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WILL MA: I guess I'll get started. So all right, cool. OK, so before I get into any hands, I wanted to-- this is really loud.

Before I get to any hands, I want to talk about tournaments versus cash games since I haven't really made the distinction yet. So essentially-- so this is a big chart with all the differences. So when you guys play in the things online, those are called tournaments. So in the tournament, you sort of buy-in for a fixed amount of play chips. case, it's not that relevant. It's like one play dollar. And then you get, for coming in the top 20% a round, you're going to get some amount of play chips paid out to you.

And like, if you win, you get the most. And if you just barely make it, you'll probably make back like two play chips. So you'll profit one play chip or something. So that's how tournaments work. And that's sort of what, throughout this class so far, I sort of assumed all the hands are taken from tournaments.

So there is a different way to play poker. And a lot of you might have actually been introduced to poker like this-- so, you have like sort of a home game, where there's just a bunch of friends, you're playing at someone's house. And you all buy in for some amount of play chips. And basically, you can play, and people can join the stock any time. If you lose all your play chips, you can just buy in for more.

It's not like tournaments where once you're out, you're eliminated. And you can never go back into that tournament and cash in to go buy in whenever. You can hit and run people. You can come try to make a bit of money and then just leave as soon as you make a bit.

So what are the main differences? So I wanted to highlight the differences between the two types of games and talk about why we mostly choose students tournaments in this class. So everyone knows the definition of what a tournament is, what a cash game is.

So let me talk a bit more about, what are some differences? In cash games, usually, the stakes are fixed. So usually, it will say we're playing for like one play dollar, two play dollars, or something like that, whereas in tournaments, I'm sure as you've noticed, the blinds keep going up.

The blinds start 10/20 in your tournaments. And then they become 20/40, and then like 40/80, or 30/60. Actually, there's a 15/30 level, I think. So it's 15/30 and 20/40, and then 25/50. And it keeps going up. and the reason this is the case is so that eventually the tournament ends, because if the blinds don't go up, the tournament will take forever to end.

So what's a big factor about tournaments versus cash games? In tournaments, you have no control over your table. You just join in the tournament, and you're put at some table, and you've got to do your best at the table you're placed at.

And the fact that there's not this much metagame, I think is one of the reasons it's much easier to analyze poker hands in terms of tournaments, because in cash games, if you're at the cash game, and everyone's really, really good, you could just choose, I don't want to play in this cash game anymore. I'm just losing my money. And you could choose to stand up and leave. And there's a lot of decisions of this form. So there is more metagame required.

And in tournaments, the general goal is to survive. You're just trying to get eliminated as late as possible to maximize your payout, whereas in cash games, a lot of it comes down to, if there's one bad player at the table, you're trying to target that specific player. You're trying to do everything you can to get in hands against that player, and exploit them, and win a lot of money against them, and risk a lot and stuff like that. There's less focus on the math of poker and more focus on specifically targeting certain players.

Tournaments-- there's frequent but fixed losses. So if you were playing tournaments for real money, how it works is most of the time, like 80% of players don't get paid anything back from the tournament. So when you play tournaments most of the time, you're going to lose, even if you're really good.

You're not going to win more than 50% of the time. So you're going to lose, lose, lose, lose lose. And then you're going to get a big win and then win a lot. And then it's going to be lose, lose, lose, lose, and you're going to win a lot.

Sort of like playing the lottery, whereas cash games, anything can happen. You can lose a lot. If you are having a bad day and you decide not to quit, you could lose all your money, buy back in, lose all your money, buy back in, eventually, lose all the money in your bank account. That could happen. You could also win a lot. So anything can happen.

But in some sense, tournaments is more variance. So like when I was talking in the first class

about the law of large numbers and reaching the long run, it does, overall, in some sense, take longer if you're playing tournaments, because in tournaments, you do need to occasionally get the big score in the tournament-- it's sort of like winning the lottery-- to make back all your money. And if you don't, then you won't make back all your money.

I argue that tournaments, I think, are more fun. They're more exciting. If you make it far in a tournament, eventually, it comes down to just two of you. It's pretty exciting.

Also, tournaments have a wider range of situations. So in cash games, usually, it'll be a fixed number of players at the table. And players will have a similar number of big blinds, because whenever you lose a bunch of big blinds, you can always buy back in and get those big blinds back by putting more money on the table, whereas in tournaments, we have to learn how to handle I, think interesting, mathematical situations where you have one big blind. How do I play it optimally? And stuff like that.

The last thing is if you play at a casino, another good thing about tournaments is relatively, the casino makes a lot less from tournaments and cash games. Cash games, just as a fraction of how much money you wager, the casino takes way more compared to tournaments.

Tournaments-- what the with the house takes is very small.

OK so those are the main differences. But I did want to comprehensively go through the differences, because if you do decide to play poker, these are essentially the two ways to play it. So I wanted to make sure everyone is well aware of the differences.

So yeah, so why I chose tournaments for the class-- I think there's less metagame. I think it's more exciting. I'm mostly a tournament player, myself, although I have played cash games for extended periods during my career. Yeah, there's a wider range of scenarios.

And I think it's more applicable. I think the MIT Poker Club-- the event they're running in January is a tournament, because tournaments are exciting. OK, so are there any questions about this chart? OK, cool.

Yeah, our club actually has both-- I mean the points-only tournaments count. But if you look at this thing above, then actually, the pen works now. I don't have to draw in here.

OK. If you look there, then these are the cash tables. And you could, in theory, sit down there and play for play money. And if you do lose all your play money in those cash tables to a shark in the class, and you have no more play money, and you can't join tournaments, you can

always refill your play money and join the tournaments. So that's why it's called "play money".

Only tournaments count for standings. And if you want to see the standings, you have to-- oh, I see. They annotate. So you see that you've got to click the blue arrow, and then you can see the standings.

Some people ask me about this. So if you want to see your standings, how many points everyone has, how many points you have, you can click that. You can click there.

OK, let's get into some poker hands now. That being said, I highlighted all these differences about cash games and tournaments. But good poker is essentially good poker. If you're good at one, you're probably good at the other. The difference is still rather small.

It's more based on, how much risk do I want to take? What kind of schedule do I want to play? And that determines which one you choose to play rather than, am I better at tournaments or cash games?

At least once yours-- except at the very top levels, there there really is no difference between-- there's no such thing as a cash game specialist, except at the very, very top where it's possible the best cash game players are good at cash games compared to the best tournament players. But when you're just starting out, if you're good at one, you're good at the other, essentially.

All right, cool. So today, I'm going to talk about some preflop play. Last class, I focused on post-flop play.

The first class, I talked a bit about what hands you should open with preflop. But I didn't really say that much about playing preflop. But it's one of the most important parts of the hand, because it determines what cards are playing for the rest of the hands.

So first of all, I wanted to run through some numbers. It's good to have a sense of these. You don't have to memorize all of these. But it's good to have a reasonable idea of equities, of specific hands versus specific hands, when you get it all in preflop. And I've classified this to make this roughly easier to memorize.

So the first example, which is sort of the dream situation, is you have a bigger pair against a smaller pair. What's the best situation that you can be given preflop in poker? So, what's the best hand you can have? It's aces, right?

But you don't want aces and for everyone else to have 3/2 offsuit, because they're just going to fold. So you want aces, and you want someone else to have kings. One of my screen names is actually, please give me ace ace against king king or something, on a site, because it really is the best situation you can hope for, because they're going to put all their money in with kings. And so roughly, when you have a bigger pair against a smaller pair, you're an 80/20 favorite. So you win 4/5 of the time.

