poker players will often make hero calls on the river based upon their instincts and gut feelings without considering how often they need to be right based upon their opponents' bluffing frequencies.

CONCLUSION

As you can see, math in poker is vitally important to your long-term success in poker. Yes, you can be a very good and profitable poker player without using math at the poker table. But by doing so, you'll win less than you should with your best hands and lose more than you should in marginal spots where you make slightly –EV and unprofitably calls. Remember, a complete poker player is one that has the ability to get reads and tells on their opponents easily while at the same time use math at the poker table to ensure they are making the right mathematical moves as much as possible.

CHAPTER 2. ESSENTIAL CONCEPTS

INTRODUCTION

In this chapter we will be covering three essential poker concepts that you will need to know before we begin talking about poker mathematics. These topics are:

- Bet Sizing by Pot Size
- Effective Stack Sizes
- Stack-to-Pot Ratios (SPRs)

BET SIZING BY POT SIZE

In poker, it is universal to talk about bet sizing referring to the size of the bet as it relates to the size of the pot. For example:

- 1/4 pot-sized bet
- 1/3 pot-sized bet
- 1/2 pot-sized bet
- 2/3 pot-sized bet
- 3/4 pot-sized bet

The reason for this is because it is universal for every stake of poker. A 1/3 pot-sized bet means the same at 2NL through 500NL, whereas saying “I bet $12 on the flop” is significantly different for 2NL than it is for 500NL. When you say you bet a percentage of the pot, such as 1/3 pot, then it can easily be determined how much it was simply based upon the size of the pot.

Additionally, there are standardized bet sizes based upon the size of the pot. You will often hear that you should bet “x” amount of the pot in different situations. So for all of these reasons you should become accustomed to bet sizing by pot sizing.

EFFECTIVE STACK SIZES

Effective stack sizes are an important concept to know when you play poker. It is nothing more than then size of the smallest stack between two different players in a hand; additionally, it is the most amount of money you can either **win** or **lose** in a hand against any one particular opponent. We need to understand the concept of effective stack sizes because it plays an important role in poker mathematics, including implied odds, fold equity and stack-to-pot ratios (SPRs).

Let's do a quick example scenario to explain how to quickly determine effective stack sizes in a hand.

EXAMPLE

- Small Blind (SB): $5 Stack
- Big Blind (BB): $10 Stack
- You: $15 Stack

SB versus BB
The most BB can win or lose from SB is $5 since SB only has a $5 stack. Conversely, the most SB can win or lose from BB is $5 since SB only has $5 to wager even though BB has a $10 stack. Therefore, the effective stack size is $5 between SB and BB.

BB versus You
The most you can win or lose from BB is $10 since BB only has a $10 stack. Conversely, the most BB can win or lose from you is $10 since BB only has $10 to wager even though you has a $15 stack. Therefore, the effective stack size is $10 between BB and you.

Multiple Effective Stack Sizes in a Hand
It is important to note that there can be several effective stack sizes in a hand, especially if there are multiple all-in situations. For example in a 3-handed game with SB, BB and you, there can be 3 effective stack sizes to consider:

- SB versus BB
- SB versus You
- BB versus You

Knowing effective stack sizes against any one particular opponent in a hand will be important when you are calculating implied odds and fold equity.

STACK-TO-POT RATIOS (SPRS)

Stack-to-Pot Ratios, commonly referred to as SPRs is another important poker concept you need to understand. It is a fairly straight forward concept, which its name implies. An SPR is the effective stack size divided by the size of the pot.

- **SPR** = Effective stack size / Pot size

Why is it important to know and understand? Well, it is essentially a risk-to-reward ratio, where a person risks his or her effective stack size to win the size of the pot. Moreover, different SPR size amounts will tell you generally what type of hands people will commit to in a poker hand. I'll explain this in detail a bit later, but let's first do an example to help you learn how to calculate SPRs.

EXAMPLE

- Effective Stack Size: $50
- Pot size: $10
- SPR = Effective Stack Size / Pot Size
- **SPR** = 50 / 10 = **5.0**

WHY SPRS ARE IMPORTANT

People will play different based upon their effective stack sizes and SPRs in a poker hand. In general, a short-stacker with a lower SPR will be more likely to commit to a hand with a more marginal holding, whereas a deep-stacker with a higher SPR will be less likely to commit to a hand with a marginal holding. To explain this and to show what types of hands people will be likely to commit to based upon their SPR, I have created the table below as a reference guide.

SPR Guideline Table

SPR	SPR Size	Hands to Commit
Low	0 to 5	Over Pair, Top Pair, Bottom 2 Pair
Medium	6 to 15	Top 2 Pair, Sets, Non-Nutted Flushes & Straights
High	16+	Sets, Nutted Hands

As you can see in the table above, the lower the SPR, the weaker of a hand a person will need to commit to a hand, but as SPRs and stack sizes increase, your opponents will most likely only be committing to hands with very strong holdings.

The main takeaway from SPRs is:

- Lower SPRs = Smaller Effective Stack Sizes (Short Stackers)
- Higher SPRs = Larger Effective Stack Sizes (Deep Stackers)
- Lower SPRs = Commit with Weaker Hands

- Higher SPRs = Commit with Stronger Hands

CONCLUSION

The concepts covered in the book are general important poker concepts you need to understand not only for poker mathematics, but for general poker strategy. They are essential concepts all poker players should know, so do your best to understand and memorize them.

CHAPTER 3. PROBABILITY AND ODDS

INTRODUCTION

In this chapter I will be providing you an introductory overview of mathematical probability and odds. It is essential that you have a fundamental understanding of probability and odds before we begin discussing pot odds, implied odds and equity calculations. So let's go ahead and get started.

PROBABILITY

Probability is simply the likelihood that something will occur. It is used in many areas of study, including mathematics, science, business finance, and in our case, gambling to describe the number of times something will happened out of a total chances of it happening. Moreover, it is commonly expressed as a fraction (1/3) or percentage (33.3%). For example, if I say there is a 60% chance it will rain today, I am saying the probability of it raining today is 60 out of 100, which is the same as 60/100 and 60%.

A simple gambling example is a coin flip. The probability of flipping a coin and getting either heads or tails is 1 out of 2. Below are the equations for determining probability.

$$Probability = \frac{\#\ of\ Desirable\ Outcomes}{\#\ of\ Possible\ Outcomes}$$

$$Probability\ of\ Getting\ Heads = \frac{1}{2}$$

ODDS

Odds are another way of expressing probability. Specifically, odds are expressed as ratios, such a 2:1, which is stated as 2-to-1. It is a reward-to-risk ratio, where you risk a certain amount to be rewarded a certain amount:

- 2:1 Pot Odds à Reward:Risk Ratio
- You risk 1 to win 2

Common reward-to-risk gambling ratios you are familiar with are the following:

- Blackjack pays 3:2, meaning for every $2 you wager, you will win $3 if you get a Blackjack.
- A roulette single number pays 35:1, meaning for every $1 you wager on a single number, you win $35 if your number is hit.
- Poker pot odds are the same and you'll learn how to calculate pot odds later in this book.

CONVERTING ODDS TO PERCENTAGES

For lots of people, interpreting odds can be a bit cryptic, including myself. I have found that converting and viewing odds as a percentage is much more intuitive simply because most people are used to seeing and interpreting percentages. So that is what we are going to do in this section.

WHAT DOES 2:1 REALLY MEAN?

That is a very good question. Let's convert it into a percentage to help us better understand what 2:1 means. There is a very simple process for doing so, which I will outline below.

SIMPLE MATHEMATICAL RELATIONSHIP

The image below shows a very simple mathematical relationship between a ratio m:n and its counterpart fraction, which can be reduced into a percentage.

$$m:n = \frac{n}{m+n}$$

- **m** = Reward
- **n** = Risk
- **m + n** = Reward + Risk
- **Percentage** = Risk / (Reward + Risk)
- **Percentage** = n / (m + n)

LETS CONVERT 2:1 POT ODDS

- Given 2:1 à m:n, where m = 2 & n = 1
- Percentage = n / (m + n)
- Percentage = 1 / (2+1) = 1/3
- 1/3 then reduces to 33.3% odds
- So 2:1 pot odds is equal to 33.3% pot odds

LETS CONVERT 3:1 POT ODDS

- Given 3:1 à m:n, where m = 3 & n = 1
- Percentage = n / (m + n)

- Percentage = 1 / (3+1) = 1/4
- 1/3 then reduces to 25% odds
- So 2:1 pot odds is equal to 25% pot odds

LETS CONVERT 4:1 POT ODDS

- Given 4:1 à m:n, where m = 4 & n = 1
- Percentage = n / (m + n)
- Percentage = 1 / (4+1) = 1/5
- 1/3 then reduces to 20% odds
- So 2:1 pot odds is equal to 20% pot odds

ODDS TO PERCENTAGE TABLE

While it is not that difficult to convert odds to percentages once you get the hang of it, you often only have seconds to act at the poker table, especially if you are playing online poker. So I have created a simple reference "odds-to-percentage" table that you can use at the poker table instead of having to convert odds to percentages on the fly why you play poker.

Odds Ratios	Odds Percentages
1:1	50%
2:1	33%
3:1	25%
4:1	20%
5:1	16.7%
6:1	14.3%
7:1	12.5%

CONCLUSION

In this chapter I introduced the concept of mathematical probability and odds and showed you how to convert odds ratios into percentages. You should now be comfortable with understanding probability and odds and also be able to convert ratios to percentages. These are important core concepts to understand because we will be relying on them throughout the rest of this book when discussing pot odds, implied odds, and equity, as well as other important poker mathematical concepts.

CHAPTER 4. UNDERSTANDING EQUITY

INTRODUCTION

In poker, you will often hear the term “pot equity”, “card equity” or simply equity. Well, what does pot equity mean? Pot equity is our share of the pot if the hand is played to showdown. It is essential how much we expect to win in the long-run based upon how often we expect to win the hand. It is commonly expressed as a percentage or dollar amount. Don’t worry if this is a bit confusing, it’ll all make sense by the end of this chapter.

UNDERSTANDING EQUITY: COIN FLIP EXAMPLE

Let's use a simple coin-flip example to demonstrate the concept of equity. So when you flip a coin and chose either heads or tails, you expect for heads or tails to hit 50% of the time. In other words, if you pick tails and wager on it, you expect to win 50% of the time. Therefore, you have 50% equity (chance of winning) in the wager.

