Scavenger Blackjack (or Generalized Basic Strategy)

by James Grosjean and Previn Mankodi

"Tonight will be different!" It's 2:30 a.m., somewhere in the wasteland that once was industrial America but is now riverboat country. Time is running out for the degenerates hoping to go home even. The gambler goes for a Hail Mary—a $2000 limit bet that will get him halfway to even, if he wins. The regulars don't blink an eye. They see it every night at this hour of desperation. They're in their own private hells anyway.

The instruments of death come—77 v. 3 up. He scrapes up enough to split, but now he's at the end of his rope. The next card—4. The angel of mercy has presented itself in the form of a gorgeous 11 v. 3 doubling opportunity, an edge over 25% on any additional money he can lay on the felt. He has none. Yet chips start flying at his circle from all directions to complete the double down. Where did these chips come from? From the Darwinian enforcers. Nature's garbagemen. Scavengers. The only difference tonight will be who carves up this guy's carcass.

With insufficient funds to double, the guy actually costs himself 0.11% in expectation by allowing us to double his hand, because he forgoes the option to hit again if he gets an Ace to his 11. He probably wouldn't hit 12 v. 3 anyway. He doesn't complain after winning the hand, but short-pays have a way of hastening ultimate demise.

Later, we double his A7 v. 3 "for him." This is a gain of 8.97% for us. Sure, it costs him 6.15%, but he is beyond salvation, and even he is starting to realize it. Why not grab a piece before the casino gets it all? The concept transcends blackjack. The poker vermin know it well—get the mark's money before the casino rake takes it all. The wongers know it, too—play one or more hands in the good counts, but leave the negative shoes to the marks.

A few minutes later, D returns to our table, proudly displaying a couple of bloody, black chips dangling from his jaws. He took a guy's $100 double on 11 v. 3. Our cub has learned to scavenge.

Scavenger Blackjack

Scavenging opportunities in blackjack fall into three main categories—buying/selling hands, doubling down, and splitting. There is an opportunity to buy or sell a hand anytime a civilian has mispriced a hand, or when his risk aversion differs from the scavenger's, offering hedging possibilities. For instance, suppose that the civilian holds hard 18 (not A7, not 99) v. 8. The expectation for standing on this hand is 10.4% (6-deck). If a guy had a bet of $100 on this hand, you could turn an expected profit of 40 cents or more by buying the hand for anywhere from $100 to $110. The civilian might sell that hand for two reasons. He may have mispriced the hand. He may not realize that the expectation is 10.4%. He may even think that he holds a loser against the 8 up. Or, he may know the correct price, but his risk aversion causes him to prefer a sure $100 instead of a risky $110.40. The scavengers are market makers.

Even if he held a disadvantageous hand, you might still be able to buy it for *even less* than that. Or, you can sell your own hands for more than they are "worth." The key issue is not whether a hand is advantageous or not, but whether you and the civilian value the hand differently, either in pricing the expectation, or in risk preference.[1] The basic strategy chart shows the expectation for each hand if played the expectation-maximizing way.

In cases where late surrender is the best play (a -0.5 return conditional on no dealer natural), the notation "r" is shown on a second line, together with the *unconditional* expectation, just to convey additional information. For instance, with hard 16 v. T, hitting is -53.48%. If available, late surrender would be better (at -50%), but your overall expectation will be -53.88% if we allow for dealer blackjack (unconditional hitting expectation would be -57.10%, but that is not shown in the

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[1]If the scavenger is getting the hole card, his prices will be wildly different from the civilian's. This asymmetric information can create huge opportunities, such as buying the civilian's insurance whenever the dealer has blackjack.

chart). Early surrender would be the best yet, indicated only by the "e" (for Early) preceding the "h" (for Hit).

In many cases, buying and selling is difficult to implement in a casino. The casino may frown upon the practice, and civilians have a way of misunderstanding the terms of an agreement, or trying to chisel and take shots. The boss may even consider these arrangements to be side bets, which may be discouraged by casino policy or law. Doubling and splitting are more likely to produce realizable opportunities. There is not much more to say here, other than: "Buy low, sell high."

Scavenger Doubling

In the anecdote above we saw examples of doubling down on another player's hand. The values of these plays are shown in the chart for 6-deck games. Where there is an opportunity for the scavenger, the chart shows the edge (in %) on *the scavenger's money.* For example, suppose a civilian bets $100 and receives 10 v. 6, which he intends to hit. If you intercede and put up the additional $100 to double, your expected profit is $28.75 under H17, and $29.29 under S17.

As a curiosity, we can look at the effect our scavenging has on the civilian. This number depends on the alternative play the civilian would have made if we had not interceded. In the example 10 v. 6, the gambler would have hit the hand. Since he likely would have taken only one hit, our doubling did not restrict him, making this a zero-cost scenario for him.

In most cases, the restriction to one hit only on a double down is a binding constraint, meaning that the civilian would have wanted to take additional hits. Therefore, our doubling hurts him in expectation on these hands. There are a few cases where our doubling can help the civilian, if his alternative play would have been a bad one. For instance, doubling A6 v. 4 is a win-win situation if he would have stood otherwise. He gains 13.58% in a 6-deck S17 game, more than twice our gain on the play!