And the edge dwindles a bit as you get to like, 33 versus 22, because there's a higher chance both pairs will be counterfeited. Like the board can come 66 77 8 or something. And then pocket threes ties pocket deuces.

And an equally good situation is one pair against zero overcards. So ace ace against ace king off it's also a very good situation. You're actually 93% there, because you dominate their ace. So there's very few ways for them to win.

Pocket aces against 6-5 suited-- this is actually the hand that's best against aces, other than aces itself, is 6-5 suited. And aces is only 77.5%. But it's still ludicrous.

So pocket jacks against 10-9 suited, 81.7%-- so, some rough numbers. 10-9 suited is pretty good. But pocket jacks crushes it because having two jacks blocks a lot of their straight-outs. Pocket queens against 7-4 is very good, because 7-4 off is not suited, not connected.

And the best you can do preflop is actually king king versus king two off. If you have pocket kings against king deuce off, I think that's the highest equity you can possibly get in preflop is 94.6%. And pocket kings against king two suited is 89 points.

So look how much better king two suited does than king two off against king king. The fact it's easier to make a flush is so relevant. We'll talk more about this later.

OK, the next few categories-- so a pair against one overcard. So you're still a favorite, but less big of a favorite. Instead of an 80/20, you're a 70/30. So queen queen against ace jack off is 71.7%. Queen queen against ace jack suited is a bit worse.

Queen queen against ace queen suited is actually much worse than queen queen against ace jack suited. I think this is a bit counterintuitive, because with, against ace jack suited, I always thought they have more outs. They can hit three jacks. But it actually turns out, the fact that they have a queen to prevent you from hitting three of a kind in the situation they've already

had an ace, is actually a lot more relevant. So queens is much worse against ace queen than is jack.

And pocket eights against ace two off-- 70.2%. Pocket threes against ace two off is a bit worse, because once again, small pairs can get counterfeited when you all-in preflop.

OK, a similarly good situation, which is the 70/30, is when you are, quote, "dominating" the other person. So "dominating" means one of your cards is the same. But the other card is different. And yours is higher.

OK, so ace king off against ace queen suited-- pretty good situation to get it in poker. You're at 70%. If you are suited, and they are not, then you're 75%. If neither of you are suited, it's 74%.

Yeah, ace king off versus king queen off. You're actually a bit better. So, ace king off against ace queen off, you're at 74.4%.

Ace king off is king queen off, you're 74.8%. And you're a bit better, because it's harder to tie with the ace. So when you both have an ace, it's possible the board will come with two pairs, so like 6, 6, 7, 7, 8. And then both of you will have two pairs of sixes and sevens with the ace kicker. But that's less likely to happen if they don't have-- like if your bottom card is their top card instead of your top card being their top card--

One thing to keep in mind is ace five off against ace two off is barely a favorite at all. So it's nowhere near as good as ace queen off against jack off. Anyone have any idea why that is?

Is it draw?

Right. Exactly, yes. So the five and two are going to get counterfeited. The five kicker is going to get counterfeited a lot more often, because if four cards on the board come, that's higher than five. The five is going to be irrelevant. So that's a good thing to remember.

Let's look at some more numbers. This is one thing that I've always thought is really cool. Two overcards versus a pair is actually very close to a 50/50 for the most part. Ace king suited against pocket twos it's 49.9%.

I actually showed you in the first class, if they don't have a two of your suit, then it's actually like 50.1%. So ace king off versus pocket twos is 47.4%. Note that 10/9 suited against pocket twos is actually a 54% favorite. It's much better than ace king against pocket twos, because

10/9 can make a lot more straights and flushes. And the fact that you're making a pair of tens instead of a pair of aces, is irrelevant when the thing you're trying to beat is a pair of deuces.

Ace king off versus pocket queen is only 43%. Even though people call it a coin flip, it's actually much worse than a coin flip. So yeah, this is actually one of the first things that drew me to Hold'em.

When I found this out, I was curious. I was wondering, the person who invented the rules of Hold'em, did they invent it so that this is a 50/50? Or was it just by coincidence that is [INAUDIBLE] 50/50? But I think it's very cool that it turns out to be a 50/50.

OK, so the last cases-- there's some weird cases where all four cards are different. Roughly speaking, when all four cards are different, the guy with the highest card is going to be a 60/40. I mean, this is very rough, because it's hard to encompass all the different types of scenarios under the same umbrella. But the thing that matters is having the highest card.

So let's see. So AB versus CD, which means you have two cards above their two cards. You can be as good as 67.7% if it's like ace king off versus queen seven off, because queen seven off has no straight-outs and no flush-outs.

AC versus BD, it's about 60 versus 40. AD versus BC, it can be as low as 50/50. So ace two off against 10-9 suited is only 51.6%. So that's sort of the worse case for AD versus BC.

You can look through those numbers more on the slides. And you can also get it yourself on PokerStove. Or a lot of websites, you can compute the equities of a hand versus another.

But it's good to have some rough ideas of these categories. When is it an 80/20? When am I a [? four to one ?] favorite? When am I a 70/30 favorite? When am I a 50/50? When am I a 60/40?

OK, so one thing that I hope you sort of got from these numbers is that suitness matters a lot when you're behind, and matters not that much when you're ahead. So if you look at these numbers, the gain in equity of ace king suited when-- sorry. The gain of equity of ace king when ace king is suited, is only 1%. You only increase your equity from 74.4 to 75.4.

But if ace queen is suited, then the equity of ace king drops by 4% instead of 1%. And the reason, essentially, is if your hand is bad, you need as many ways as possible to try to get lucky. And being suited is one of them.

But if your hand is already very good, you just really need your opponent to not get lucky. And you being suited is only going to be relevant if they first hit a pair to beat you. And then you need to hit a flush to beat them. So that's one thing to keep in mind.

So like with ace king, the difference of being suited and unsuited doesn't matter that much. But with a hand like 9-8, being suited is way better than being not suited. And shrewdness is also important for implied odds, as I talked about last class, because you can make much better decisions post-flop if your hand is suited.

So that's roughly some hand [? equities ?] to remember. Now, we're going to talk about some preflop all-ins, so going all-in preflop. OK so this class-- most of this class, this is going to be a bit boring maybe. These are not really highlight reel plays. And this is about routine, making good decisions that increase your preflop equity by a couple percent that will-- but it's really these boring decisions, I think, that make you win right, not the occasional brilliant thing that you see on TV.

So if your goal is to get on TV, then studying this is maybe pointless. But if your goal is to make expectancy, win money, essentially, then it's really the simple, boring decisions that affect whether you win, not the one-time crazy bluff you pulled off against Phil Ivey that makes you a winner.

Let's talk about this a bit. So the main thing is, don't be afraid to go all in preflop. I didn't really stress this yet. But one thing I tend to see people do is, you are too afraid to put all your money in preflop because you would think it's gambling or something.

It is a lot of luck. You essentially put your tournament life-- you let it ride on a coin flip. So it does seem scary. But the thing to remember essentially, is late in the tournament, the antes and blinds are so big. And if you ever can win the blinds by going on, that's such a large gain relative to what you risk, and also, any two cards of a chance against any other preflop.

So what was the rule I said? So the rule I said in the first class is, when the effective stack size is less than 12 big blinds, when there is antes, then just go all in if you're going to play the hand at all. And if there's no antes, then you need to be a bit shorter, because you don't want to risk 12 big blinds when there's no antes. So you only want to risk like 10 big blinds without antes. But this is the rule that I outlined in the first class, roughly, and when you can go on.