So if you wager $1 on a coin flip, you expect to win $0.50 in the long run. Why? Your equity is 50% of the pot:

- Your Coin Flip Equity: $1 Wager x 0.50 = $0.50

Therefore, your equity can be expressed as a percentage or a dollar amount:

- **Percentage Equity**: 50%
- **Dollar Amount Equity**: $0.50

UNDERSTANDING EQUITY: POKER EXAMPLE

Pre-flop all-in situations are a common situation in poker, so we'll use a fairly common all-in scenario of QQ versus AK all-in pre-flop. In this situation, QQ is a 55% favorite to win, meaning QQ has 55% equity; therefore AK has 45% equity. Let's assume the all-in pot size is $200 and determine QQ and AK's equity in dollar amounts:

- Dollar Amount Equity = % Equity x Pot Size
- **QQ Equity** = 0.55 x $200 = $110
- **AK Equity** = 0.45 x $200 = $90

So in the long run, QQ's 55% equity share of the pot will yield $110 in this all-in situation, whereas AK's 45% equity will yield only $90.

IMPORTANCE OF UNDERSTANDING EQUITY

Now that you know what equity is, you need to know why it is important in poker. Before we make a call, raise or fold a hand in poker, we need to know our equity share of the hand. All of our decisions in poker revolve around our equity in the hand, i.e. how often and how much we expect to win. With simple poker mathematics, we evaluate our equity combined with the pot and implied odds we are being offered in a hand to determine the correct mathematical play. Equity combined with odds help us to determine the correct long-term mathematical play. Without understanding equity and odds, we are less likely to make the correct, profitable play.

TOOLS OF THE TRADE: EQUILAB

PokerStrategy.com has developed a free invaluable equity calculator software application that all online poker players should have and use. You can download Equilab via this direct link. Equilab gives you the ability to analyze the equity in a poker hand against your opponent's specific hand or range of possible hands (see image below). It also has many other features as well, such as a hand scenario analyzers and equity trainer.

At its most basic level, you can use it to analyze hands that you previously played to determine your pre-flop and post-flop equity. While a full Equilab demonstration is outside the scope of this book, you can view live demonstrations in my **Udemy Essential Poker Math** Course.

If you do not have Equilab installed on your computer, I highly recommend you download and install it right now. You will find it invaluable in your poker career.

COMMON PRE-FLOP EQUITY SCENARIOS

Below are some common pre-flop hand equity scenarios. I used Equilab to calculate which hand is the equity favorite in each scenario. This will give you an idea of your equity in all-in pre-flop situations, such as AA vs. QQ or AK vs. TT. In an over pair versus under pair scenario, the over pair is a huge favorite pre-flop. In the other common pre-flop all-in situation of AK over cards versus a pocket pair, we see that the pocket pair is a slight favorite. In poker AK versus a pair is commonly referred to as a coin flip scenario.

The other two scenarios are not pre-flop all-in situations, but give you an idea of why being out-kicked with top pair can lead to a lot of big losing pots. In our KQ versus KJ scenario, we see that KQ is expected to win 73.16% of the time. The last scenario shows the value of playing higher cards versus smaller cards for suited and off-suited connectors.

Scenario	Example	Equity Favorite
Over Pair vs. Under Pair	AA vs. QQ	AA (81.55%)
Over Cards vs. Pair	AK vs. TT	TT (56.17%)
Dominated Hand	KQ vs. KJ	KQ (73.16%)
Over Cards vs. Under Cards	JT vs. 68	JT (69.69%)

PRE-FLOP & POST-FLOP EQUITY

One very important concept to understand with equity is that it changes throughout the hand. What do I mean? Your pre-flop equity is not the same as your post-flop equity. Pre-flop, we do not know what cards are going to hit the flop, turn and river but as they do your equity in the hand will change.

For example, given A♣A♠ versus Q♦Q♥ example, A♣A♠ is a 81.55% equity favorite pre-flop. However, what happens if the board flops T♥J♥9 ♥? Q♦Q♥'s equity increases and A♣A♠ decreases.

Hand 1	Hand 2	Action
A♣A♠ (81.55%)	Q♦Q♥ (19.14%)	Pre-Flop
A♣A♠ (40.30%)	Q♦Q♥ (59.70%)	T♥9♥J♥ Flop

As you can see from the table above, pocket queen's pick up a lot of outs for draws on the flop with a straight flush draw. Consequently, pocket queen's is now the equity favorite to make the best hand by the river.

This simple example shows how pre-flop and post-flop equity are not the same and how equity evolves from pre-flop, to the flop, to the turn and to the river. You can use Equilab to practice analyzing hand equities on a street-by-street basis such as I did with pocket aces and pocket queens, comparing pre-flop and post-flop flop equity.

CONCLUSION

Equity is a simple concept in poker and you should definitely understand it. It is important both in pre-flop and post-flop play. When we have the best hand, we use equity to determine the draw our opponents can have to make a better hand on the river; moreover, when we have a drawing hand, we use equity to determine if we can profitably call a bet with our draw or not. Later in the book, we are going to discuss equity combined with pot odds and implied odds to determine if we can call with a drawing hand or not. So if this all seems a bit cryptic and you are unsure if it will be useful or not, don't worry, it will be. I'll be tying everything in together later in the book to show you just how useful concepts such as equity are in poker mathematics.

CHAPTER 5. POT ODDS & IMPLIED ODDS

INTRODUCTION

In this chapter we are going to continue our poker mathematics journey by discussing pot odds and implied odds. In this chapter, we'll relate our discussion on probability and odds directly to poker with pot odds and implied odds. Remember, knowing our odds is very important in poker because it will allow us to determine if we can profitably call a bet, raise a bet, or simply fold our hand. So let's get started.

POT ODDS

So what are pot odds? Pot odds are the immediate odds you are being offered when you call a bet in poker. The important aspect of this definition is **immediate** because with pot odds, it is how much you stand to win **immediately** in relation to what you have to risk by calling a bet. Remember, this relates directly to our reward-to-risk ratios we discussed in a previous chapter.

For example, if your opponent bets “x” amount in a hand on the river, you are given a certain amount of pot odds to make the call on the river to win the pot. With our **reward:risk** ratio, you **risk** the amount you have to call to win the **reward** of the amount of money in the pot.

HOW TO CALCULATE POT ODDS RATIOS

- **Pot Odds** = [pot size]:[amount to call] where [pot size] includes any and all bets on the current street (pre-flop, flop, turn or river) as well as the amount in the middle.
- **Remember that Odds** = [reward]:[risk] ratio
  - **Reward**: The pot of chips
  - **Risk**: Amount we have to call

POT ODDS RATIO CALCULATION EXAMPLE

The pot is $200 and there is a $100 bet in front of you. Follow the steps below to determine your pot odds ratio:

1. **Pot Odds** = [pot size]:[amount to call]
2. = [$200 + $100]:[$100]
3. = $300:$100 = 3:1
4. **Pot Odds** = 3:1
5. **Convert Ratio to Percentage**= 3:1 à ¼ à25%
6. So your **Pot Odds** are **3:1** or **25%**

Because we are using the ratio method to find pot odds and then converting the ratio to a percentage, **we do not add our amount to call into the total pot size** during our pot odds ratio calculation.

POT ODDS % CALCULATION EXAMPLE

The pot is $200 and there is a $100 bet in front of you. Follow the steps below to determine your pot odds percentage:

1. **Pot Odds %** = Call Size / Pot Size
2. **Pot Size** = Initial Pot Size + Bets + Our Call
3. = $200 Initial Pot + $100 Bet + $100 Call = $400
4. **Pot Odds %** = $100 / $400 = ¼ = 25%

Note that when we do the pot odds calculation as a percentage, we do add our call into the total pot size.

WHAT METHOD SHOULD I USE?

It is really up to you to determine what method you prefer to calculate your pot odds. Some people prefer the ratio method, while others prefer the percentage method. I personally prefer the percentage method because percentages are more intuitive than ratios for me to understand.

WHAT DOES POT ODDS REALLY MEAN?

So what does 3:1 or 25% pot odds mean? It means that you have to put 25% more money into the pot if you decide to call. So in our previous example, the $100 more we have to put into the pot is 25% of what the total pot size will be after we call.

- **Pot Size + Our Call** = $300 + $100 = $400
- **25% Pot Odds** = $100 / $400 = ¼

WHY ARE POT ODDS IMPORTANT?

Pot odds are important because we use them in conjunction with implied odds and card equity to determine how we should optimally play a hand. We use pot odds to ensure we only call bets when we are getting **good pot odds** or **good implied odds** based upon **our equity** in the hand. In short, pot odds and equity tell us if we should call a bet or not. We will be discussing how to estimate our equity and use it, combined with pot odds to determine if we should call or not later in the book.

ODDS TO PERCENTAGES TABLE

If you find that the pot odds ratio calculation is the easiest for you, you can use this simple table to quickly convert ratios to percentages.

Odds Ratios	Odds Percentages
1:1	50%
2:1	33%
3:1	25%
4:1	20%
5:1	16.7%
6:1	14.3%
7:1	12.5%

POT ODDS EXERCISES

In this section, we will be doing some simple pot odds exercises to help your to learn how to quickly determine pot odds ratios and percentages.

EXERCISE 1

Villain bets $10 into a $20 pot and it is your turn to act. What are you pot odds ratio and percentage?

Pot Odds Ratio Calculation

- **Pot Odds** = [pot size]:[amount to call]
- **Pot Size** = $20 Pot + $10 Bet = $30
- = $30:$10 = 3:1 Pot Odds Ratio
- **3:1 Pot Odds**

Pot Odds % Calculation

- **Pot Odds** = call size / pot size
- **Pot Size** = $20 Pot + $10 Bet + $10 Call = $40
- = $10 / $40 = 1/4 = 25%
- **25% Pot Odds**

EXERCISE 2

Villain bets $50 into a $50 pot and it is your turn to act. What are you pot odds ratio and percentage?

Pot Odds Ratio Calculation

- **Pot Odds** = [pot size]:[amount to call]
- **Pot Size** = $50 Pot + $50 Bet = $100
- = $100:$50 = 2:1 Pot Odds Ratio
- **2:1 Pot Odds**

Pot Odds % Calculation

- **Pot Odds** = call size / pot size
- **Pot Size** = $50 Pot + $50 Bet + $50 Call = $150
- = $50 / $150 = 1/3 = 33%
- **33% Pot Odds**

EXERCISE 3

Villain bets $10 into a $40 pot, an opponent calls the $10 and it is your turn to act. What are you pot odds ratio and percentage?