Notice that since this is a zero-sum game among the casino, the civilian, and the scavenger, the casino's gain or loss can easily be computed from the chart. Let's go back to the A7 v. 3 from the anecdote. Our expectation was 8.97%. The effect on the civilian was -6.15%. To produce a sum of zero, we infer that the effect on the casino was -2.82%, compared to the alternative of having the civilian stand on A7. So, our scavenging play took some money from the casino. Any time our scavenging play causes the hand to be played according to the traditional basic strategy, we are costing the casino money if the civilian would have made a bad play. There is a theorem there!

When a civilian misplays a hand, he is giving an extra gift to the casino. As scavengers, we can, in principle, capture that excess money. The idea is that we intercede so that the hand gets played correctly relative to the casino—basic strategy. Having thus transferred that extra gift back to the player's side, we carve it up with the civilian. Jumping ahead a bit, here's a clean example. If a civilian takes even money on his blackjack, he is misplaying the hand (according to expectation-maximizing basic strategy). How can we profit? If we buy the hand from him at two times his original bet, he is satisfied. He has his one-unit profit, and he's done. We now own the hand, and forgo the even money against the dealer's Ace. That is, we stand on the hand and do not buy insurance. The expected profit is about 1.04 units on a 1-unit bet. (Note that even a basic-strategy player gives the casino a gift by gambling on a hand to begin with! By extension of the theorem, the scavenger's opportunity to make money in that case is to *become* the casino—bank the game. This probably requires a gaming license.)

The scavenger's opportunities go beyond misplayed hands. In many cases, the scavenger's different incentives cause him to try to misplay the hand, to the detriment of the civilian. The most extreme example would be for the scavenger to double down on a civilian's blackjack. A less extreme example would be to scavenge-double on A2 v. 4. This is not a correct basic-strategy play in 6-deck, but it gains over 3% for the scavenger, at a cost of nearly 7% for the civilian. So, the chart shows some doubles that are not traditional basic strategy. The rule is that there is a scavenging opportunity if $E_{H1} > 0$, that is, if there is a positive expectation from hitting the hand once only.

Scavenger Splitting

When a civilian does not have enough money to split, it is often beneficial to him that the scavengers enter. The scavenger can offer to "buy" the first hand spawned by the initial pair.[2] The scavenger now owns the first hand, and will then resplit if called for by basic strategy. For example, if the civilian holds 88 v. 4, the scavenger will buy the first 8, and then resplit it as many times as possible, producing an expected profit of 11.20% of his bet. The civilian also gains, 32.30%, because it is better for him to play out a hand starting with an 8 than to stand on the hard 16 (88) against the 4 up.

In computing the effect on the civilian, we had to settle for a slight contrivance. We assume that the civilian will play *his* 8 according to basic strategy, even resplitting and doubling if called for, even though he sold his first 8 to us, ostensibly because he didn't want to put up the money. What story will rationalize this behavior is unclear, but how can we ever rationalize the behavior of civilians? Let's just say he does some soul searching or wallet searching so that he is able to play his hand correctly after we are finished with ours. Note that after he sells us the first card, we own the hand and play it out, but the numbers in the chart assume that we do not make any additional buys if the civilian should happen to get, say, another 8 on his 8. In practice, if he gets another 8 and we can buy that one, too, then we would.

As with doubles, there are some plays that the scavenger will try to make that are contrary to basic strategy and hurt the civilian. For instance, the scavenger loves to split other people's Tens, even against an Ace! (Of course, if he buys a Ten and then receives a Ten to it, he's not crazy enough to split his own TT.)

For those of you who like to compute things, there are two ways to compute the scavenger's gain: (1) the "decompose-the-split" approach; (2) the "bet-card" approach. The first method is to play out the split all the way (meaning to resplit and even double if called for by basic strategy), and afterwards split up the profit, with all proceeds deriving from the first spawned hand going to the scavenger. We used this method. The second approach is to imagine the value of a hand starting with the known bet card against the known upcard. For instance, if we scavenge an 88 split against a 4 up, what is the value of starting a hand with an 8 against a 4 up? This computational approach is fraught with pitfalls:

1. Even though the game is RS4, you may split to only three hands, because the civilian is using up one hand.

2. You must remove the civilian's card (an 8 here) from the deck when computing your expectation (on 8 v. 4).

3. For splits against Tens and Aces, remember to condition on the dealer not having a natural, which must be the case if we are at the point of scavenging a split.

4. For splits of Aces and Tens, a two-card 21 is not a natural, and does not get paid 3:2 (or 6:5, or whatever), and does not beat a dealer's multiple-card 21.

5. For splits of Aces, you get only one card (unless it's another Ace under RSA), whereas the Ace as a bet card has no such restriction.