And one thing I wanted to talk about, too, before we get to the first example, is from the small

blind-- in the first class, I said, your button-opening range is similar to your small blind opening range. And why was this, even though from the small blind-- so when it's folded to you in the small blind, you may have to get through one more player, whereas when it's folded to you on the button, you need to get through two more players. So it seems like you could play a lot more hands from the small blind.

And another advantage of playing from the small blind, is you've already put in half a blind. So the amount more you're going to put in to play the pot is less, is half [? blindless. ?] But we said that being in position-- especially [? when we sell this last class-- ?] being in position is so important, that the fact that you're in position on the button and not in position was the small blind, meant about balanced-out the advantages of playing hands from the small blind.

So we said, roughly speaking, you should be similarly willing to raise hands from the button and raise hands from the small blind. But for all-ins, position doesn't matter. If all the money goes in the pot preflop, then who gets the [? act ?] last postflop? Doesn't matter, because there's no more actions to make postflop.

So for all-ins, your small blind all-in range can be a lot wider than your button-on range. And furthermore, I think the threshold of how many bets you can have to go all in is a lot higher, because even with like 15, even with 20 big blinds, I often go all in from the small blind if I know the big blind is a competent player. From the button, I would pretty much very rarely go on for 20 big blinds, because I'm not that sad if I just raise it to 2.25 and then call, because I play the rest of the hand in position.

But from the small blind, when I know that if they call, I'm playing the hand out of position, I really want to avoid this situation. So going on for a huge amount from the small blind is usually OK since there's only one player behind anyway.

Let's look at a sample situation. And I'm going to first analyze it theoretically. And then I'll try to go through a bunch of examples.

So do we go all in or fold here? And let's suppose we're reasoning exploitatively. So this was level 2 thinking, not level 3 thinking.

So if we're reasoning exploitatively, what we're asking ourselves is essentially, what's exploitative thinking? We model our opponent, give them a probability distribution, and then playing in a way that maximizes our expectation relative to the Bayesian probability distribution

we put on our opponent. You can ask yourself, is a blind a gambling

Player? Is it likely he or she will call with a wide range of hands? How crazy have I been playing? Will he give me any credit if I go all in?

Suppose the pay bubble doesn't matter. Suppose it's far from having to try to survive to make the next pay increase or whatever. So let's do this. What do we think he's calling?

OK so I want to see what you guys think. Does someone want to give me a hand that that you think he's calling, or definitely calling, or definitely not calling? You give me a no-brainer. I just want people to-- so what's the hand he's obviously not calling?

AUDIENCE: 2-7 offsuit. OK, good.

WILL MA: 2-7 offsuit. What's the hand he's obviously calling?

[INTERPOSING VOICES]

WILL MA: OK, so let's try to zero in a bit more, OK, don't worry. It's OK. So tell me what hands you think he might be calling that are a bit worse than pocket aces? What do you think is the smallest pocket pair he's calling? If you're not sure, let me ask you. What's the smallest pocket pair you would call if you don't know anything about the small blind?

So it's 15 big blinds. It's a 15 big blinds all-in-one. OK, who would call pocket fives? Who would call, call pocket twos. Who would call ace seven suited? Who would call a queen jack offsuit?

OK, so I guess we have a rough idea of-- so assuming you're playing against someone in this class, let's just say when you look at that sample, just sort of guess what they're calling. So I had this range. Maybe it's a bit more ambitious than what people put up their hands for. I said they would call with any pocket pair, any ace, king ten offsuit, king eight suited. So this is what I said they would call with just 25% of hands.

Maybe in reality, they call with even less. Maybe in reality, they only call 20%, 15% of hands. But this just further emphasizes my point.

So we assume, they call it 25%, let's say. OK, let's do the math. Let's now assume we have 10 offsuit.

OK, so let's do the math against this. Oh, sorry. So what is the equity of ten eight offsuit

against their 25%

Range? So when we get called, we're not going so well, because they're only calling 25% of hands. So their hand is going to be good when they call. We're only 36%.

So let's do the math. So 75% of the time, they're going to fold. And we're going to win 2.5 big blinds. Why is it 2.5 big blinds? There's a big blind that we're winning, there's a small blind that we're winning, and then there's one big blind from the antes that we're winning.

And it's 3.5. We count the small blind, because even though we put in the small blind, the fact that you put it in the pot-- it doesn't matter who put it in the pot. The fact that it's already in the pot means we're winning the money. That make sense?

So 25% of the time, he's going to call. And then when this happens, 36% of the time, we're going to win the all-in. And we're going to win 16.5 big big blinds.

Because we're going to win the 1.5-- we're going to win the small blind, the antes plus his entire 15 Big Blind stack. 64% of the time we're going to lose, and we're going to lose 14 and 1/2 Big Blinds, which is how much we wagered to do this all-in. So you can do the calculation. And it's actually very positive. We're making an expectation, an entire Big Blind by going all in. So now let's suppose we had a worse hand. So let's suppose we had 3-2 offsuit. We can do the same calculation again. The only thing that changed is, now we only have 28% equity instead of 36% equity. So 3-2 offsuit is actually a worse hand than 7-2 offsuit for a lot of all-in purposes.

Because 7-2 offsuit is, like, the worst poker hand against a range of strong hands. But against a range of any two cards, 3-2 off is actually worse than 7-2 off because seven high is relevant if they had six high. Anyways, so you do the calculation, and you find that this is still an excellent play. So going on with 3-2 offsuit, it's actually not a crazy bad play. It looks like a crazy bad play on paper. And I'll tell you, in reality, it is a crazy bad play. But according to this calculation, it's actually not a crazy bad play.

You're actually earning 0.42 Big Blind. OK, so what's wrong? What's wrong? Why does our calculation say 3-2 off is a good play? And there's no mistake in the calculation. It's not because of a mistake in the calculation.

AUDIENCE:

Because of the high probability that he's not going to call you.

WILL MA:

Right, exactly. OK, good. Yeah, so basically remember, we did this calculation using Level 2 reasoning, exploitative thinking, right? We built a model for him. And if our model is correct, then actually 3-2 offsuit is a good all-in. So what this is showing us is actually-- the point is, if our model is correct, then they're making a mistake. Then he's making a mistake by only calling 25% of hands. It's just too small a fraction. It's too small a fraction of hands to call with. So I guess the lesson sort of is-- so when I took the poll around the class, you guys wanted to call even less than 25%, right?

25% still includes Ace-2 offsuit, and still includes hands like-- let's see again. It still includes hands like Queen, King-10 offsuit, Queen-10 suited, King-8 suited. So even 25% is sort of too low in the sense that it allows a Small Blind to shove any two cards-- shove means all-in, shove any two cards profitably. And in reality, it might be the lower if people were being truthful when they put up their hand for what they're calling with, right? So basically my point is, I think people are too afraid to go all-in preflop. Going all in preflop is fine, basically. So let's suppose we're the Big Blind now, and we're considering adding Queen-Jack off to our calling range.

So I'm saying, OK, you're making the mistake as a Big Blind of only calling 25%. But what's wrong with my reasoning, right? The thing that's wrong with my reasoning is, that's only a mistake from a Level 3 reasoning point of view, right? That's only a mistake in that it's not theoretically optimal because in theory, the Small Blind could shove any two cards profitably. But if the Small Blind isn't actually shoving any two cards, then maybe this is actually the optimal range to call. If the Small Blind is shoving too small, then maybe 25% is the optimal strategy for the Big Blind from that point of view.