Pot Odds Ratio Calculation

- **Pot Odds** = [pot size]:[amount to call]
- **Pot Size** = $40 Pot + $10 Bet + $10 Opponent Call = $60
- = $60:$10 = 6:1 Pot Odds Ratio
- **6:1 Pot Odds**

Pot Odds % Calculation

- **Pot Odds** = call size / pot size
- **Pot Size** = $40 Pot + $10 Bet + $10 Opponent Call + $10 Call from You = $70
- = $10 / $70 = 1/7 = 14%
- **14% Pot Odds**

IMPLIED ODDS

Implied odds states that you can call a bet now even if you are not getting good direct pot odds if you expect to make up for it on later streets (turn or river) of betting if you hit your draw. What this means is that you can call a bet now getting bad pot odds with a drawing hand, if you expect your opponent to pay you off nicely if you hit your draw. So implied odds reflect how much we expect to win on later streets when we hit our drawing hand.

WHEN IMPLIED ODDS WORK BEST

Implied odds work the best in the three following situations:

- Against Aggressive Opponents
- When you are in Position
- With Hidden Draws

AGAINST AGGRESSIVE OPPONENTS

Against aggressive opponents, you can call flop and turn bets with bad direct pot odds when you expect your aggressive opponent to pay you off if you hit your draw. Implied odds are higher with aggressive opponents because they will usually tend to bet on later streets for value and as a bluff even when you hit your draw. So look to play implied odds draws against aggressive opponents, especially bad loose aggressive opponents.

WHEN YOU ARE IN POSITION

It is easier to extract value when you are in position because you are last to act in each betting round; therefore, you will get paid off more often when you hit your drawing hand and are in position. For example, if you are out of position and hit your draw, if you check then your opponent may check behind for pot control; however, if you are in position you can fire out a value bet and hope to get called by your opponent. Therefore, it makes more sense to play implied odds drawing hands more often in position than out of position.

WHEN YOU HAVE A HIDDEN DRAW

So what is a hidden draw? It is typically a set or straights using one-gapper connectors. These are draws that are very difficult to detect; therefore, you can expect to yield a lot of value when you hit them. Here are some examples:

- You have 6♣8♣and the Flop is 5♣7♦K♥
- You have 6♥6♣ and he Flop is K♣2♠9♦

If you hit the straight on the turn with a 9 with 6♣8♣ it will be hard for your opponent to see the straight. If your opponent has top pair, he or she will definitely continue to bet for value. The same goes for the second example. If you turn a set of 6's, your opponent will never see it and will continue to value bet top pair. These are classic examples of hidden draws that have a lot of implied odds value because they are so difficult to spot. You can expect to extract maximum value with drawing hands like these when they hit.

WHEN IMPLIED ODDS DON'T WORK

There are also many situations when implied odds hands do not work that often:

- Against Tight Opponents
- When you are Out of Position
- With Obvious Draws

AGAINST TIGHT OPPONENTS

Tight opponents, such as NITs that shut down at any sign of a draw hitting will tend to not pay you off. Some will even lay down top pair. So tend not to play drawing implied odds hands against weak, tight, passive opponents.

WHEN YOU ARE OUT OF POSITION

We discussed why implied odds hand yield value in position and yield much less when out of position. So for that reason, do not play implied odds draws out of position unless you are playing against a really loose aggressive opponent that you know will pay you off if you hit your draw.

WITH OBVIOUS DRAWS

Obvious draws, such as flush and straight draws that your opponent can easily identify are terrible hands for implied odds. Flush draws are horrendous for implied odds because even bad players will know a flush completing on the turn or river is bad for them a majority of the time. Obvious straight draws on the board are also very bad as well. So tend to play less obvious draws for implied odds because you will not get paid off a majority of the time.

CONCLUSION

In this chapter we discussed pot odds and implied odds. You now should know how to calculate pot odds as a ratio and a percentage, as well as know what implied odds are and when they work the best and when they often do not work. If you need practice calculating pot odds, I highly recommend reviewing hands you previously played and using them to calculate pot odds. Your goal should be to be able to quickly calculate your pot odds at the table (with a calculator if you need one).

You now know about equity and pot odds. In the upcoming chapter you will learn how to count outs and use the nifty Rule of 2 and 4 to quickly estimate your card equity at the poker table. So let's now jump to the next chapter where we will be talking about draws and counting outs.

CHAPTER 6. DRAWS & OUTS

INTRODUCTION

In this chapter we are going to be talking about drawing hands and outs. When you have a drawing hand to a flush or a straight, you have a certain number of outs to hit your draw. Your outs are how many cards that will allow you to make your draw. So the goal of this chapter is for you to be able to easily identify your draws and the corresponding outs to making your draw.

IMPORTANCE

Understanding draws and outs is essential to poker. It is one thing to know that you have a flush draw or a straight draw, but it is entirely different to know exactly how many outs you have to make your draw. This is a very important concept because knowing our outs gives us the ability to know our equity in the hand; moreover, using the simple Rule or 2 and 4, which we will discuss in the next chapter, it also gives us the ability to know when we can call a bet or not profitably.

OUTS YOU SHOULD MEMORIZE

In poker, there are common draws you will often see when you play; therefore, you should memorize their corresponding outs:

- Flush Draw: **9 Outs**
- Open-Ended Straight Draw (OESD): **8 Outs**
- Over Cards 2-Pair Draw: **6 Outs**
- Gut-Shot Straight Draw: **4 Outs**

DISCOUNTING OUTS

Before we start practicing identifying draws and counting outs we first need to discuss the concept of discounting outs. We should consider discounting outs if we think those outs to our draw are already taken by one of our opponents or if we don't expect to win the hand if we hit our out.

Here are some simple examples of situations where you would need to discount your outs:

- When you have a straight draw, but some of your outs would also complete an opponent's potential flush draw.
- When you have over cards, drawing towards a pair, but cards that give you a pair also complete a straight or flush for your opponents.

We need to be able to identify when an out is a **dirty out** for us, meaning it completes a better draw for one of our opponents. When we have a **dirty out**, we should err to the side of caution and discount it. Many poker players fail to discount **dirty outs**, which leads them to **overestimate** their equity in a hand and make bad, unprofitable calls.

LET'S PRACTICE

In this section, we will be practicing identifying draws and outs to our drawing hands with real hands I have previously played on the Bovada poker network.

HAND 1: Q♦J♠

Our Draws

On this flop board texture, our only draw is a pair on the turn or the river with our over cards. We do not have any other draws.

Our Outs

We do not have to worry about discounting any of our outs with our over card pair draw. We have a combined 6 outs:

- 3 Queens
- 3 Jacks

HAND 2: A♠T♣

Our Draws

On this flop board texture, we have a gut shot straight draw to the nut straight and an over card draw to a pair of aces.

Our Outs

Since there is a flush draw on this flop board texture, we must first eliminate all clubs from our outs because if any club hits it will complete a flush that will beat our straight or pair of aces. So how many outs do we have to make our straight or pair of aces?

- Straight Draw: K♦,K♥,K♠
- Pair of Aces: A♦,♥A
- Discounted (Eliminated Outs): K♣,A♣
- Total Outs: **5 Outs**

HAND 3: 7♣7♥

Our Draws
If we assume our opponent has a pair of tens, then we are only drawing to a set of sevens.

Our Outs
Although there are two sevens left in the deck, we do not want to see a spade because our opponent could also have a flush draw. So we should eliminate the 7♠ from our outs; therefore, we only have **one out**, the 7♦.

HAND 4: A♠5♠

Our Draws
We have a draw to the nut flush and if we assume our opponent does not have trip sevens or a full house we also have a draw to a pair of aces as well. However, if our opponent has trip sevens, then our only draw is the flush. If our opponent flopped the full house, then we are drawing dead, meaning we cannot win the hand.

Our Outs

We don't have to discount any outs since none of our outs improve our opponent, unless our opponent has a stronger ace. Let's assume our opponent rarely has trips or the full house. With that said, we have the following outs:

- 9 outs for the flush
- 3 outs for a pair of aces
- Total Outs: **12 Outs**

HAND 5: K♦J♣

Our Draws
We have a plethora of draws in this hand if we think our opponent has a pair of aces. So what are our draws? We have the nut flush draw, trip jacks draw, and a two-pair draw.

Our Outs
Let's discuss out outs for each draw:

- Flush Draw: 9 Outs
- Trip Jacks: 2 Outs (J♥,J♠)
- Two-Pair Draw: 3 Outs (K♣,K♥,K♠)

Do we need to discount any outs? We do not need to discount outs for the nut flush. However, if opponent flopped a set or has AJ, then we do need to discount our trip jacks and two-pair draws. We should not assume our opponent has such a strong set all of the time, so we should not discount our outs for trips and two-pair completely. It would be safe to discount them by approximately 50% and assume we only have 2 or 3 outs instead of 5 for those two draws. So with discounting our outs, we can conservatively assume we have **10 or 11 outs** than the initial 14 outs we calculated.

CONCLUSION

Hopefully you can now easily identify your draws and count your corresponding outs while at the same time know when you need to discount dirty outs as well. In the next chapter we will be discussing the Rule of 2 and 4, where we will be using our knowledge of identifying our draws and properly counting our outs to quickly estimate our equity in a poker hand with very simple math.

CHAPTER 7. RULE OF 2 & 4

INTRODUCTION

The Rule of 2 and 4 is a very easy way to estimate your equity while you are playing a hand without any complicated math or equity calculators. It involves basic arithmetic and nothing more. In this chapter I will teach you how to use the Rule of 2 and 4 and then we will practice using it together by going through several exercise hands.

HOW DOES IT WORK?

The Rule of 2 and 4 is very simple and involves two simple steps:

Step 1: Count your outs for your draws

Step 2: Multiple your draws by 2 or 4 based upon the criteria below:

- Multiple Outs x 2 on the **flop** if you are not being put all-in or calling an all-in
- Multiply Outs x 4 on the **flop** if you are being put **all-in** or are calling an **all-in**
- Multiply Outs x 2 on the **turn** always

So, on the flop you are either multiplying your outs by two or four. If you are not calling an all-in or being put all-in on the flop, then you would multiple your outs by 2. If you are calling an all-in or going all-in on the flop, then you would multiple your outs by 4. Lastly you always multiply your outs by 2 on the turn regardless if you are all-in or not.

So why do you multiple by 4 or 2 in difference instances?