6. After a split, we cannot surrender and cannot double under NoDAS, restrictions which do not apply to the bet card.

If you take the bet-card approach, you must also realize that you cannot cheat by looking up values for hard totals of equal value. For instance, a total of hard 8 v. 4 is not the same as a bet

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[2]As a technical detail for multiple-deck games, note that if both hands are played according to basic strategy, then the first hand (with non-Aces) is more valuable than the second under RS4. With Aces, this result is true if we have RSA as well as RS4.

card of 8 against the 4. One reason is the composition effect—a hand of 8X is not the same as a hand of 62, 53, or 44. Another reason is the doubling effect—we will double down on our hand if we get a 2 or 3 to go with the 8, but since we cannot double on three cards, we cannot double the 622 and 623, etc. Or, with a TX, we will never double, but with 64 we often would. Then there's the splitting effect—88 can be split, but 628 cannot. Then surrender—T6 can be surrendered, but 646 cannot. Then naturals—TA is a natural, but 64A is not. For all of these reasons, we recommend that you compute scavenger gains by decomposing the split.

Grand Unified Theory of Basic Strategy

GUT Doubling

Let's say our civilian holds A2 v. 5 with a $100 bet. He wants to double but has only $50 left. Should we try to scavenge the double? With only $50, should the civilian even make this double? The answers to these questions require fairly deep knowledge of blackjack, but not regarding card-counting, hole-carding, or other forms of advanced play. Rather, the answers involve "basic" strategy, in its more generalized form.

When the players decide what to do here, they are considering a case of doubling for less, in the case of the civilian, and doubling for more, in the case of the scavenger (who had no money down on the original hand). Traditional basic strategy charts give us the answer to a more restricted question—if you must double for exactly the same amount as the original wager, then is the expectation-maximizing play to double, or not? There are no other choices considered, even though I have yet to see a casino in the world where doubling down is restricted to the exact amount of the original wager!

There are factors that may cause a player to double for some amount other than the original wager. Perhaps the player does not have enough money for a full double. Perhaps he is risk averse. Or, suppose a rider has backbet on the player's hand, but the rider does not have funds to double in full. In this case, the original player may be able to double for *more* than his original bet. Traditional basic strategy has an artificial dichotomy—full doubling or not at all—that must be dismissed.

Our generalized approach to basic strategy will answer a different question: At what additional wager amount will doubling produce the same expectation as not doubling? For instance, instead of saying, "Basic strategy is to double A2 v. 5 (6-deck S17)," we will now say, "The critical doubling fraction for A2 v. 5 (6-deck S17) is 0.964." This means that if we double for 96.4% of our original bet, doubling will produce the same expectation as hitting. If we double for more than this fraction— for instance, doubling for the full amount—then doubling is the expectation-maximizing play, over hitting.

Back to the case of our poor sap with only $50 left and a $100 A2 v. 5, a traditional basic strategy chart gives him no guidance on what to do. It tells him, "Double for the full amount." He cannot. Our new chart reports the critical fraction 0.964, so he realizes that he has insufficient funds to justify doubling in a 6-deck S17 game. He should just hit the hand. However, if he were playing 1-deck, the critical fraction is under 50%, so his highest expectation will be to double.

To report a critical fraction instead of a binary decision is old hat to statisticians, who long ago realized that instead of reporting whether a hypothesis is accepted or not at a prespecified significance level, they should instead report a "p-value," the threshold significance level at which we are indifferent between acceptance and rejection of the hypothesis. Or, to interpret the generalization in the time-honored context of coin flips, we convey more information by saying, "The coin is 60% weighted in favor of heads," than "The better bet is on heads."

The tables following report the critical fractions, in thousandths, for doubling down. Since these "indices" advise the expectation-maximizer to double for the specified amount or more, we rounded the fractions up to the nearest thousandth. So, doubling for exactly the amount shown will produce a slightly higher expectation than the alternative play.

From the earlier section, we saw that the scavenger shows up anytime hitting once would be a positive-expectation play. These same hands have an interesting property: Since hitting once is positive, if we are able to double for more than the original wager, there must be some amount at which doubling becomes the best play. For example, look at A2 v. 4 in 6-deck S17. Normally we would not double this hand, not because doubling isn't positive, but because doubling is not as positive as hitting is. Suppose we could double for more. Specifically, suppose we could double for 2.049 times our original bet. At that level or higher, doubling is the best (expectation-maximizing) play.

GUT Splitting (Rider Splitting)

Now that we have considered doubling for less and for more, the next extension is to allow splitting for less and splitting for more. Duh! We saw splitting for less (for zero) in the case of the player who allowed a scavenger to buy off the first spawned hand. Another case is when a rider backbets another player's hand. Backbetting is common in Asia, Europe, and California, under various rules. In most other jurisdictions, a rider could always put his money on top of the seated player's hand. In the case of the backbettor, the casino rules may allow one or both players to split a hand by putting up additional money. If one of the players does not want to put up additional money, his original wager will attach to the first spawned hand. (There is a variety of rules in this context.) In the case of a rider bet on top of the player's bet, the players can agree between themselves whether one player will split for more (causing the other player to split for less).