So we can do a calculation with Queen-Jack. So let's assume the Small Blind only shoves top 25% of hands instead of 100%. Then your equity is only 42%. And what equity do we need to call all-in? We need to call 14 Big Blinds, right? We need to call 14 Big Blinds. And if we call, the pot will be 31. So we need 14 over 31, which is about 45% equity. We only have 42, so we actually shouldn't call anymore. So it's possible the Big Blinds play is correct. But the point is, someone's play isn't correct.

So I also wanted this example to give you another idea of what sort of optimal Nash equilibrium play is. So I'm going to-- so let's draw a chart of what is in game theory called an iterative best response. So how this works is, I fix a strategy for one player. I take the best strategy for the other player at exploiting this strategy. And then I fix that strategy, and I come back. So I fix the strategy for the Big Blind, which is only call 25% of hands. And then I ask

myself, what's the best way for the Small Blind to exploit this? Well, it's to shove 100% of hands, right, by the calculation.

So now, if the Small Blind is fixed on this strategy, what's the best way for the Big Blind to exploit this? Well, it's to call with anything basically, because you know they're shoving anything. So it's a call with a very wide range, say, 67% of hands. So once the Big Blind is calling too much, how does the Small Blind exploit this? Well, now they tighten up, right? They only shove their good hands. And that's fine, because they're getting paid off very often when they shove their good hands. But once the Small Blind realizes they shove only their good hands, then the Big Blind's like, oh crap, I shouldn't be calling 67% anymore.

I'm going to call less, 30%. So overall, let me draw sort of a diagram of how it's going to work. So you can see, right? 0, 100 Small Blind. So essentially how it works is-- let me just put some markers. So how it's going to start out is, the Big Blind calls 25%, right, which is here, 25%. And then the Small Blind, to exploit this, shoves 100%. Then the Big Blind goes to call 67%, and then the Small Blind will respond by shoving 40%. These numbers are approximate, right? Then the Small Blind will shove too little, and then the Big Blind will sort of call too little.

And then it'll essentially go here, and then go here, and then go here, and then go here. So essentially, the point is it's going to converge. It's going to zero in on this blue line, on these blue lines. And the thing that it zeroes in on is basically what's called the Nash equilibrium. So you can actually compute the Nash equilibrium with a computer in this case, which is what I did. And this is what the Nash equilibrium is. So the optimal thing to do is for the Small Blind to shove about 66.8% of hands, and the Big Bind to call about 38.5% of hands.

And I think if you play reasonably, reasonable stakes online poker tournaments nowadays, this is what most people know how to do because most people will have a computer program that can do this calculation for them. But it's quite loose, essentially. So remember, the situation was 15 Big Blinds, there are antes, and you're in the Small Blind. You should be shoving 2/3 of hands, roughly. And the Big Blind should be calling almost 40% of hands. And this is the ranges. And as you can see, the Small Blind can shove 4-3 suited. So suitedness is very important. But if your hand is unsuited, then 7-6 offsuit is a shove. Oh, 6-5 offsuit it as a shove, too.

But 9-5 offsuit is not a shove because it says 9-6 off plus, which means 9-5 off is not a shove. So it's always a good idea to know the Nash thing just for preflop. Because even if you're

trying to exploit your opponent, you want to make sure you're never going too far off from the optimal play. Because whenever you get too far off, you could potentially be getting exploited. Yeah, but I mean, you don't have to do exactly this. I'm not saying everyone should do exactly this, right? If you think you're smarter than your opponent, and you have a good model than your opponent, if you think the Big Blind is calling way fewer than 38.5% of hands, then you can go in with a lot more than 66.8% of hands.

Just make sure if you do decide to try to exploit your opponent, you do the exploitation in the right direction. If they're calling too little, then you need to shove a lot. If they're calling too much, then you need to shove very little. That makes sense to everyone, right? That's the right direction to exploit your opponent. And similarly, if the opponent is shoving too much, then you're going to call a lot. And if they're shoving too little, then you call very little as well. But Yeah, but what's good about the Nash equilibrium strategy is you can't be exploited.

You know no matter what they do-- the optimal, basically the reason why this is called the convergence point is because if the Small Blind is shoving 66.8%, the best for the Big Blind to do against that is 38.5%. And the best you shove against 38.5% calling range is 66.8%. So it essentially converges, that's why it's called an equilibrium. So hopefully this gives you a better, a more concrete example for those of you who haven't seen what a Nash equilibrium is exactly, of what I mean by optimal Level 3 reasoning play.

OK, so that's enough of that. So now let's go do some concrete ranges. So now you can ask me, how do we learn these ranges, right? I showed you the Nash range for one specific situation. But the situations you can enumerate. There's going to be a lot, right? So I showed you the range for Small Blind versus Big Blind, and there's 15 Big Blinds. But what if it's 14 Big Blinds? What if it's 13 Big Blinds, right? What if it's 10 Big Blinds with no ante? So essentially it's a combination of memorization, understanding theory, and then extrapolation slash interpolation.

So let me just show you a few more. So just to give you a rough idea, this is where the memorization slash interpretation comes in, because if you have a few baselines to go off of, you can sort of use rules that theoretically make sense to extrapolate, right? So here's button, 10 Big Blinds. 43.9%, and this is roughly the hands. Oh sorry, is it clear what this range of hands means? I guess I never really explained. Basically s mean suited, o means offsuit, and plus just means any hand where the denominations are strictly higher. If you don't know exactly what it means, it's not a huge deal. But roughly, you want to sort of know what this is,

what this is saying.

So there's a few weird cases, but roughly, if it says $Ax+$, that means any Ace, any hand with an Ace, suited or unsuited you can go all-in. So 43.9%-- So in terms of extrapolation and interpolation-- I just want to make sure everyone gets the directions right. So if I move from button to the cutoff, does the fraction of hands go up or down?

AUDIENCE: Down.

WILL MA: Down, right? So the fraction of hands goes down because from the cutoff there's more players to get through, right? So you need a better hand. You can't-- so the fraction of hands you can shove goes down, right? That make sense to everyone? So make sure you get the direction right. And then what if the number of Big Blinds goes up or down? So let's say it's 15 Big Blinds. I guess 15 is sort of too much to go all-in with, but let's say it's 12 Big Blinds. Does someone have a guess what the percentage might be? You just have to get the direction right. Someone? Yeah?

AUDIENCE: 40%.

WILL MA: Yeah, 40%. That's about right. That's about right, basically. So the percentage will go down a bit. And what if you only have 5 Big Blinds? Does someone want to guess the percentage?

AUDIENCE: 60%.

WILL MA: 60%, yeah. That's about right. So try to get the directions right. If you have a few baseline points, and if you can get the directions right, that's a very important first step. So here's another data point. Cutoff, 7 Big Blinds. It's 38.8%. So notice that the cutoff, this situation compared to the first one, you're one position worse because you're cutoff instead of button. But you're risking a lot less, so you only have 7 Big Blinds. But the percentage is still going down. So I think I said this first class as well, the position matters a lot more than the number of Big Blinds because for the number of Big Binds, even though you are, in some sense, risking a lot more as you have more Big Blinds, it's also harder to get called.

If I go all in for 10 Big Blinds, they're going to fold a lot more than if I go all-in for 7 Big Blinds. So that's why the position actually matters a lot more than how many bets. OK, so lojack-- So that's hijack minus one. So that's two over from the cutoff. It's only 28-- 10 Big Blinds is only 23.4%, but it's still nothing. Not nothing. So under the gun nine handed with 3 Big Blinds, it's actually pretty high. It's 24.1%. So you can go look at those on your own. You can also

calculate on your own in certain websites. Yeah, so this will roughly give you an idea of the shape of the graph.