- **Multiple by 4 on the Flop:** When you are calling an all-in or going all-in on the flop, you get to see 2 cards without putting any more money into the pot. You get to see the turn and the river card without having to put another bet into the pot.
- **Multiple by 2 on the Flop:** Conversely, when you are not calling an all-in or being put all-in on the flop, you only get to see 1 card without having to put more money into the pot. You only get to see the turn card without having to put more money into the pot. Put another way, you pay to see only the turn card and if your opponent bets on the turn, you have to pay another bet to see the river card.
- **Multiple by 2 on the Turn:** The same goes with calling a turn bet regardless of if it is an all-in or not. You get to see the river card after calling a turn bet whether you are all-in or not.

So let's summarize:

- **Multiple by 2**: Paying to See 1 Card
- **Multiple by 4**: Paying to See 2 Cards

Now let's take a simple example of 4 outs to see how the rule of 2 or 4 works:

Outs	Multiple By	Equity
4	4	16%
4	2	8%

When we multiple our outs by 4 our equity is double what it is when we multiple our outs by 2. The reason for this is we get to see two cards instead of just one; therefore our equity is twice as much in an all-in situation than when we are not in an all-in situation.

Now let's do some more realistic examples:

Draw	Outs	Flop Not All-In	Flop All-In	Turn
Flush Draw	9	9 x 2 = 18%	9x4 = 36%	9 x 2 = 18%
Open-Ended Straight Draw	8	8 x 2 = 16%	8 x 4 = 32%	8 x 2 = 16%
Over Cards 2-Pair Draw	6	6 x 2 = 12%	6 x 4 = 24%	6 x 2 = 12%
Gut Shot Straight Draw	4	4 x 2 = 8%	4 x 4 = 16%	4 x 2 = 8%

The above table shows us the different equity percentages we have with our common draw scenarios when we are:

- All-In on the Flop
- Not All-In on the Flop
- Calling a Turn Bet

RULE OF 2 AND 4 EQUITY ODDS CHART

You can use the table below while you are playing poker to quickly estimate your equity if you do not want to do the arithmetic behind the Rule of 2 and 4. Simple identify the number of outs and find the corresponding equity percentage based upon the scenario.

# of Outs	% Flop Not All-In	% Flop All-In	Flop All-In Odds	% Turn	Turn Odds
1	2.1%	4.3%	22.5:1	2.1%	45:1
2	4.3%	8.4%	10.9:1	4.3%	22:1
3	6.4%	12.5%	7:1	6.4%	14.3:1
4	8.5%	16.5%	5.1:1	8.5%	10.5:1
5	10.6%	20.3%	3.9:1	10.6%	8.2:1
6	12.8%	24%	3.1:1	12.8%	6.7:1
7	14.9%	27.8%	2.6:1	14.9%	5.6:1
8	17%	31.5%	2.2:1	17%	4.8:1
9	19.1%	35%	1.9:1	19.1%	4.1:1
10	21.3%	38.4%	1.6:1	21.3%	3.6:1
11	23.4%	41.7%	1.4:1	23.4%	3.2:1
12	25.5%	45%	1.2:1	25.5%	2.9:1
13	27.7%	48.1%	1.1:1	27.7%	2.6:1
14	29.8%	51.2%	.95:1	29.8%	2.3:1

LET'S PRACTICE

In this section, we will practice using the Rule of 2 and 4 using a few of the same hands we discussed in the previous chapters. We know the draws and outs; now we will determine our corresponding equity in each hand.

We will use the Rule of 2 and 4 to list the following equities:

- Flop All-In Equity
- Flop Not All-In Equity
- Turn Equity

We will then compare the Rule of 2 and 4 estimations to exact equities.

HAND 1: Q♦J♠

Draw(s): Pair of queens or jacks

Outs: 6 Outs

Rule of 2 & 4:

- Flop All-In Equity: 6 x 4 = **24%**
- Flop Not All-In Equity: 6 x 2 = **12%**
- Turn Equity: 6 x 2 = **12%**

Exact Equity (Using Equity Odds Chart)

# of Outs	% Flop Not All-In	% Flop All-In	% Turn
6	12.8%	24%	12.8%

You will notice the Rule of 2 of 4 is very accurate. The difference between our estimation of our equity in the hand (how likely we will hit our draw) versus the exact equity using the chart I included earlier in the chapter is small. However, this will not always be the case. The Rule of 2 and 4 becomes more inaccurate as our outs increase.

HAND 2: A♠T♣

Draw(s): Gut shot straight draw and pair of aces. We must discount all clubs due to the flush draw as well.

Outs: 5 Outs

Rule of 2 & 4:

- Flop All-In Equity: 5 x 4 = **20%**
- Flop Not All-In Equity: 5 x 2 = **10%**
- Turn Equity: 5 x 2 = **10%**

Exact Equity (Using Equity Odds Chart)

# of Outs	% Flop Not All-In	% Flop All-In	% Turn
5	10.6%	20.3%	10.6%

Again the Rule of 2 and 4 is very accurate. That is why it is such a great tool to use when you are playing poker. In a matter of seconds, you can quickly estimate (with a very low level of error) your equity in a hand.

HAND 3: A♠5♠

Draw(s): The nut flush draw and a pair of aces, assuming our opponent does have trips or a full house.

Outs: 12 Outs

Rule of 2 & 4:

- Flop All-In Equity: 12 x 4 = **48%**
- Flop Not All-In Equity: 12 x 2 = **24%**
- Turn Equity: 12 x 2 = **24%**

Exact Equity (Using Equity Odds Chart)

# of Outs	% Flop Not All-In	% Flop All-In	% Turn
12	25.5%	45%	25.5%

In this example hand, now that we have a lot of outs, we now see that the Rule of 2 and 4 is a bit inaccurate. Multiplying by 2, we slight underestimate our equity and multiplying by 4, we slightly overestimate our equity. It is still okay to use the Rule of 2 of 4 when you have a lot of outs, just be aware that after **10 outs**, you can expect it's inaccuracy to be +/- 1%.

ESTIMATE YOUR EQUITY CONSERVATIVELY

As a general rule, it is a good idea to estimate your equity conservatively. You should estimate down rather than up, even when you have a lower amount of outs. Why? Because we do not know what cards were dealt to our opponents or were used as the burn cards. Any of those cards could be one of our outs. Just because we know that theoretically we have 9 outs to make a flush or 8 outs to make an open-ended straight draw, it does not mean all of those cards are left in the deck.

For example, in a 6-handed game, 2 cards are dealt to each player at the table. If you are sitting at a full table, that is 10 cards that are gone from the deck that your opponents have; moreover, the dealer will burn a card on each street as well. So, on the flop that is 11 cards that could potentially hold several of your outs to your draw. In a full ring 9-handed game, more cards are out of play. So, as a general rule, I recommend under-estimating your equity.

CONCLUSION

As you can see, the Rule of 2 and 4 is a simple but very powerful tool in poker. Players that don't use it are simply guessing when they have drawing hands. When you use the Rule of 2 and 4, you will have a major skill advantage on many of your opponents that you can use to make sure you make the correct, profitable move.

We have now talked about pot odds and implied odds, equity, draws and outs, and the Rule of 2 and 4. In Chapter 9, we are going to bring all of this information together and I am going to show you how to use everything we have learned so far to determine if we can or cannot call a post-flop bet with a drawing hand. However, before we get to that, in the next chapter we are going to talk about the concept of expected value (EV) because EV ties into all of our mathematical decisions at the poker table.

CHAPTER 8. INTRODUCTION TO EXPECTED VALUE (EV)

INTRODUCTION

Expected value, commonly referred to by its acronym EV in the poker world is a very important mathematical concept that you should understand. I am going to introduce the concept in the chapter and in later chapter I will show you how its basic calculation works and how you can use it to evaluate your poker game.

WHAT IS EV?

EV is how much you should expect to win or lose **on the average**, **over the long-run** based upon a specific scenario in poker. Every single situation and scenario in poker has an expected value to it and certain situations with be profitable (**+EV**) while others unprofitable (**-EV**):

- **+EV** = A profitable long-term play
- **-EV** = A lose long-term play

It is important to note that EV is concerned with how well a certain play will do over the long-run; not the outcome of a single hand. For example, if we are considering the EV of calling a pre-flop all-in with pocket aces against an opponent that has pocket queens we know that this is a long-term profitable play regardless if we lose that hand or not. We may get unlucky and lose that hand, but we know over the long-run this is a +EV play.

WHY IT IS IMPORTANT?

Our goal is to understand what EV is and use it as a tool to maximize our +EV decisions. In poker, we want to strive to make as much long-term profitable plays as possible, and EV will help us do so.

HOW DO WE USE EV?

We can use EV while we are playing and also after we play. When we are in a hand, we use our knowledge of poker math to enhance our likelihood of making profitable poker plays, which we call +EV plays. By implementing simple math into our poker game and understanding pot odds, implied odds, equity, the Rule of 2 and 4, and other important poker math topics, we maximize the chance that we make profitable +EV plays. Conversely, poker players that don't know poker math or chose not to implement it in their game are unknowingly constantly make –EV plays.

We can also use EV and the EV calculation, which I will discuss later in this book, to analyze hands we played to determine if they were +EV or – EV. The EV calculation is a simple mathematical formula to determine if a particular play is a long-term profitable +EV or unprofitable -EV play.

CONCLUSION

Whenever you are making a poker play, you should be asking yourself, “Is this a profitable +EV play or unprofitable –EV play?” You should use your new found knowledge of poker math to maximize your likelihood of making the profitable play and folding if a call or a raise is –EV. This will make much more sense in the next chapter, where we will bring everything we have discussed so far in this book together to determine if we can call or not profitably with a drawing hand.

CHAPTER 9. CAN WE CALL?

INTRODUCTION

In this chapter, we will be using our knowledge of basic poker mathematics to determine if we can call or not profitably with a drawing hand. We will be determining if we can call a bet with a drawing hand based upon our knowledge of pot odds, implied odds, outs, equity and the Rule of 2 and 4. Our goal with this chapter is to make the correct mathematical +EV decision.

FOUR SIMPLE STEPS

We will follow four simple steps that you can easily implement into your game to determine if we can profitably call a bet or not with a betting hand:

1. First we determine our pot odds and implied odds.
2. Secondly we determine our card equity in the hand.
3. Next, we compare our pot and implied odds with our equity in the hand.
4. Lastly, we determine if calling is +EV or –EV by comparing our equity to our pot odds and implied odds.