Again, traditional basic strategy charts instruct us to split or not split, assuming that splitting must be for the same amount as the original wager. Suppose we hold 33 v. 9. It would be better to play out hands starting with a 3 instead of a hard 6 (33); unfortunately, if we have to match our original bet to complete the split, then it's not worth it, because the starting 3 against a 9 isn't a strong enough improvement to warrant doubling the money on the table. Let's relax that restriction, by allowing splitting for less. In the extreme, suppose we could split for zero. Our original bet attaches to the first 3, and we start out a second 3 with no money at risk. Clearly we would take this option, because playing our original bet out with a 3 is better than playing a hard 6. If we had to put out some small amount greater than zero to split, we might still do it. As with doubles, there is some critical fraction of our original bet which would make splitting as good as hitting (in expectation).

With 33 v. 9, if they allow us to split for 41.3% of our original bet, or less, then we would split instead of hit. This number appears as 413 thousandths in the chart. Since we would split at this level or less, the number is underlined, which also tells us that the optimal amount is to split for zero. For an index with this direction, we rounded the number down to the nearest thousandth; therefore, splitting for exactly the amount shown will indeed be slightly better than the alternative.

Splitting 33 v. 9 for less is a "defensive" split. We do not have an advantage on the additional money put on the table, but we are trying to improve our play of the hand by avoiding the dreaded hard 6. Similarly, splitting 88 v. 8-A is a defensive move where we would split for zero if we could. In contrast, there are some splits that are "offensive" in nature, where we have an advantage on additional money put on the table. For instance, splitting 99 v. 6 is an offensive move. Starting a hand with a 9 against a 6 up is advantageous, so we are glad to be able to put more money into the situation. Indeed, if we could split for more, we would. Since we are breaking up an 18, which holds an advantage against the 6, we need to be able to get more money out there to justify the split. How much more? The critical fraction for a 6-deck S17 game shows that as long as we put out 26.5%, or more, of our original bet, then we should make the split. Optimally, we would put out as much as possible, exceeding our original bet if allowed. Indices of this type are not underlined, and have been rounded up to the nearest thousandth. So, betting exactly the amount shown makes splitting the best play.

Since splitting for more or less usually arises in the context of a rider who is not splitting, or

another player who has been bought out, resplits usually *cannot* be made for more or less. So, if our original bet had been \$100 on 33 v. 9, and we split for less, \$41.30, we are not then allowed to split for \$17.05 if we get another 3. For resplits, the traditional constraint is applied, so that \$41.30 would have to be wagered on a third hand. At that point, since we cannot resplit for less, we apply traditional basic strategy by hitting the developed 33 on the second hand against the 9. The critical fraction is computed assuming that subsequent resplits (none in this case) are at the exact level of the first split. That is, only the first split is for less (or more). In the example of 99 v. 6, after putting \$26.50 on the first split, a resplit would be for another \$26.50. Traditional basic strategy instructs us to go ahead and make this resplit. So, if we resplit all the way to four hands, the total amount of money on the table would be \$179.50.

As a curiosity, note that there are some defensive splits where the additional money is not at an advantage, such as 88 v. T, so we would ideally split for zero, but that the critical fraction is greater than 1.000, meaning that even if the rules required us to split for 123.5% of our original bet, we would still split the 88 against the Ten up. That's how bad a hard 16 is!

GUT Tipping

The generalized basic strategy above arises commonly in situations where there are multiple parties involved on the same hand, and their incentives clash. The scavenger wants to double a hand that the original player does not. The rider does not want to put out additional money to split 88 v. T. Another common case where a second party is involved in your hand is when you have a "toke bet" on the hand for the dealer. Since the original tip is a sunk cost, it does not affect the subsequent play of the hand.

However, the tip does not (directly) improve the expectation on a hand; the tip hurts the expectation. So, the tip must have been made for some non-pecuniary reason. This same social pressure may cause you to double down or split the tip as well. Suppose that you feel constrained to double the tip in cases where you double down on your hand. Should you still go ahead and double? Let's go to the charts.

The chart shows how big your own bet must be, as a multiple of the tip, for you to go ahead and double down both your bet and the tip, as opposed to the alternative (usually hitting). Say you have a \$5 tip for the dealer and you have hard 11 v. 6. If you could double just your own bet and not the tip, then the tip does not enter into consideration and you just double down according to traditional basic strategy. If you feel that you must put an additional \$5 to double for the dealer, then your own bet must be at least 3.0 times the toke. So, if your original bet was \$15 or more, then you should go ahead and double, \$15 more for yourself, \$5 more for the dealer. These numbers are rounded up to the nearest tenth. Many of the marginal doubles, such as A2 v. 5, will not earn enough additional expected profit to absorb the additional tip.

For splits, the critical multiple assumes that you will split all the way for the dealer's tip as well, but that you will not double after split on the dealer's tip. (We can stomach only so much.)

The critical multiples will allow you to make the correct decision for any general tip amount, but two additional charts are provided to summarize the common cases. On these charts, deviations from traditional basic strategy are listed for common tip amounts such as a \$5 tip on a \$100 bet (an amount that will create a negative-expectation hand for most counting situations, but who's counting, anyway).