So this is under the gun all-ins. It's a bit approximated, but with 15 Big Blinds-- I know I recommended with 15 Big Blinds not to go all-in. And I think that's a good recommendation, but let's say you told the computer they were forced to go all-in with 15 Big Blinds, and they had to calculate the Nash equilibrium, this is what it would spit out. It would say, you go all-in with this 6.2%. And with 10 Big Blinds, it's 13.4%. With 5 Big Blinds, it's 33.3%. So it actually increases quite a lot for under the gun. For under the gun, the amount of the fraction of hands you can wager as a function of how many Big Blinds actually goes up quite a lot.

AUDIENCE: Question.

WILL MA: Yeah?

AUDIENCE: For example, you have 15 Big Blinds, and you get an Ace-Jack offsuited, what would be-- how much would you raise?

WILL MA: Oh, I would raise to 2 Big Blinds, or 2.25 Big Blinds.

AUDIENCE: That's it? Very little?

WILL MA: Yeah. For all hands, I essentially raise to 2.25 Big Blinds.

AUDIENCE: But it goes from 2.25 Big Blinds to all-in? There's no middle range?

WILL MA: Right, right. There's no in between, yeah. So the reason essentially is, there's-- so let's say you raise to 5 Big Blinds, right? This is essentially equivalent to an all-in, except worse. So why is it equivalent to an all-in? Because if your opponent has pocket Aces, or a good hand, not necessarily pocket Aces, they're going to go all-in. And pretty much, you have to call. I mean, if you knew they had exactly pocket Aces, you could fold. But it's possible for them to play a balanced strategy where they could have pocket Aces, or Ace-King, or pocket 10s, or whatever, and you're forced to call anyway.

So essentially if you make it any more than 2.25 Big Blinds, you put in enough chips that your opponent can just play a strategy that forces you to go all-in when they want to. And so it's basically strictly worse than just going all-in yourself. Yeah, good question. But yeah, with 15 Big Blinds, I would recommend just raising small, although I don't think going all-in is the end

of the world. OK, so this is roughly what the shape of the curve looks like. So here's another example. So for hijack, from 15 Big Blinds to 10 Big Blinds, it actually changes very little.

I guess it changes somewhat-- 23.4% to 28%. And then with 5 Big Blinds, it goes up very fast. So as the number of Big Blinds goes down, it increases a lot. But the difference-- but the change from 15 to 10 isn't that much. I guess under the gun it's a lot, but for hijack, it's not that much. So just give you some ideas. I don't expect anyone to do this perfectly. I'm trying-- I gave you a bit of data points. Just try your best to extrapolate a lot, try your best to extrapolate slash interpolate. If you're off by a lot, that's fine. The biggest thing is, just try not to get the direction wrong.

Don't think, if I'm one position worse, I can shove more hands, or something. So a few more pointers about going all-in preflop. So here, this is definitely a good play, I think. So you have pocket fours from hijack. You have 15 Big Blinds, which is more than what I said you should go all-in with. But I think-- but going all-in is a good play, instead of just raising to two times the Big Blind. Because small pairs, while having good implied odds when very deep-- so in the last class, I talked to you about set mining.

I said small pairs are great when you have 100 Big Blinds because you can try to hit three of a kind, and just win a massive amount of money when you do. But they actually have terrible implied odds when it's 20 Big Blinds deep because you only hit three of a kind one eighth of the time. When you do, the total effective stack size is not enough for you to recoup your losses. And when you don't, you're just always going to be sitting there with a pair of fours, and there's always going to be higher cards on the board. It's going to be Ace, Jack, 10, and you're always playing a guessing game. Does my opponent have a better pair? And you just can't make good decisions.

So that's why with small pairs, just going all-in, even for a lot of Big Blinds, is reasonable. So here's another example. Queen-8's good. Normally you wouldn't go all-in with that. You normally would just fold under the gun if you had a lot of chips. But with only 5 Big Blinds, going all-in is fine. Another factor that's actually sort of relevant here is-- this is sort of a higher level thing, but it's good to keep in mind is, when you're under the gun, in some sense you have the least to lose by busting the tournament. So by going all-in, you're risking busting the tournament. So this is not true in a cash game, but in a tournament it's true.

You want to go all-in from under the gun when you're really, really short. You have very little to

lose by busting the tournament because if you don't bust the tournament, the next hand, you're the Big Blind, which really, really sucks. So even though you busted the tournament, you busted the tournament in a situation where the next hand you would have had to pay the blind, which is one fifth that your stack, in this case. So going all-in is OK. Ace-2 suited is another example of a hand that's pretty good to go all-in with.

Because if they have a better Ace, you're still suited, so you have chances of catching up. And the fact that you remove an Ace, there's less Aces out there for them to have, is quite relevant, actually. The fact that there's three Aces out there for them to make a good hand to call you with, than being four. Everyone know what I mean by that? So if you have an Ace, there's one less out there to go around. Yeah, so we go all-in here. And yeah, here we have 17 and 1/2 Big Blinds from the button.

But I think going all-in with Ace-4 off is fine, basically. So it's a lot. It's 17 and 1/2 Big Blinds, but once again, Ace-x offsuit has terrible implied odds. It also protects your small pair shoves a bit. So when I said this pocket twos hand-- sorry, this pocket fours hand, I said you can go all in for 15 Big Blinds. But what's one problem if you follow this strategy exactly? It's whenever you do this, your opponent knows you have pocket twos or pocket threes, right? Then what can they do? They can call with 10-9 suited, which is not a good hand. Like 10 high against a 15 Big Blind shove shouldn't be possible, but they can.

So if you also do this with Ace-x, it protects you a bit. Yeah, with 7-6 suited, I think it's also OK. This is a similar story, pocket Deuces. 7-6 suited has great implied odds when you're 100 bets deep, and making straights and flushes is very relevant. But when you're only 20 bets deep, and you're just trying to make a big pair, essentially, small cards just aren't good at making big pairs, can't make big pairs. So once again, going on is acceptable. So one thing to watch out for is-- I actually swept this under the rug in the last couple of slides.

But in all these cases I showed you, there's actually a pretty big disincentive to go all-in. Does anyone see what it is by looking at the stack sizes? So they've always been the same actually, but does someone see a pretty big disincentive? Yeah, Vincent?

AUDIENCE: Other people have much larger stacks than you.

WILL MA: Right, although actually I should say this, other people having much larger stacks than me is actually an incentive to go all-in. The reason being, it's possible-- let's say you go all-in and then someone calls, and then another guy re-raises all-in and the first guy who called folded.

Then what would happen is, you're still all-in. And if you win the pot, you now triple up instead of double up, and you still only have to beat one hand. Did that make sense? I can draw it if it didn't make sense.

So you go all-in for \$5,400. So let's say this guy calls for \$5,400. Let me use a different color. This guy calls for \$5,400. And then let's say this guy goes all-in for \$12,000. And then this guy folds-- which he shouldn't be doing because he definitely has odds to call, but let's say he does fold. Then the situation is great because how the rules work is, now the pot-- so now this guy is going to get back \$6,600. And the pot-- But \$5,400 of his is still in the middle.

And essentially, there's this \$5,400, this \$5,400, and your \$5,400. And you're only against his hand. And if you win, you get all the money. So you actually triple up instead of double up. So that's actually a good incentive. But yeah, that's a good observation. Yeah?