COMPARING POT ODDS & EQUITY

There are two ways to compare our pot odds to our equity in a hand. The first is the ratio method and the second is the percentage method. We will focus on the percentage method in this book, but I'll tell you how both methods work:

Percentage Method: We can call if the % chance of making our hand is greater than the % of the pot you have to call:

- **Call**: Equity % Greater Than Pot Odds %
- **Fold**: Equity % Less Than Pot Odds %

Ratio Method: We can call if the pot odds are greater than our equity odds (odds of completing your draw):

- **Call**: Equity Odds Ratio Less Than Pot Odds Ratio
- **Fold**: Equity Odds Ratio Greater Than Pot Odds Ratio

LET'S PRACTICE

In this section, we will practice using hand examples to determine if we can call with a drawing hand or not profitably.

HAND 1

You have A♣T♣ and the flop is 5♣K♣8♥. Villain bets $10 into a $50 pot.

What are the pot odds?

- **Pot Odds** = [pot size]:[amount to call]
- **Pot Size** = $50 Pot + $10 Bet = $60
- = $60:$10 = 6:1 Pot Odds Ratio
- **14% Pot Odds**

How many outs do we have?

We have 9 clubs for the flush draw & 3 Aces, giving us a total of 12 Outs.

What is our estimated equity?

Using the rule of 2 and 4, we multiply our outs by 2 since we are not calling an all-in on the flop:

- 12 outs x 2 = approximately **24% Equity** (actual equity is 25.5%)

Should we call?

Yes! We have approximately 24% equity in the pot and only have to put 14% more into the pot. Since our equity % chance of hitting our draw is greater than the pot odds % we have to call, then this is a +EV call.

HAND 2

Let's use the same exact hand but change villain's bet size and pots odds. You have A♣T♣ and the flop is 5♣K♣8♥. Villain bets $40 into a $50 pot.

What are the pot odds?

- **Pot Odds** = [pot size]:[amount to call]
- **Pot Size** = $50 Pot + $40 Bet = $90
- = $90:$40 = 2.25:1 Pot Odds Ratio
- **31% Pot Odds**

How many outs do we have?

We have 9 clubs for the flush draw & 3 Aces for an over pair draw, giving us a total of **12 Outs**.

What is our estimated equity?

Using the rule of 2 and 4, we multiply our outs by 2 since we are not calling an all-in on the flop:

- 12 outs x 2 = approximately **24% Equity** (actual equity is 25.5%)

Should we call?

It depends! Based upon direct pot odds, we should fold since we have to put 31% more money into the pot and only expect to make our draw 24% of the time. So based upon direct pot odds alone, this would be a –EV call and we should fold.

Let's now consider implied odds. If we think that villain will pay us off if we hit our A or flush, then we can call since we have good implied odds. However, if we think he will shut down and not put any more money in the pot when we hit the winning hand, then we should just fold since we have bad implied odds. So calling is really villain-dependent in this situation and we should only call if we think we have good implied odds.

HAND 3: Q♦J♠

Villain bets $50 into a $50 pot making the pot size $100

- We have to call $50 into a $100 pot
- 100:50 = 2:1 = **33% pot odds**

Draw(s): Pair of queens or jacks

Outs: 6 Outs

Rule of 2 & 4: Flop Not All-In Equity: 6 x 2 = **12%**

Should we call?

We should fold because this is a –EV call. We only have a 12% equity chance of hitting our hand and

have to call 33% more into the pot. We have to call more than our equity share in the pot, so it is an easy fold.

HAND 4: K♦J♣

Villain bets $3 into a $3 pot making the pot size $6.

- We have to call $3 into a $6 pot
- 6:3 = 2:1 = **33% pot odds**

Draw(s):

- Flush Draw: 9 Outs
- Trip Jacks: 2 Outs (J♥,J♠)
- Two-Pair Draw: 3 Outs (K♣,K♥,K♠)

Outs: 14 Outs

Rule of 2 & 4: Flop Not All-In Equity: 14 x 2 = **28% Equity**

Should we call?

We should call even though this is a slightly –EV called based upon direct pot odds. But we have excellent implied odds with so many outs if our opponent has a pair of aces or a lower flush draw. If villain bets a pot-sized bet on the flop, we can expect to get more money out of him on later streets if we hit our hand, so we should continue assuming we have good implied odds in this situation.

HAND 5

You have 7♦9♦ and the turn is 6♦8♠A♦2♣. Villain goes all-in for $3.50, making the pot now $7.50.

What are the pot odds?

- We have to call $3.50 into a $7.50 pot
- 7.50:3.50 = 2:14:1 = **32% pot odds**

Draw(s):

- Flush Draw: 9 Outs
- Open-Ended Straight Draw: 6 Outs (2 outs for this draw are accounted for in the flush draw, 5♦ & T♦)

Outs: 15 Outs

Rule of 2 & 4: Turn Equity: 15 x 2 = **30%** (actual equity is 31.9%)

Should we call?

Yes, we should call. This is a break-even call. We are getting 32% pot odds and expect to hit our draw 32% of the time, so we are getting the correct pot odds to call here with both a flush and open-ended straight draw.

HAND 6

You have K♠Q♠ and the flop is A♠9♠3♥. Villain bets $2.00 into a $2.50 pot. You raise to $6.50. Villain re-raises all-in for a total of $10.00. The pot is now $19.00 and you have to call an additional $3.50 with your draw if you want to continue.

What are the pot odds?

- We have to call $3.50 into a $19.00 pot
- 19:3.50 = 5.42:1 = **15.6% pot odds**

Draw(s):

- Flush Draw

Outs: 9 Outs

Rule of 2 & 4: Flop All-in Equity: 9 x 4 = **36%** (actual equity is 35%)

Should we call?

Yes, this is an easy call. You are getting great pot odds to call. You only have to put 15.6% more into the pot and expect to win 36% of the time versus villain's all-in jam on the flop. Folding here would be a huge mistake.

HAND 7

You have K♠T♥ and the flop is A♥Q♣4♣. Villain bets $5.00 into a $4.00 pot.

What are the pot odds?

- We have to call $5.00 into a $9.00 pot
- 9:5 = 1.8:1 = **35.7% pot odds**

Draw(s):

- Gut shot Straight Draw

Outs: 3 Outs (we have to discount the J♣ because of the flush draw on the board)

Rule of 2 & 4: Flop Not All-in Equity: 3 x 2 = **6%** (actual equity is 6.4%)

Should we call?

No, we should not call. We only have 3 outs to hit the nut straight due to the flush draw. This gives us 6% equity but we are being forced to put 35.7% more into the pot. This is a –EV pot odds call. Moreover, if a J or club hits the turn or river, our opponents might shutdown and not pay us off because he may be afraid we hit the straight, flush or two pair, especially if he only has one pair, such as AK or AT.

CONCLUSION

In this chapter, we pulled together everything we have learned thus far in this book to determine if we can call a bet with a drawing hand profitably or not. This is a simple process that you should be able to easily implement into your poker game with a bit of practice:

- **Step 1**: Determine pot odds & implied odds
- **Step 2**: Estimate your card equity in the hand
- **Step 3**: Compare your pot and implied odds with your equity in the hand
- **Step 4**: Determine if calling is +EV or –EV by comparing your equity to your pot odds and implied odds

While this is a simple process, practice makes perfect. In this chapter we used seven simple hand examples to highlight this process; however, I highly recommend that you practice it on your own reviewing hands you played previously before you attempt to use it in a live game, especially online games where you have only anywhere from 15-45 seconds to make a decision at the poker table.

CHAPTER 10. BETTING THE BEST HAND

INTRODUCTION

We will often have the best hand when we are playing poker; therefore, we need to know how to mathematically play it profitably. Why? When we have the best hand we want to do two things. First we want to extract maximum value from our opponents. Secondly we want to give drawing hands a bad mathematical price to call our bets. We do this by betting an amount we think our opponents will call that is also a –EV call for them based upon the pot odds we offer them with our value bet.

BOARD TEXTURE

Board texture plays an important role in determining the likelihood that our opponents can have a drawing hand or not. Therefore, we need to understand board texture to correctly size our bets.

WET BOARD TEXTURES

A draw-heavy and coordinated board with several possible draws is called a **wet board** texture. Here are some example wet boards:

- **Wet Board #1**: A ♣ J ♣ T ♣
- **Wet Board #2**: 5 ♦ 6 ♦ 8 ♥

As you can see with both example wet board textures, there are many draws. With both, our opponents can have flush draws and straight draws; therefore, on a wet board texture we need to **bet more** to protect our strong made hands from drawing hands that can easily suck out on us on the turn or the river.

DRY BOARDS

A non-coordinated board with little to no possible draws is considered a **dry board texture**. On a dry board texture our opponents either have a made hand or not with very little draws to suck out on us. Here are some example dry boards:

- 2♦ 6♥ J♣
- K♦ 8♠ 2♥

As you can see there are very little draws on the example hands shown above; therefore, we are less worried about protecting our value hands on dry boards since there are not many drawing hands that can suck out on us on the turn or the river. Therefore, in general, we should **bet less** on dry boards with made hands since it is hard for our opponents to call unless they have a made hand as well.

REVISITING DRAWING HAND EQUITIES

Remember from our previous discussions that different draws have different equities, so let's quickly recap with the table below, which shows flop not all-in and turn equities:

Drawing Hands	Outs	Flop Not All-In & Turn Equity
Gut-Shot Straight Draw	4	8%
Over Cards 2-Pair Draw	6	13%
Open-Ended Straight Draw (OESD)	8	17%
Flush Draw	9	19%
Flush + Gut-Shot Straight Draw	12	25%
Flush + OESD	15	33%

Knowing how to quickly determine what draws your opponents may have based upon the board texture, combined with each draw's equity is very important because we need to size our bet to give our opponents a bad pot odds price to call. Our goal with our bet is to extract maximum value and to get our opponents to call –EV pot odds bets.

OUR BETS = OPPONENT'S POT ODDS

When we bet, we offer our opponents mathematical pot odds. The table below shows common bet sizes and each bet size's associated pot odds:

Bet Size	Pot Odds Ratio	Pot Odds Percentage
1/4 Pot Sized Bet	5:1 Pot Odds	16.7% Pot Odds
1/3 Pot Sized Bet	4:1 Pot Odds	19.9% Pot Odds
1/2 Pot Sized Bet	3:1 Pot Odds	25% Pot Odds
2/3 Pot Sized Bet	2.5:1 Pot Odds	28.5% Pot Odds
3/4 Pot Sized Bet	2.3:1 Pot Odds	30% Pot Odds
Pot Sized Bet	2:1 Pot Odds	33.3% Pot Odds

HOW MUCH SHOULD WE BET?