These charts will allow you to decide how to play hands when there are multiple parties involved, where you can double for more or less, split for more or less, and where there is a tip out there for the dealer. Traditional basic strategy is just the special, constrained case where doubling and splitting are for the exact amount, and where the tip is zero.

GUT Postulates

The formulas used to derive the critical fractions and multiples are simple, but revealing. Let's use the following notation:

$$
\begin{aligned}
\mathrm{E_{H1}} &= \text{Expectation from hitting once} \\
\mathrm{E_{H}} &= \text{Expectation from hitting out} \\
\mathrm{E_{D}} &= \text{Expectation from doubling} \\
\mathrm{E_{S}} &= \text{Expectation from standing} \\
\mathrm{E_{P}} &= \text{Expectation from splitting} \\
\mathrm{E_{P1}} &= \text{Expectation from first spawned hand} \\
\mathrm{E_{BS}} &= \text{Expectation from basic strategy} \\
\mathrm{E_{A}} &= \text{Expectation from unspecified alternative} \\
B &= \text{Initial bet} \\
b &= \text{Additional bet on double or split} \\
T &= \text{Initial tip amount} \\
t &= \text{Additional number of tips on splits} \\
f &= \text{Critical fraction} = b/B \\
m &= \text{Critical bet multiple} = B/T
\end{aligned}
$$

Scavenging

$$
\begin{aligned}
\mathrm{E_{H1}} > 0 &\implies \text{Scavenge double} \\
\mathrm{E_{P1}} > 0 &\implies \text{Scavenge split} \\
\mathrm{E_{BS}} > 0 &\implies \text{Scavenge buy "at cost"}
\end{aligned}
$$

Doubling for Less or More

$$
\begin{aligned}
\mathrm{E_{H1}} &> 0 \text{ (assumed)} \\
b\mathrm{E_{H1}} + B\mathrm{E_{H1}} &= B\mathrm{E_{A}} \\
(b/B)\mathrm{E_{H1}} + \mathrm{E_{H1}} &= \mathrm{E_{A}} \\
(b/B) &= (\mathrm{E_{A}} - \mathrm{E_{H1}})/\mathrm{E_{H1}} \\
f &= (\mathrm{E_{A}} - \mathrm{E_{H1}})/\mathrm{E_{H1}}
\end{aligned}
$$

Splitting for Less or More

$$
\begin{aligned}
B\mathrm{E_{P1}} + b(\mathrm{E_{P}} - \mathrm{E_{P1}}) &= B\mathrm{E_{A}} \\
\mathrm{E_{P1}} + (b/B)(\mathrm{E_{P}} - \mathrm{E_{P1}}) &= \mathrm{E_{A}}
\end{aligned}
$$