AUDIENCE: Because your going all-in is profitable because there's a high probability of other people folding. But if two people call or three people call, you get a lot of people can call it, and then your odds are not very good when they call.

WILL MA: Right, right. Yeah, that is relevant, yeah. So multiple people can call, but the Nash ranges that I presented do take that into account. So the Nash ranges, the Nash calculations do take into account that multiple people can call. You have to look carefully at the stack sizes. Yeah?

AUDIENCE: [? They now only ?] have \$2,100?

WILL MA: Right, good. Good. Damn, I wish I'd brought one of those gift certificates. I still have some, but OK. So this is actually very relevant. And I swept this under the rug, but let me clear the annotation. The Big Blind only has four bets, only has 4 Big Blinds in this situation. And they're basically guaranteed to call. That's not a terrible result for you because there's a good chance that just have absolute trash, and Queen-7 suited is better than them. But it's still worse than being able to steal the Big Blind for free. So the fact that the Big Blind is so short here that they're basically almost guaranteed to call, maybe they'll fold 3-2 offsuit is really, really bad for you.

Because your chances of just winning down-- taking out the blinds without having to win an all-in is a lot lower. That make sense to everyone? So it's hard to do when you're just starting out, but it's good to pay attention to all the different stack sizes. And if there's someone behind, someone in the blinds who is very short and who's almost guaranteed to go all-in, then you

should be a lot less incentivized to try to steal the blinds. Yeah?

All right guys, I'm going to get started again. So I'm going to give you a few more examples of extrapolation. I know this is a bit boring, but to be honest, I think-- this is less exciting than playing postflop, and reading your opponent, and trying to read what cards they have, and trying to make tricky bluffs. But really, in tournaments, the best skill you can have when just learning, just starting out is knowing when to go all-in. Because even if you're pretty good at it versus very good at it, the fact that, because most hands just come down to going all-in preflop, if you can increase your equity every time you do this by even 1%, that's a huge game in terms of how profitable a player you'll be.

So yeah, it's a bit boring. But just try to bear with me. This is, like, the most important skill in tournaments, essentially. So I wrote down on this graph the most number of Big Blinds I'm willing to risk all-in for from each position. So I want to sort of illustrate a concept. These numbers are actually quite ambitious, by the way. I think I made this maybe four years ago when I was trying to play exploitatively against the fact that the average player was too tight, the average player was not willing to call often enough.

So you would be shove more hands than Nash because most players don't call enough. Nowadays, I think people are getting closer to Nash, so you can't really be this ambitious anymore. All these numbers should go down a bit. You shouldn't be going all-in for that many bets. But nonetheless, the graphs illustrate the same point. So I roughly-- I wrote down in black how many bets I'm willing to risk from each position with Ace-4 offsuit. So notice that from the button it's huge, it's 22. But under the gun, it's a lot smaller-- it's only seven. And roughly, it decreases as a 1 over x, curve as a inverse curve.

And that's sort of intuitive because if you shove from the button, you need to be the best out of three hands, so it's like 1 over 3. And then you got to be the best out of four, so it's 1 over 4, and then 1 over 5, 1 over 6, et cetera. So the graph is roughly-- I mean, I don't know, let's say 88 over number of hands remaining. Or I don't know, something like that. But I want to show a similar curve with 7-6 suited. So what do you notice about these two curves?

AUDIENCE: Looks more linear than the other one.

WILL MA: Right. So this one is very curved. This one is like 1 of x. This one is maybe there's like-- this one it's a lot flatter, right? It's 9.5 under the gun, which is more than 7.7 for Ace-4. But Ace-4, it's 22 from the button, whereas for 7-6, it's only 19. So the thing is, these two hands are a bit

different. So essentially with Ace-4 off, it's a hand that does poorly against good hands, but well against bad hands because against a bad hand, your Ace high is going to be good. And against a good hand, you're always going to be dominated. Like, if they call with an Ace-Jack, or a pair of 7s, you're going to be at 30/70, right

Whereas with 7-6, even if they have Aces, I mean, it's bad, but it's the best hand against Aces. But basically 7-6, you're going to be better on average. If they call with Ace-King, it's not a good situation, but it's much better than if you had Ace-4, whereas if they have 8-2 offsuit, which is a terrible hand, that actually, theoretically is ahead of yours. So what's the most important thing about 7-6 suited and going on with it? Essentially it's having a lot of chips, it's having a large stack. Because you want them to fold all of their trash hands. And it's good when they're not going to call you very often. So you want to have a lot of bets.

Whereas for Ace-4, the most important thing is-- you don't mind if they call, as they call with a bad hand. So the most important thing you want with Ace-4 is, you want to be later in position so that you're against your hands so that there's less of a chance that someone behind is going to pick up Ace-Jack or pocket 10s. So when you're extrapolating slash interpolating, try to remember this principle. So with a suited connector hand, it matters a lot more how many bets you have. Whereas with a hand with two unsuited but sort of big cards, like Ace-4 offsuit, King-8 offsuit, I guess Queen-7 offsuit or whatever, the thing that matters most is having few players left to act behind.

So I talked to you a lot about how do you initiate all-ins from preflop. So what about calling other people's all-ins? So another thing that I sometimes see people do is fold with ridiculously good odds preflop. And similarly how you can shove any two cards preflop, you can also call a lot preflop because you'll always have some equity. So yeah, it's difficult to get less than 30% equity preflop no matter what your cards are, unless your opponent has a really strong range. Like they're really tight, and you know Jacks plus an Ace-King or something. It's difficult to have less than 30% equity if you have an Ace in your hand, right?

Because if you have an Ace, then you're either going to have an over card, at least, to their pair, or be dominated. But both of those are still 30/70s. Only if they have Aces are you actually in a really bad situation. So I wanted to show you a hand here that looks maybe a bit like bad play to some of you, but I think it's very reasonable play. So we have 9-8 suited, we have 15 Big Blinds so we don't go all-in, right? Which is fine. We may get \$1.600. And then it's folded to the Big Blind, but the Big Blind goes all-in for 10 Big Blinds.

So normally, if the Big Blind had covered us, if they had 15 Big Blinds, you would probably fold because you have 9 high. You probably-- you don't have enough odds to call. But in this specific case, the effective stack size is not 15 Big Blinds, right? They only have 10 Big Blinds, so the effective stack size is 10 Big Blinds. So if you do the math, when the effective stack size is only 10 Big Blinds, basically you have enough equity to call. Even if they had 12 Big Blinds, maybe it's very borderline. But even if they have 12 Big Blinds, roughly speaking, you have enough equity to call, right?

This is sort of the same calculation as me saying, if you had 12 or less Big Blinds and you raise, and someone goes all-in, you basically have to call. This is sort of a similar calculation. It's the same thing. You raised, someone went all-in, it's effectively 12 Big Blinds, and you can call. So this is a totally reasonable play. And then you just call. If you do the math, you need 37% equity to call. It's possible in some corner cases you can convince yourself that you don't have 37% equity, but for the most part, I see a lot more bigger mistakes by people folding this spot.

If you call, you're never really making a huge mistake. OK, fine, if they're sort of tight, maybe you only had 35% equity, and you needed 37. You made a small mistake. But there are situations similar to this where you might have 45% equity and you only 37% equity. So it's a huge mistake. Folding can be a big mistake, but calling is rarely a huge mistake when it's 12 Big Blinds or less. So any hand that we would raise here in the first place, we probably would have enough equity to call. If I had 7-2 offsuit here, I probably would not call.