So we know our goals with betting with the best hand, along with drawing hand equities and the pot odds we offer our opponents based upon our bet size. With that said, how much should we bet to both extract value and make our opponents make a –EV pot odds call with worse hands?

Below is a table outlining recommended bet sizes; however, it is recommended that we should bet at least a **1/2 pot sized bet** when we have the best hand even if betting less would give our opponents a bad price to call. The reason for that is that our opponents will tend to call a 1/2 pot sized bet regardless of their draw.

Drawing Hand	Flop Not All-In & Turn Equity	Our Bet Size?	Pot Odds We Offer
Flush + OESD	33%	Slightly Over Bet Pot	Greater than 33%
Flush + Gut-Shot Straight Draw	25%	2/3 Pot-Sized or More	28.5% or more
Flush Draw	19%	1/2 Pot-Sized or More	25% or more
Open-Ended Straight Draw (OESD)	17%	1/2 Pot-Sized or More	25% or more
Over Cards 2-Pair Draw	13%	1/2 Pot-Sized or More	25% or more
Gut-Shot Straight Draw	8%	1/2 Pot-Sized or More	25% or more

As you can see in the table above, we look to bet a sizing that our opponents are likely to call that gives them a –EV bad price to call our bet. We can default to a minimum of a 1/2 pot sized bet in many instances, but when boards are extremely wet with lots of draws we need to bet more.

In my experience playing poker, most opponents will call with all of their draws, weak or strong, to a 1/2 to 3/4 pot-sized bet. So if you think your opponent will call a larger bet, then I highly recommend you bet more to exploit their tendency to call larger bets.

OVER-BETTING THE POT

In the table above, when our opponents may have a flush + open-ended straight draw with 15 outs and 33% equity we must over-bet the pot to give our opponents a bad price to call. The reason for this is that a pot sized bet will offer 33% equity. So my recommendation is to slightly over bet the pot with around a 1.2 to 1.3 pot sized bet to ensure we put our opponents in a –EV situation; however, you will often find that when someone has such a strong draw he or she will often look to get all-in on the flop because with 15 outs, such a strong draw is greater than a 50% favorite to win all-in by the river.

LET'S PRACTICE

EXAMPLE HAND 1

You have A ♣ K ♣ and the Flop is K♥ 9♥ 4♠

This is a semi-wet board texture with both a flush and gut-shot straight draw. A flush draw and gut-shot straight draw have 25% equity combined if you suspect an opponent can have both draws. So how much should we bet to give our opponents a bad price to call? We should bet at minimum a 2/3 pot sized bet, which will offer 28.5% or more pot odds. If we think our opponents will call a 3/4 or pot sized bet, then we should bet more to extract more value, but at minimum we should bet a 2/3 pot sized bet.

EXAMPLE HAND 2

You have 7 ♦ 7 ♣ and the Flop is 5 ♥ 6♥ 7 ♠

This is a very wet board texture with both a flush draw and open-ended straight draw. We most likely have the best hand with top set, but our opponents can easily suck out on us on the turn or the river. Such strong draws combined can have up to 33% equity in the hand, so we need to bet big to give our opponents a bad price to call. We should over bet the pot to around a 1.2 to 1.3 pot sized bet and if we are re-raised all-in we should definitely consider calling with top set. Even if we are behind, we have redraws to quads or the full house.

EXAMPLE HAND 3

You have K ♣ Q ♦ and the Flop is K♥ 7♣ 2♦

This is an extremely dry flop. You most certainly have the best hand unless your opponent flopped two pair or a set, which are both unlikely. Your opponent either has a made hand or not without any draws on the turn. So how much should you bet? On such a dry board texture we should be no more than a 1/2 pot sized bet. If we think our opponents are unlikely to have a king, then we should consider checking the flop to allow our opponents to catch up or to induce a bluff. The benefit of checking the flop is that we allow our opponents to think we do not have a king and bluff the flop if they are in position. If we are in position, we allow our opponents to bet the turn with smaller pairs or call our delayed turn continuation bet with weaker hands thinking their smaller pairs are potentially the best hand.

CONCLUSION

With understanding poker mathematics, we are not only concerned with understanding the math of our drawing hands, but also the math behind betting the best hand. It is vitally important that you both extract maximum value in a poker hand and also give your opponents as bad a price as possible to call with their drawing hands. Lots of beginning poker players make the mistake of offering their opponents a good pot odds price to call only to get sucked out on time and time again. We do not want to make that same mistake. So always remember to properly size your bets with the best hand.

CHAPTER 11. SEMI-BLUFFING

INTRODUCTION

In this chapter, we are going to be discussing the mathematics behind the semi-bluff and understand why it is okay to get all-in on the flop with certain draws with lots of equity in a poker hand. Before we move any further with this discussion, let's define exactly what a semi-bluff is and how it differs from a pure bluff. A semi-bluff is when you bet in a poker hand with a drawing hand, such as a flush draw, a straight draw or over cards. Even though it is a bluff at the time of your bet, you can make a strong made hand on the next street to win the hand, hence making it a semi-bluff.

QUICK REVIEW OF ALL-IN EQUITIES

When we semi-bluff we need to understand our all-in equity, meaning our drawing odds if we are all-in because often times we will look to semi-bluff all-in with a monster draw. Remember that our all-in equity is different than our not all-in equity. If we use the handy rule of 2 and 4, we should multiply our outs by either 4 or 2 depending up if we are getting all-in on the flop or the turn:

- Use the Rule of 2 & 4 to find your **all-in equity:**
  - On the flop: multiply your outs x **4**
  - On the turn: multiply your odds x **2**

SPOTS TO GET ALL-IN AS A SEMI-BLUFF

With a very strong draw with a lot of equity, we ideally want to get all-in as a semi-bluff on the flop rather than the turn. This is simply because if we get all-in on the flop, we get to see two cards for free whereas if we get all-in on the turn we only get to see one more card.

In a heads up hand, if we have approximately 50% equity, we are happy to semi-bluff all-in on the flop. In a 3-way hand, we can profitably get all-in with around 33% equity if we expect both opponents to call. Good drawing hands to semi-bluff all-in are the following:

- The Nut Flush Draw
- Open-Ended Straight Draw
- Flush + Straight Draw
- Pair + Straight Draw
- Pair + Flush Draw

OUR SEMI-BLUFF GOAL

There are two primary goals with the semi-bluff. Our first goal is to maximize fold equity and to take down the pot right then and there with our bluff by getting our opponents to fold. The secondary reason is to build the pot for when we make our strong draw. We are happy if our opponents fold and we are also okay with them calling.

SOME EXAMPLE SEMI-BLUFFING HANDS

EXAMPLE HAND 1

You have A ♣ K ♣ and the Flop is Q ♣ J ♣ 4 ♠

Villain bets $75 into a $100 pot making it $175.

- **Pot Odds:** Given the bet size, you are offered 2.3:1 pot odds, which convert to 30% pot odds.
- **Outs**: You have 9 outs for the nut flush plus and additional 3 outs for the nut straight, giving you a total of 12 outs. An A or K on may also give you the best hand, possibly giving you more outs.
- **Not All-In Equity**: 12 outs x 2 = ~24% Equity
- **All-In Equity**: 12 outs x 4 = ~48% Equity

Calling would be slightly –EV; moreover, if the straight or flush hits the board on the turn, your opponent might shut down. So your implied odds are somewhat reduced. With that said, this is a great spot to semi-bluff. If you think your opponent will fold top pair, such as KQ to a flop check/raise, then this is a great spot to semi-bluff. Furthermore, even if your opponent calls or raises you, you can safely get all-in on the flop with close to coin flip scenario with 12 outs with such a strong draw.

EXAMPLE HAND 2

You have 8 ♦ 9 ♦ and the Flop is 6 ♣ 7 ♥ 2 ♠

Villain bets $50 into a $100 pot making it $150.

- **Pot Odds**: Given the bet sizing, you are getting 3:1 pot odds, which convert to 25% pot odds.
- **Outs**: You have 8 outs for the straight and an additional 6 outs for your two over cards, giving you potentially 14 outs.
- **Not All-In Equity**: 14 outs x 2 = 30% Equity
- **All-In Equity**: 14 outs x 4 = 51% Equity

You have great direct pot odds to just call if you think that your over cards are live and your opponent is simply continuation betting with a hand such as AK, AQ, and KQ. However, if your opponent has a hand such as TT or JJ, then you only have 8 outs which gives you approximately 16% equity if you are not going all-in, which you cannot call the bet profitably via direct pot odds.

This is a potential opportune spot to semi-bluff raise the flop because on such a dry board texture, you opponent may think you have a set or two pair and may lay down a better hand, such as 88 or 99 or over cards that beat you. And if you are called or raised all-in, you still have decent equity to win the pot by the river. However, your main goal with a semi-bluff in this spot is to maximize your fold equity and take down the pot without seeing showdown.

CONCLUSION

There are going to be many great spots for you to semi-bluff the flop with a very strong draw. Don't be afraid to play draws with 12 or more outs very aggressively on the flop, because with so many outs you are essentially a coin flip to win by the river. So you are okay with being called; however, your first and main goal with a semi-bluff is to try to take down the pot on the flop by making your opponent(s) fold better hands. While playing such draws aggressively can lead to higher variance swings in your game and can be a bit scary for beginning poker players, just understand that they are +EV in the long run and therefore should be implemented into your poker game.

CHAPTER 12. BLUFFS & HERO CALLS

INTRODUCTION

Lots of poker players understand what a bluff and hero call is; however, not many truly understand how often they need to work to be profitably. The goal with this chapter is to help you understand how often your bluffs and hero calls need to work in the long-run to be profitable.

WHAT IS A HERO CALL?

Everybody knows what a bluff is, so there is no need to explain a bluff; however, not everybody knows what a hero call is. A hero call is simply when you call a potential bluff on the river with a marginal hand, hoping to catch your opponent bluffing. It is called a hero call, because you are the hero in the hand when you catch your opponent bluffing.

For example, you have 8♣8♥ and call an aggressive opponent's pre-flop raise. The flop comes 2♦4♦9♣, your opponent fires out a continuation bet and you call. The turn comes T♠. Your opponent bets again and you call. The river comes 7♣. You opponent goes all-in, you think about it for a few minutes and call. You opponent turns up A♦K♦ and you take down the pot.