$$(b/B) = \frac{E_A - E_{P1}}{E_P - E_{P1}}$$

$$f = \frac{E_A - E_{P1}}{E_P - E_{P1}}$$

Doubling when Tipping

$$BE_D - T = BE_A$$

$$(B/T)E_D - 1 = (B/T)E_A$$

$$(B/T) = \frac{1}{E_D - E_A}$$

$$m = \frac{1}{E_D - E_A}$$

Splitting when Tipping

$$BE_P - tT = BE_A$$

$$(B/T)E_P - t = (B/T)E_A$$

$$(B/T) = \frac{t}{E_P - E_A}$$

$$m = \frac{t}{E_P - E_A}$$

	Basic Strategy 6-deck H17									
Player Hand	Dealer Upcard									
	2	3	4	5	6	7	8	9	T	A
5	h:-1260	h:-0932	h:-0554	h:-0157	H:0193	h:-1195	h:-1872	h:-2660	h:-3129	eh:-3178
6	h:-1392	h:-1042	h:-0670	h:-0268	H:0099	h:-1537	h:-2197	h:-2945	h:-3394	eh:-3443
7	h:-1094	h:-0755	h:-0379	H:0021	H:0365	h:-0689	h:-2125	h:-2869	h:-3210	eh:-3526
8	h:-0230	H:0082	H:0442	H:0800	H:1092	H:0839	h:-0593	h:-2106	h:-2499	h:-2659
9	H:0750	D:1307	D:1964	D:2633	D:3169	H:1756	H:1003	h:-0521	h:-1520	h:-1252
10	D:3679	D:4208	D:4740	D:5299	D:5750	D:4013	D:2906	D:1474	H:0263	H:0341
11	D:4814	D:5293	D:5794	D:6312	D:6741	D:4659	D:3493	D:2271	D:1769	D:1202*
12	h:-2533	h:-2328	s:-2036	s:-1602	s:-1207	h:-2152	h:-2750	h:-3439	h:-3785	eh:-3851
13	s:-2867	s:-2461	s:-2021	s:-1599	s:-1209	h:-2719	h:-3274	h:-3854	h:-4229	eh:-4287
14	s:-2871	s:-2453	s:-2025	s:-1600	s:-1210	h:-3249	h:-3702	h:-4291	eh:-4638	eh:-4690
15	s:-2856	s:-2452	s:-2025	s:-1605	s:-1218	h:-3679	h:-4160	h:-4714	eh:-5035 r:-5388	eh:-5083 r:-6543
16	s:-2866	s:-2463	s:-2031	s:-1613	s:-1246	h:-4086	h:-4532	h:-5046 r:-5000	eh:-5348 r:-5388	eh:-5397 r:-6540
17	s:-1565	s:-1204	s:-0815	s:-0460	s:-0098	s:-1091	s:-3849	s:-4220	s:-4178	es:-5133 r:-6540
18	S:1097	S:1378	S:1644	S:1955	S:2203	S:3977	S:1041	s:-1852	s:-1745	s:-2234
19	S:3779	S:3940	S:4131	S:4375	S:4505	S:6150	S:5911	S:2839	S:0694	S:1920
TT	S:6329	S:6436	S:6543	S:6689	S:6766	S:7720	S:7904	S:7561	S:5591	S:6003
A2	H:0456	H:0738	H:1043	D:1410	D:2042	H:1202	H:0518	h:-0341	h:-1024	h:-1004
A3	H:0221	H:0504	H:0828	D:1396	D:2030	H:0765	H:0165	h:-0727	h:-1372	h:-1352
A4	h:-0009	H:0291	D:0653	D:1349	D:1997	H:0364	h:-0284	h:-1124	h:-1734	h:-1720
A5	h:-0214	H:0083	D:0615	D:1303	D:2020	h:-0079	h:-0694	h:-1514	h:-2108	h:-2092
A6	h:-0003	D:0572	D:1233	D:1974	D:2521	H:0547	h:-0717	h:-1473	h:-1956	h:-2214
A7	D:1163	D:1752	D:2448	D:3023	D:3569	S:4019	S:1081	h:-0985	h:-1430	h:-1605
A8	S:3808	S:3998	S:4156	S:4399	D:4621	S:6157	S:5959	S:2876	S:0633	S:1895
A9	S:6376	S:6453	S:6558	S:6704	S:6776	S:7733	S:7907	S:7595	S:5546	S:6055
BJ									S:13883	S:10388
AA	P:4854	P:5327	P:5823	P:6337	P:6796	P:4756	P:3597	P:2378	P:1820	P:0.1210*
RSA	P:6091	P:6576	P:7082	P:7611	P:8072	P:6279	P:4995	P:3628	P:2984	P:0.2307*
DAS										
22	p:-0783	p:-0066	P:0732	P:1762	P:2675	P:0085	h:-1568	h:-2379	h:-2873	eh:-2927
33	p:-1294	p:-0462	P:0543	P:1563	P:2468	p:-0512	h:-2192	h:-2953	h:-3389	eh:-3443
44	h:-0222	H:0093	H:0463	P:1143	P:2066	H:0866	h:-0591	h:-2098	h:-2486	h:-2639
55	D:3711	D:4239	D:4794	D:5397	D:5875	D:4047	D:2930	D:1492	H:0266	H:0345
66	p:-1903	p:-0931	P:0103	P:1149	P:1917	h:-2206	h:-2793	h:-3472	h:-3820	eh:-3873
77	p:-1204	p:-0289	P:0725	P:1605	P:2497	p:-0485	h:-3777	h:-4379	eh:-4742	eh:-4776
88	P:0745	P:1480	P:2182	P:3013	P:3737	P:3187	p:-0291	p:-3894	ep:-4751*	ep:-5140* r:-6553
99	P:1948	P:2499	P:3189	P:3931	P:4529	S:3996	P:2298	p:-0814	s:-1711	s:-2195
NoDAS										
22	h:-1125	h:-0801	p:-0322	P:0531	P:1244	p:-0485	h:-1568	h:-2379	h:-2873	eh:-2927
33	h:-1393	h:-1059	p:-0527	P:0284	P:1005	p:-1084	h:-2192	h:-2953	h:-3389	eh:-3443
44	h:-0222	H:0093	H:0463	H:0828	H:1134	H:0866	h:-0591	h:-2098	h:-2486	h:-2639
55	D:3711	D:4239	D:4794	D:5397	D:5875	D:4047	D:2930	D:1492	H:0266	H:0345
66	h:-2536	p:-1912	p:-1092	p:-0273	P:0338	h:-2206	h:-2793	h:-3472	h:-3820	eh:-3873
77	p:-1982	p:-1266	p:-0481	P:0201	P:0905	p:-1048	h:-3777	h:-4379	eh:-4742	eh:-4776
88	p:-0004	P:0639	P:1247	P:1979	P:2603	P:2640	p:-0650	p:-4081	ep:-4860*	ep:-5162* r:-6553
99	P:1538	P:2035	P:2680	P:3373	P:3931	S:3996	P:2088	p:-0934	s:-1711	s:-2195

T = Any Ten-valued card (10, J, Q, K)

R = late suRrender, E = Early surrender, D = Double down, H = Hit, S = Stand, P = sPlit

Uppercase letters indicate a player advantage.