But I would not raise here with 7-2 offsuit. So any that you would've chosen to open here, which is about 30% of hands, or 25% percent of hands I think you can call. Here's another situation that we sort of talked about already. You have 4 Big Blinds, and you had to pay a Big Blind. Basically you pretty much have to play close to any two cards in this spot. If you do the calculation, right, you only need to call-- I mean, calling is equivalent to going all-in, sort of. If you go all-in, you know you're getting called because they're going to have almost four to one odds, so they're going to call.

So essentially the calculation is, do I want to wager my entire stack on this hand? And you're risking 3 Big Blinds for a total pot of 9 and 1/2 Big Blinds. So essentially, you only need 30% equity to call. And 30% equity is very easy to have preflop, essentially. So basically you have to play any two cards. Queen-8 off is way more than good enough. Yeah, so this is basically

the calculation I just went through. And yeah, like here I think I would probably play 95% of hands. I think I'll fold 3-2 offsuit, 4-2 offsuit, but I'll probably play any hand with a card that's 10 or higher, and I'll probably play every suited hand.

So let's talk a bit of re-raising all-in preflop now. And all the situations I showed you were just going all-in, and someone calling preflop. So I wanted to show you. So don't do this, don't call preflop. I already talked to you about this, but especially when you have 10 Big Blinds. So once again here, don't just raise when you only have 10 Big Blinds. That's less than 12, so you can go all-in. Yeah, so you basically either want to go all-in or fold. But I want to talk about raising now. So why is this so bad, but this is OK when we have more Big Blinds? So now everyone has 19 and 1/2 Big Blinds.

So why is this OK? The main reason is because-- so in the first case, right-- so I talked about this. If you get caught, if someone goes all-in, basically you have to call anyway. So you might as well go all-in yourself because you're not getting away if they pick up a good hand. So that's the same calculation. I'm just going to skip that part. It's the same calculation. Essentially it's just saying there's no point to not go all-in because if someone else goes all-in, we're essentially roped into calling anyway.

So the second case, we can get out. We can fold. So let's keep this in mind, right? So in this case, we can definitely fold. So we can do the calculation. In this case, we need to call 17 Big Blinds to win a total pot of 40.5. We need 42% equity. And we almost certainly don't have this because we raised from early position, they went all-in against an early position raise, so they probably have a good hand. We're almost certainly going to be a 30/70. So let's look at whether we call or re-raise. So for re-raise sizing, so now let's put ourselves in his shoes. If he's re-raising-- sort of the same principles apply when you're re-raising.

So the advantage of re-raising to a small size is that, what if it's deep enough where he could re-raise, and we could four bet, re-raise again, and go all-in. Then they could fold, if they were intending to do that. The advantage of re-raising to a large size is you deny your opponent the odds to call profitably. And once again, if your re-raise size would cause you to commit a critical portion of your stack such that you can't escape, you're going to go all-in anyway, then you might as well just re-raise all-in. So it's essentially the same principle, but let's see this in action.

So this is what you don't want to do. And I see some players doing this, which is fine because

I've never really explained this in class. But if someone raises, let's say to \$2,000, you don't really want to just click the raise button. This is what would happen if you click the raise button. Because he raised \$1,200-- from \$800 to \$2,000. So if you click the raise button, this is the minimum amount you could lose. You can raise it to \$2,000 plus \$1,200. But if you look at the odds you're giving him, it's actually ludicrous.

They have to call \$1,200. So they would have to call \$1,200, and the pot will be \$5,000, \$5,200 \$6,400-- essentially \$7,200. So it's \$6,100, right? They got to call \$1,200 into a pot of \$7,200. So this size is basically way too small. So how big do you want to make it? So roughly speaking, you want to make it 2.5 times their open. I think that's a reasonable rule. There's a lot of factors that can affect this, but if you're not sure what to do, a reasonable rule for re-raising preflop is 2.5 times what the original guy raised.

If you're out of position, you might want to raise a bit more because there's more incentive for them to call if they can play in position postflop. But I think in this specific spot, this \$5,000 is a good size. I'm going to skip to this slide. But in this case actually-- can we see our stack size? So our stack size is only \$20,000. So in this case, I think going on, it's a bit big. So the thing is, if you're going to re-raise, it's the same principle again where if the amount you re-raise to is more than a quarter of your stack, which sort of means you're committed and you can't escape, then you might as well just go all-in yourself. So I'd say in this hand, if you had less than \$18,000, I would just go all-in.

Because you can't really escape. Even in this specific case where you have \$20,000, I don't think it's terrible to just go all-in instead of making it only \$5,000 because it's pretty hard to fold a hand is good as Ace-King, even if you make it \$5,000, and then he goes all-in for \$20,000. But I think \$20,000 is enough that you can make it \$5,000. And you can do this with your good hands. You can also do this with your bad hands, sometimes as a bluff to balance it out. And you can fold when you do have a bluff and he goes on.

So that's roughly the sizing you want to make at preflop. And another thing I want to say is, why is calling a preflop raise OK? So I said in the first class, if no one has entered the pot, and you're just attacking the Blinds, you always want to raise. You always want to raise to give yourself a chance to win the Blinds for free. You don't want the Blinds to be able to see the flop for free. But if someone has already raised, I think it's OK to call. I mean, a hand like Ace-King is sort of too good, but if you have an Ace-Jack suited or Ace-Queen suited, I think just calling is fine. So why is this?

So it's because-- the reason why, in the first case, there's no real advantage to not raising, just calling is because if a Big Blind has a good hand, they can still raise anyway. So it doesn't matter. But in this case, there isn't a huge incentive to not re-raise, right? What is the huge incentive here? So let me go back here. What's the huge incentive to just call for \$2,000 instead of make it \$5,000 is, if you make it \$5,000, then you give him the option to go all-in, right? This is a huge difference.

In the case where you're just raising the Big Blind, they can't go all-in. But here you're giving him an option. So that's why you just want to call sometimes so that they can't have the option of going all-in. So this is a good example. So this is now a different scenario, but it's very-- the Blinds are only 25/50, and players have \$8,000, which is, I guess, 160 Big Blinds. And here, calling is definitely a positive expectancy play because you're in position, it's very, very deep, there's a lot of money still to play for, and you're in position for all the rest of the hand, which is great. This is a good play.

So if you raise in this spot, it could lead to disaster, right? So what happens here is you raise, and then now hijack minus one, the guy who originally raised, they now have an option to re-raise again, which is what they do. And now it's just terrible. We basically have to fold. We could call if we're feeling lucky, but we basically have to fold. And I think calling is actually, in reality, a reasonable play. But basically, it's a much worse situation than this one where we just called. So yeah, that's a demonstration.

So if someone's already raised, you can just call. I'm going to talk more about this next class as well, a preflop strategy against someone who's already raised. But that's one thing to keep in mind. Another thing I want to go through quickly is how do you deal with callers. So I've said that you should never be just calling a pot when the pot hasn't been raised. But people will inevitably make this mistake. And usually if it's folded to someone, no intention to pot yet, and someone just calls, we call-- the term in poker is a limper, which is a bit of a derogatory term. Poker actually has a lot of derogatory terms, which is a bit unfortunate.

But I sort of have the tough decision of either making up my own terminology, but then if you go into the poker world, no one understands what you're saying. Or I use the same terminology, which is derogatory. But OK. So we're just going to call them limpers. Either way, you need to be prepared and raise their limps. But you do need to change your raise size if there's limpers. So let's say normally when it's deep, you decide to raise to 3 Big Blinds, which

is fine. I mean, I said raise to 2.25, but I think it's fine if you raise to 3. It doesn't matter that much when it's deep.