THEY DON’T HAVE TO WORK ALL THEY TIME

The first thing you need to about bluffs and hero calls is that they do not need to work 100% of the time to be profitable. Lots of poker players make the mistake of getting upset when a bluff or hero call does not work. How often they need to work depends upon the bet-sizing. We will discuss this in the upcoming sections.

HOW OFTEN DO BLUFFS NEED TO WORK?

When we are bluffing we are risking our bet-size to win the amount of money that is in the pot. Therefore, we have a simple risk and reward ratio where we risk a certain amount to win a certain amount:

- **Risk**: Out Bet Size
- **Reward**: The Pot

EXAMPLE HAND

The pot is $100 and you bluff $50

- **Reward:Risk Ratio** = $100:$50 = 2:1 = 1/3 = 33.3%

Therefore, your bluff has to work 33.3% of the time to be break-even. So if it works more than 33.3% of the time, it is profitable!

BLUFF BREAK-EVEN TABLE

Below is a simple table that highlights how often a bluff needs to work to be break even based upon the size of the bluff. So, for example, if you commonly bluff continuation bet on the flop a ½ pot sized bet, it only needs to work 33% to be break even. If it works more than 1/3 of the time, then it is profitable. It is as simple as that. So the next time you bluff, refer to this chart to see how often it needs to work for it to be profitable in the long run.

Bluff Size	Reward:Risk Ratio using $100 Pot Size	Break-Even Percentage
1/4 Pot Sized Bet	$100:$25 = 4:1	20%
1/3 Pot Sized Bet	$100:$33 = 3:1	25%
1/2 Pot Sized Bet	$100:$50 = 2:1	33%
3/4 Pot Sized Bet	$100:$75 = 1.3:1	43%
Pot Sized Bet	$100:$100 = 1:1	50%

HOW OFTEN DO HERO CALLS NEED TO WORK?

Hero calls and how often they need to work is based purely upon the pot odds you are being offered. If you are being offered 25% pot odds, then your hero calls need to be right more than 25% to be profitable. One thing to note is that hero calls do not need to work that often to be profitable, which you will see from the hero call break-even table below. So don't be afraid to make a hero call if you feel there is a good chance your opponent is bluffing and you are getting decent pot odds to call.

HERO CALL BREAK-EVEN TABLE

Villain Bet Size	Hero Call Pot Odds	Hero Call Break Even Percentage
1/4 Pot Sized Bet	5:1 Pot Odds	16.7%
1/3 Pot Sized Bet	4:1 Pot Odds	19.9%
1/2 Pot Sized Bet	3:1 Pot Odds	25%
2/3 Pot Sized Bet	2.5:1 Pot Odds	28.5%
3/4 Pot Sized Bet	2.3:1 Pot Odds	30%
Pot Sized Bet	2:1 Pot Odds	33.3%

CONCLUSION

The mathematics behind how often hero calls and bluffs need to work are really simple, but lots of poker player neglect to use them in their game, especially with bluffs. The great thing about bluffs and hero calls is that they really don't need to work that often to be profitable. So remember to refer to the provided bluff and hero call break-even tables to know how often your bluffs and hero calls need to work in the long-run to be profitable the next time you are thinking about bluffing or making a hero call.

CHAPTER 13. EV CALCULATIONS

INTRODUCTION

In this chapter, we are going to build on our earlier discussion of Expected Value (EV). Specifically, we are going to introduce the most basic EV calculation, in which you can use for off-the-table analysis to determine if a particular play you made in a previous hand you played was +EV or –EV.

EV REFRESHER

Remember, EV is simply how much you expect to win or lose on the average over the long run. Furthermore, it is based upon a certain play that you make in a poker game:

- **+EV** = A profitable long-term play
- **-EV** = A lose long-term play

WHY IS IT IMPORTANT?

We want to make as many **+EV** plays, aka profitable plays as possible in the long run!

HOW DO WE USE IT?

We use correct poker mathematics at the table to enhance our likelihood of making **+EV** plays. Also, we use EV calculations off the table to analyze our previous plays to determine if they were profitable or not.

THE BASIC EV CALCULATION

The basic EV calculation is very simple and is composed to two parts:

- **EV** = [Part A] + [Part B]
- **Part A**: How often you win ***x*** How much you win
- **Part B**: How often you lose ***x*** How much you lose

As you can see above, the calculation compares your long-term winnings and long-term loses to determine if a play is profitable or not.

COMPUTING EV IN 3 SIMPLE STEPS

In this section, we will perform a basic EV calculation using an example hand.

Step 1: Determine how often you will win and how much you will win:

- 80% of the time you will win $500 = (.80 x 500) = **+$400**

Step 2: Determine how often you will lose and how much you will lose:

- 20% of the time you will lose -$1000 = (.2 x -1000) = **-$200**

Step 3: Add the amount you expect to win and lose together:

- $400 + (-$200) = **$200 +EV**

This example shows that this play is +EV and you expect to win $200 in the long run.

EV CALCULATION EXAMPLE HANDS

EXAMPLE HAND 1

Hand Details: Pre-flop you have JJ and villain 3-bets you all-in.

You estimate that you are a 59% favorite to win and will lose 41% of the time based upon your opponent's 3-betting frequency. If you call and win, you will win $166. However, if you call and lose, you will lose $100. What is the EV calculation and amount for this play? Is it a +EV or -EV play?

Calculating our EV:

- **EV** = [Part A] + [Part B]
- **Part A**: How often you win ***x*** How much you win
- **Part B**: How often you lose ***x*** How much you lose

Part A: How much we will win x percentage to win = ($166 x .59) = **+$97.94**

Part B: How much we will lose x percentage to lose = ($100 x .41) = **-$41**

EV = $97.94 + (-$41) = **+$56.94**

Hand Conclusion: This is a **+EV** Play. Each time you make this play you can expect to win, on average, $56.94.

EXAMPLE HAND 2

5NL Hand Details: Pre-flop you raise 3.5BB with A♠ A♦ and get called by one opponent. The flop comes K♠ 8♥ 3♠. You bet $0.41 into a $0.41 pot and your opponent raise to $0.82. You go all-in for $4.69, you opponent calls and turns up K♣9♦. The turn card is a 9♥ and the river card is a Q♣ and you lose a $9.79 pot.

You lost this hand; however, it is a very profitable long-term winning play. We will do a simple EV calculation to show exactly how profitable it is.

Determining Win & Lose Information

First of all, we need to determine how often we expect to win. To do so, you will need to use Poker Stove or Equilab software. Using Equilab, I determined how often we expect two win and lose:

- Win: 82.40%
- Lose: 17.60%

Next we need to determine how much we win and lose with this play. If we won, we would have won the entire pot of $9.79; however, each time we lose we lose our flop all-in re-raise amount of $4.69. It is important to note that the amount we lose is only our re-raise all-in because the money in the pot no longer belongs to us.

- Win: $9.79
- Lose: $4.69

Calculating our EV:

- **EV** = [Part A] + [Part B]
- **Part A**: How often you win ***x*** How much you win
- **Part B**: How often you lose ***x*** How much you lose

Part A: How much we will win x percentage to win = ($9.79 x .824) = **+$8.07**

Part B: How much we will lose x percentage to lose = (-$4.69 x .176) = **-$0.83**

- EV = (.824 x $9.79) + (.176 x -$4.69) = **$7.24**
- EV = $8.07 + (-$0.83) = **+$7.24**

Hand Conclusion: So even though we lost around a buy-in in this hand in a vacuum, in the long-run we can expect to win almost 1.5 buy-ins in this spot. The key takeaway with the EV calculation is that it confirms that our flop all-in shove was a very profitable long-term play and that we should not dwell on the fact that we lost that particular hand. We should, in fact, be happy that our opponent called with such a weak hand and hope he continues to do so in the future since we will win a lot of money from him in the long run.

CONCLUSION

These simple EV calculations are good for off-the-table analysis, especially when you are in a big hand that you are not certain if your play was optimal or not. You should use EV calculations to see if you made a long-term +EV or –EV play after you played a hand and you know the outcome. Lastly, EV calculations help you determine if you made a long-term winning or losing play regardless of the short-term outcome.

CHAPTER 14. CARD COMBINATIONS

INTRODUCTION

In this chapter, I will introduce you to the concept of hand combinations, commonly referred to combinatorics; however, we will not be taking a deep dive into this subject, but instead just an introductory primer.

WHAT ARE HAND COMBINATIONS

Hand combinations are all of the possible combinations of any particular hand, such as A♣K♥. Below we will highlight starting hand combinatorics:

- **Any Pocket Pair**: 6 Combinations
- **Any 2 Non-Pair Cards**: 16 Combinations
  - Any 2 Suited Cards: 4 Combinations
  - Any 2 Non-Suited Cards: 12 Combinations

HOW DO WE USE COMBINATORICS?

We use hand combinations to estimate the likelihood of a particular made hand. Understanding how to estimate hand combinations allows you to better estimate the amount of hands in your opponents' range as well as in your range.

POCKET PAIR COMBINATIONS

Remember, a pocket pair has a total of 6 combinations.

Example: There are 6 combinations of Pocket Aces

1. A♣A♠
2. A♦A♥
3. A♣A♦
4. A♣A♥
5. A♠A♦
6. A♠A♥

To estimate combinations of any pocket pair, use this simple formula, such as pocket aces:

- 3 + 2+ 1 = 6 combinations of pocket aces

If we Have an Ace: If we have an Ace in our hand, such as A♣Q♣, we would eliminate "3" from our simple formula:

- ~~3~~ + **2** + **1** = 3 Combinations Left:
  - **Eliminated Combos**: A♣A♠, A♣A♠, and A♣A♦
  - **Remaining Combos**: A♦A♥, A♠A♦, and A♠A♥

If we Have an Ace & an Ace is on the Flop: If we have an Ace in our hand, such as A♣Q♣ and the flop is A♦7♠2♥, we would eliminate "2" from our simple formula

- ~~3 + 2~~ + **1** = 1 Combinations Left:
  - **Eliminated Combos**: A♣A♠, A♣A♠, A♣A♦, A♦A♥, A♠A♦,
  - **Remaining** Combo: A♠A♥

POCKET PAIR COMBINATION EXAMPLES

Below we will go through three simple examples where we do not have an Ace in our starting hand:

EXAMPLE 1

If the flop is K ♣ J ♣ T ♥ there are **6** possible combinations of pocket Aces. If we don't have an Ace in our starting hand and there are no aces on the board, the 6 combinations of pocket Aces remains:

- 3 + 2 + 1 = 6 Combos of AA remaining

EXAMPLE 2

If the flop is A ♣ J ♣ T ♥ there are **3** possible combinations of pocket Aces:

- ~~3 +~~ **2** + **1** = 3 Combos of AA remaining

EXAMPLE 3

If the flop is A ♣ J ♣ A ♥ there is **1** possible combination of pocket Aces:

- ~~3 + 2 +~~ **1** = 1 Combo of AA remaining

NON-PAIRED HAND COMBINATIONS

For any non-paired hand, such as AK, JT or 56, there are a total of 16 combinations. There is a simple calculation to show this. We will use AK as an example.