H = Italicized options are different in DAS and NoDAS.

Expectations are shown in ten thousandths. For example, the expectation for A5 v. 8 is -0.0694, or -6.94%.

For late surrender or player natural, allow for possible dealer natural.

H = Underlined options do not have an advantage against early Ace or early Ten.

* In no-hole-card game (primarily European), hitting is better than splitting or doubling.

Basic Strategy 6-deck S17										
Player Hand	**Dealer Upcard**									
	2	3	4	5	6	7	8	9	T	A
5	h:-1286	h:-0954	h:-0581	h:-0170	H:0022	h:-1195	h:-1872	h:-2660	h:-3129	eh:-2811
6	h:-1420	h:-1068	h:-0700	h:-0282	h:-0086	h:-1537	h:-2197	h:-2945	h:-3394	eh:-3092
7	h:-1093	h:-0754	h:-0383	H:0020	H:0348	h:-0689	h:-2125	h:-2869	h:-3210	eh:-3148
8	h:-0204	H:0105	H:0459	H:0809	H:1204	H:0839	h:-0593	h:-2106	h:-2499	h:-2009
9	H:0772	D:1326	D:1983	D:2642	D:3294	H:1756	H:1003	h:-0521	h:-1520	h:-0675
10	D:3699	D:4225	D:4756	D:5307	D:5858	D:4013	D:2906	D:1474	H:0263	H:0820
11	D:4819	D:5297	D:5797	D:6314	D:6767	D:4659	D:3493	D:2271	D:1769	H:1473
12	h:-2530	h:-2324	s:-2088	s:-1627	s:-1538	h:-2152	h:-2750	h:-3439	h:-3785	eh:-3520
13	s:-2931	s:-2516	s:-2075	s:-1624	s:-1540	h:-2719	h:-3274	h:-3854	h:-4229	eh:-3981
14	s:-2934	s:-2509	s:-2079	s:-1625	s:-1541	h:-3249	h:-3702	h:-4291	eh:-4638	eh:-4409
15	s:-2920	s:-2508	s:-2079	s:-1630	s:-1547	h:-3679	h:-4160	h:-4714	eh:-5035 r:-5388	eh:-4817
16	s:-2929	s:-2519	s:-2084	s:-1638	s:-1575	h:-4086	h:-4532	h:-5046 r:-5000	eh:-5348 r:-5388	eh:-5154 r:-6540
17	s:-1531	s:-1175	s:-0786	s:-0447	S:0083	s:-1091	s:-3849	s:-4220	s:-4178	es:-4758
18	S:1212	S:1479	S:1741	S:2001	S:2810	S:3977	S:1041	s:-1852	s:-1745	s:-0973
19	S:3862	S:4012	S:4200	S:4408	S:4941	S:6150	S:5911	S:2839	S:0694	S:2825
TT	S:6379	S:6480	S:6585	S:6709	S:7028	S:7720	S:7904	S:7561	S:5591	S:6546
A2	H:0455	H:0737	H:1037	D:1399	D:1879	H:1202	H:0518	h:-0341	h:-1024	h:-0595
A3	H:0215	H:0499	H:0817	D:1384	D:1864	H:0765	H:0165	h:-0727	h:-1372	h:-0957
A4	h:-0019	H:0281	D:0624	D:1337	D:1829	H:0364	h:-0284	h:-1124	h:-1734	h:-1343
A5	h:-0228	H:0071	D:0586	D:1290	D:1856	h:-0079	h:-0694	h:-1514	h:-2108	h:-1723
A6	H:0007	D:0580	D:1241	D:1978	D:2585	H:0547	h:-0717	h:-1473	h:-1956	h:-1830
A7	S:1240	D:1793	D:2488	D:3041	D:3828	S:4019	S:1081	h:-0985	h:-1430	h:-0953
A8	S:3886	S:4066	S:4222	S:4429	S:4939	S:6157	S:5959	S:2876	S:0633	S:2797
A9	S:6424	S:6494	S:6598	S:6722	S:7026	S:7733	S:7907	S:7595	S:5546	S:6596
BJ									S:13883	S:10388
AA	P:4859	P:5332	P:5827	P:6339	P:6824	P:4756	P:3597	P:2378	P:1820	P:0.1271*
RSA	P:6106	P:6589	P:7094	P:7616	P:8150	P:6279	P:4995	P:3628	P:2984	P:0.2483*
DAS										
22	p:-0777	p:-0060	P:0694	P:1741	P:2402	P:0085	h:-1568	h:-2379	h:-2873	h:-2543
33	p:-1333	p:-0493	P:0496	P:1540	P:2163	p:-0512	h:-2192	h:-2953	h:-3389	eh:-3092
44	h:-0198	H:0116	H:0480	P:1114	P:1676	H:0866	h:-0591	h:-2098	h:-2486	h:-1987
55	D:3732	D:4257	D:4811	D:5405	D:5989	D:4047	D:2930	D:1492	H:0266	H:0829
66	p:-1969	p:-0988	P:0046	P:1124	P:1584	h:-2206	h:-2793	h:-3472	h:-3820	eh:-3565
77	p:-1198	p:-0282	P:0721	P:1604	P:2489	p:-0485	h:-3777	h:-4379	eh:-4742	eh:-4487
88	P:0819	P:1545	P:2235	P:3038	P:4057	P:3187	p:-0291	p:-3894	ep:-4751*	ep:-3642*
99	P:1980	P:2526	P:3206	P:3939	P:4640	S:3996	P:2298	p:-0814	s:-1711	s:-0931
NoDAS										
22	h:-1147	h:-0821	p:-0363	P:0510	P:0974	p:-0485	h:-1568	h:-2379	h:-2873	h:-2543
33	h:-1422	h:-1083	p:-0577	P:0262	P:0702	p:-1084	h:-2192	h:-2953	h:-3389	eh:-3092
44	h:-0198	H:0116	H:0480	H:0836	H:1244	H:0866	h:-0591	h:-2098	h:-2486	h:-1987
55	D:3732	D:4257	D:4811	D:5405	D:5989	D:4047	D:2930	D:1492	H:0266	H:0829
66	h:-2533	p:-1970	p:-1152	p:-0301	p:-0020	h:-2206	h:-2793	h:-3472	h:-3820	eh:-3565
77	p:-1964	p:-1250	p:-0478	P:0203	P:0935	p:-1048	h:-3777	h:-4379	eh:-4742	eh:-4487
88	P:0070	P:0704	P:1298	P:2003	P:2929	P:2640	p:-0650	p:-4081	ep:-4860*	ep:-3642*
99	P:1570	P:2063	P:2696	P:3381	P:4039	S:3996	P:2088	p:-0934	s:-1711	s:-0931