You can raise to 3 to play bigger pots. But if there's a lot of limpers ahead, then you want to make it more than 3 because there's already money in the pot. So if you only raise it to 3, you're actually giving them too good of odds to call. So let's say in this case, I only make it 3. If I only make it \$150, then by the time it's folded to the last guy, their odds of calling are going to be-- they put in \$100 into a pot of \$375, right? So that's like 3.75 to 1 odds, so that's too good. So roughly, the odds-- the rule is, take whatever size you were going to raise to, and then add a Big Blind for each limper.

This essentially makes it so that the odds are the same as before. So in this case, if you were going to make it 3, I would make it 3 plus 1 plus 1 plus 1 because there's three limpers. And of course, if you only have 15 Big Blinds, then in this case, instead of raising it to 6 Big Blinds, you might as well just go all-in, right? The fact that you only raise to 6 Big Blinds instead of going all-in is predicated on you having at least 25 [AUDIO OUT] to start the hand. Or something where it's enough to escape if something weird happens after.

I'm going to finish off showing you some more simple preflop situations. I think-- so the theme this is being boring. Oh, I'm sorry about this slide. So being boring, being simple, just playing on simple probabilities and using calculators can get you very far in poker. And I will go through crazy bluffs and exciting hand reads and stuff like that as well. But this class, I wanted to stress the simple things that I think are good. So here, this is a situation. So here you have 4-3 suited. You're too scared to go all-in. Can I raise to 2 Big Blinds as an alternative?

Oh, so you're the button. So the button only has 8 Big Blinds. They started the hand with \$1,600, and they make it \$400 with only \$1,200 behind. So I want to show you why this can go wrong. Why is it bad if you don't follow the all-in rule? Because now let's say the Big Blind has 4-3 suited. Well, if he went all in for 8 Big Blinds, they would have to fold their 4 high. I'm not going to run through the calculation again. But the problem is now, if you make it 2 Big Blinds, they could actually call your small raise with 4-3 suited. And they have 4.5 to 1 odds, and that's definitely good enough odds for them.

So if our hand has 40% equity against his range, then it's going to be +EV. So essentially they're going to call, and they're not going to raise the 4-3 suited. So basically they could-- so the fact that we didn't go all-in gives them an option, here. With their good hands, they can go

all-in, and rope us into getting all-in anyway when we're the button. And with their bad hands, like 4-3 suited that they don't want to go all-in with, they can still call and see a flop. But the point is, we're essentially-- this is essentially their strategy. You can read it. I'm not going to read through this slide now.

But the point is, we're giving them an opportunity to make a better play than they otherwise could've. If we just went all-in, the choice is theirs. They either call or they fold. But here, essentially they can take their best hands, and they want to get all-in with and go all-in, and we call. Or with their worst hands, like 4-3 suited that can still call to see a flop, they can call and see a flop. And we're just letting them realize a lot more equity than we need to. So let's say, OK, fine. If you want to get around that, you can make it \$800. And if we make it \$800, it's more or less equivalent.

So if they were going to fold, then they were still going to fold. If they were going to re-raise all-in, then we're still going to call. And then-- it's mostly equivalent. I'd say in this exact situation, making it-- if you raise to \$800, it's pretty much the same as making it \$1,600. But on some off chance, it's still possible you're giving them a free option. Like maybe their better play with 4-3 suited is still to just call. And then if the flop comes really, really bad for them, like Ace-Ace-King. Maybe that's not even that bad. But 9-8-7 or something, I don't know, they could maybe fold.

So basically I think just keeping it simple is good. So one concept I'll finish on is, there's this idea of-- so I have talked about-- all this stuff I'm saying about letting them go all-- giving them the option is bad. But what if you think they're so stupid that if you give them the extra option, they're actually going to make a mistake, and giving them strictly fewer options is actually bad? You actually just want to give them more options even though it's free options because they might make a mistake. So this is slicing in from a while ago, but Bill Chen sort of gave a very good theoretical example of this.

So Bill Chen, he actually might give a guest lecture. The last lecture, we haven't decided yet, but he might come and speak for the last lecture of the class this year. He wrote the book called *The Mathematics of Poker*. He's one of the world experts on the math behind poker. He's a math PhD. He's currently a trader at Susquehanna International Group. Anyways, this is what Bill Chen calls a sucker bet. And when you see your opponent do this, you should almost be a bit offended.

Like I sometimes-- this occasionally, very rarely happens. But when it does happen, I'm sometimes very confused because my opponents shouldn't be doing this. So maybe they're stupid, and they don't go all-in because they're stupid, and they're actually giving me a free option. But maybe I'm actually the stupid one. Maybe they think I'm so stupid that if they gave me the free option, I'm going to make a mistake. So if you do get in a situation like this, it's actually sort of an interesting theoretical question, I think. If you're sitting in exactly Big Blind's shoes, you saw. Let's say you know the button is a competent player, too. This makes it worse, right?

If you know the button is a competent player, then you're saying, I guess this sort of reveals what they think of me, if they're giving me a free option to see the flop here here 4-3 suited. They must I think I'm going to mess it up so bad that they'd rather give me this free option than not. But it's an interesting concept to think about. And sometimes it does happen. Another sort of example of a sucker bet is, I guess I was talking about last class on the flop, or even on the turn or whatever, you never really want to bet a very small fraction of the pot.

Like, if the pot is \$100, and then your opponent checks you, and you bet \$1 into \$100, it doesn't-- it's not a real bet. It's \$1 into 100. It's essentially an epsilon bet. It's essentially a zero bet. But what does it do? It gives your opponent a free option, right? Now they can check-raise you. If they-- now it's saying, OK, I bet \$1. Now you have a second chance to bet on the flop, right? You check the flop, but I'm going to bet \$1 into \$100. And now if you want to make it \$50, you can re-raise my \$1 bet to \$50. And now if you want, you can.

And if you think your opponents going to make a mistake, you can try to do this. It is a very specific exploitative strategy, but it's interesting in that it's so obvious as an exploitative strategy. Anyway, I think it's an interesting theoretical thing. So I think one-- a few more examples. So once again, these are all simple hands, but I just wanted to show you there's-- the only way you can mess up this hand is by not going all-in. You only have 15 Big Blinds, someone's already raised a lot. You don't really want to try to do something cute like slow playing, especially-- if you had Aces, maybe slow playing is OK. But with just Ace-King, any hand is so much equity against you. And you just want to go all-in.

Here's an example where someone in lead position raises, and you have a pocket pair. You can go all-in. And this is pretty good because you do pretty well against their range that calls you. So this is a pretty good play often. I'll talk more about this in future classes. But if you're defending your Blinds often with small pairs, re-raising all-in, even if it's for a lot of bets, is a

reasonable play because the hand-- they might even fold pocket 3s, pocket 4s. I think it's quite likely. Yeah, I think the Nash equilibrium is to fold pocket 3s, pocket 4s if you have enough chips.

But when they do call you, even if they have a hand like Ace-King, you still have 50% equity, right? So small pairs are pretty good at just re-raising all-in against late position steals. So all-in here is good. So the last example is also easy. It's essentially saying, so under the gun raises, hijack minus one calls. You have a great hand on the button, and only 20 Big Blinds. You just go all-in. There's no reason to be cute and make it \$8,000, I guess unless you were trying to sucker your opponent.

I'm going to stop here, and then-- so the next class, I'll maybe run through a tournament history next class. I'll show you guys a history of me playing a tournament, and try to discuss some of those decision. That will be one of the next three classes. All right, cool. Thank you.