There are 4 suits for any card (A ♣ A ♦ A ♥A ♠). So for AK, we know there are 4 Aces and 4 Kings in the deck. To find out the total possible combinations of AK, we would simply multiply:

- 4 Aces x 4 Kings = 16 Combinations

We can further break down our 16 combinations to suited hands and off-suited hands:

- 4 Suited Combinations (A♣K♣, A♦K♦, A♥K♥, A♠K♠)
- The remaining 12 combinations of AK are of-suited AK hands.

NON-PAIRED COMBINATIONS ADJUSTMENTS

Estimating the number of combinations of any non-suited hand is really easy. We start with the 4 x 4 calculation; however, whenever a card is taken, then we reduce the number of cards left for the calculation. For example if we continue with AK and an A hits the flop, then there are 12 combinations of AK possible:

- 3 Remaining Aces x 4 Kings = 12 Combinations

Let's do some more examples to illustrate this.

EXAMPLE 1

If the flop is K ♣ J ♣ T ♥, how many combos are there of KJ left in the deck? Well we must eliminate the K♣ and J♣ from our calculation. So there are only 3 Kings and 3 Jacks left in the deck, giving us:

- 3 Kings x 3 Jacks = 9 Combinations

EXAMPLE 2

If the flop is 9 ♣ T ♣ T ♥, how many combos are there of AT left in the deck? Well we must eliminate two Tens from our calculation. So there two Tens left in the deck and 4 Aces:

- 4 Aces x 2 Tens = 8 Combinations

USING COMBINATIONS

While I only briefly introduced your to the concept of card combinations and how to estimate simple card combinations for paired and non-paired hole cards, we can use card combinations for advanced analysis in poker. Specifically, we use card combinations to estimate the likelihood that our opponent is holding any particular hand in a poker game. It is especially useful for both on-the-table and off-the-table analysis to see exactly how many combos of hands is in your opponents' ranges to determine how many combinations of hands beat you versus how many you potentially beat. As you can probably imagine, understanding hand combinations allows you to further advance your hand reading abilities as well as to start utilizing more advanced concepts such as blockers in your poker game. There are many resources on the Internet discussing hand combinations in detail. If you are further interested in finding out more on this topic, I highly recommend that you simple Google "Poker Hand Combinations" as well as practice determining hand combinations on your own from previous hands you played.

CHAPTER 15. CONCLUSION & REFERENCE CHARTS

CONCLUSION

I congratulation you on finishing this book on essential No Limit Hold'em Poker mathematics. We covered a wide array of essential, but simple poker mathematics topics in this book that you will now be able to easily and effectively implement into your poker game to make more +EV decisions than your opponents. Hopefully this book has shown you how powerful yet simple basic No Limit Hold'em mathematics really is. Moving forward, I implore you to continue to study topics and subjects in this book that you feel need additional review. You goal should be able to implement everything you have learned in this book at the poker table fairly quickly. For math geeks and lovers that want to continue to learn about more advanced poker mathematics topics, The Mathematics of Poker by Bill Chen and Jerrod Ankenman is a great read.

REFERENCE CHARTS

I have compiled all of the important charts from this book in this section for easy future reference.

SPR GUIDELINE TABLE

SPR	SPR Size	Hands to Commit
Low	0 to 5	Over Pair, Top Pair, Bottom 2 Pair
Medium	6 to 15	Top 2 Pair, Sets, Non-Nutted Flushes & Straights
High	16+	Sets, Nutted Hands

ODDS TO PERCENTAGE TABLE

Odds Ratios	Odds Percentages
1:1	50%
2:1	33%
3:1	25%
4:1	20%
5:1	16.7%
6:1	14.3%
7:1	12.5%

COMMON PRE-FLOP EQUITY SCENARIOS

Scenario	Example	Equity Favorite
Over Pair vs. Under Pair	AA vs. QQ	AA (81.55%)
Over Cards vs. Pair	AK vs. TT	TT (56.17%)
Dominated Hand	KQ vs. KJ	KQ (73.16%)
Over Cards vs. Under Cards	JT vs. 68	JT (69.69%)

COMMON DRAWING HAND EQUITY SCENARIOS

Draw	Outs	Flop Not All-In	Flop All-In	Turn
Flush Draw	9	9 x 2 = 18%	9x4 = 36%	9 x 2 = 18%
Open-Ended Straight Draw	8	8 x 2 = 16%	8 x 4 = 32%	8 x 2 = 16%
Over Cards 2-Pair Draw	6	6 x 2 = 12%	6 x 4 = 24%	6 x 2 = 12%
Gut Shot Straight Draw	4	4 x 2 = 8%	4 x 4 = 16%	4 x 2 = 8%

OUTS TO ODDS TABLE

# of Outs	% Flop Not All-In	% Flop All-In	Flop All-In Odds	% Turn	Turn Odds
1	2.1%	4.3%	22.5:1	2.1%	45:1
2	4.3%	8.4%	10.9:1	4.3%	22:1

3	6.4%	12.5%	7:1	6.4%	14.3:1
4	8.5%	16.5%	5.1:1	8.5%	10.5:1
5	10.6%	20.3%	3.9:1	10.6%	8.2:1
6	12.8%	24%	3.1:1	12.8%	6.7:1
7	14.9%	27.8%	2.6:1	14.9%	5.6:1
8	17%	31.5%	2.2:1	17%	4.8:1
9	19.1%	35%	1.9:1	19.1%	4.1:1
10	21.3%	38.4%	1.6:1	21.3%	3.6:1
11	23.4%	41.7%	1.4:1	23.4%	3.2:1
12	25.5%	45%	1.2:1	25.5%	2.9:1
13	27.7%	48.1%	1.1:1	27.7%	2.6:1
14	29.8%	51.2%	.95:1	29.8%	2.3:1

POT ODDS OFFERED BY BET SIZING

Bet Size	Pot Odds Ratio	Pot Odds Percentage
1/4 Pot Sized Bet	5:1 Pot Odds	16.7% Pot Odds
1/3 Pot Sized Bet	4:1 Pot Odds	19.9% Pot Odds
1/2 Pot Sized Bet	3:1 Pot Odds	25% Pot Odds
2/3 Pot Sized Bet	2.5:1 Pot Odds	28.5% Pot Odds
3/4 Pot Sized Bet	2.3:1 Pot Odds	30% Pot Odds
Pot Sized Bet	2:1 Pot Odds	33.3% Pot Odds

RECOMMENDED BET SIZING WITH MADE HANDS

Drawing Hand	Flop Not All-In & Turn Equity	Our Bet Size?	Pot Odds We Offer
Flush + OESD	33%	Slightly Over Bet Pot	Greater than 33%
Flush + Gut-Shot Straight Draw	25%	2/3 Pot-Sized or More	28.5% or more
Flush Draw	19%	1/2 Pot-Sized or More	25% or more
Open-Ended Straight Draw (OESD)	17%	1/2 Pot-Sized or More	25% or more
Over Cards 2-Pair Draw	13%	1/2 Pot-Sized or More	25% or more
Gut-Shot Straight Draw	8%	1/2 Pot-Sized or More	25% or more

BLUFF BREAK EVEN TABLE

Bluff Size	Reward:Risk Ratio using $100 Pot Size	Break-Even Percentage
1/4 Pot Sized Bet	$100:$25 = 4:1	20%
1/3 Pot Sized Bet	$100:$33 = 3:1	25%
1/2 Pot Sized Bet	$100:$50 = 2:1	33%
3/4 Pot Sized	$100:$75 = 1.3:1	43%

Bet		
Pot Sized Bet	$100:$100 = 1:1	50%

HERO CALL BREAK-EVEN TABLE

Villain Bet Size	Hero Call Pot Odds	Hero Call Break Even Percentage
1/4 Pot Sized Bet	5:1 Pot Odds	16.7%
1/3 Pot Sized Bet	4:1 Pot Odds	19.9%
1/2 Pot Sized Bet	3:1 Pot Odds	25%
2/3 Pot Sized Bet	2.5:1 Pot Odds	28.5%
3/4 Pot Sized Bet	2.3:1 Pot Odds	30%
Pot Sized Bet	2:1 Pot Odds	33.3%

ABOUT THE AUTHOR

Alton “MicroGrinder” Hardin is the founder of MicroGrinder.com, an avid micro stakes poker player, poker coach, self-published Amazon Kindle eBook best-selling author, and Udemy.com poker course instructor.

Alton began playing poker live and online during the MoneyMaker era as an undergraduate college student. He was successful playing low stakes fixed-limit and no-limit live games and online single table SnGs, earning extra spending money while in college. However, after graduating, poker took a backseat to his professional career and he stopped playing poker altogether after getting married and attending graduate school to earn two Masters Degrees.

After finishing graduate school, Alton decided to get back into poker, taking the game very seriously and learning it from an academic perspective joining several poker video training sites, obtaining poker coaching, and reading several poker books. This approach to the game has been very successful for Alton as he has crushed 5NL and 10NL 6-Max NLHE with a 12bb/100 win rate over the past year.

Alton also is also a poker coach, poker eCourse instructor in addition to being a self-published poker author:

- 60+ poker training videos
- 4 poker eCourses

Outside of poker, Alton has several years of experience both teaching and tutoring. Alton has taught several courses at the University level and was a top-ranked adjunct professor for the California State University San Bernardino School of Business & Public Administration. Within his full-time career, Alton works in the field of business and cyber security.

Find out more at http://www.MicroGrinder.com

Other Poker Books by Alton Hardin:

- Poker Fundamentals Kindle eBook
- Developing Poker Reads Kindle eBook

Udemy Courses: https://www.udemy.com/u/altonhardin/

Facebook Group: https://www.facebook.com/groups/microgrinder/

YouTube Page: https://www.youtube.com/channel/UC6Sbyk7qnsiKJRLt2XyNytQ

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