T = Any Ten-valued card (10, J, Q, K)
R = late suRrender, E = Early surrender, D = Double down, H = Hit, S = Stand, P = sPlit
Uppercase letters indicate a player advantage.
H = Italicized options are different in DAS and NoDAS.
Expectations are shown in ten thousandths. For example, the expectation for A5 v. 8 is -0.0694, or -6.94%.
For late surrender or player natural, allow for possible dealer natural.
H = Underlined options do not have an advantage against early Ace or early Ten.
* In no-hole-card game (primarily European), hitting is better than splitting or doubling.

Scavenger Doubles: 6-deck H17/S17
Scavenger's Gain (%)
Civilian's Gain (%): Alternative Play

Player Hand	Dealer Upcard				
	2	3	4	5	6
8	–	–	[1.56/1.6]	1.20/1.24	4.36/4.92
	h	H	[-6.69/-6.77: H]	-6.80/-6.84: H	-6.55/-7.12: H
9	3.39/3.50	6.53/6.63	9.82/9.91	13.16/13.21	15.84/16.47
	-4.11/-4.22: H	-3.98/-4.07: H	-3.76/-3.80: H	-3.62/-3.64: H	-3.49/-3.76: H
10	18.40/18.49	21.04/21.13	23.70/23.78	26.50/26.54	28.75/29.29
	-0.22/-0.27: H	-0.07/-0.12: H	0/0: H	0/0: H	0/0: H
11	24.07/24.10	26.47/26.49	28.97/28.99	31.56/31.57	33.71/33.83
	-0.23/-0.28: H	-0.07/-0.11: H	0/0: H	0/0: H	0/0: H
A2	–	[1.53/1.42]	3.53/3.40	7.05/6.99	10.21/9.40
	H	[-5.57/-5.63: H!]	-6.90/-6.97: H	-6.71/-6.74: H	-6.44/-6.87: H
A3	–	[0.65/0.54]	3.49/3.35	6.98/6.92	10.15/9.32
	H	[-3.81/-3.85: H]	-4.79/-4.83: H	-4.63/-4.65: H	-4.46/-4.70: H
A4	–	[0.31/0.13]	3.26/3.12	6.75/6.69	9.98/9.15
	h	[-2.05/-2.08: H]	-2.81/-2.82: H	-2.75/-2.75: H	-2.64/-2.69: H
A5	–	–	3.08/2.93	6.51/6.45	10.10/9.28
	h	H	-1.02/-1.00: H	-1.02/-1.01: H	-0.97/-0.87: H
A6	[0.71/0.67]	2.86/2.90	6.16/6.20	9.87/9.89	12.61/12.93
	[0.003/-0.04: H]	-0.06/-0.11: H	13.80/13.58: S*	13.72/13.62: S*	13.11/11.72: S*
A7	5.81/6.05	8.76/8.97	12.24/12.44	15.11/15.20	17.85/19.14
	-5.50/-6.35: S	-5.40/-6.15: S	-4.86/-5.58: S	-4.79/-5.11: S	-4.41/-8.91: S
A8	11.88/12.05	15.03/15.18	17.60/17.74	20.62/20.69	23.10/24.01
	-26.19/-26.81: S	-24.94/-25.48: S	-23.96/-24.48: S	-23.37/-23.60: S	-22.12/-25.38: S
A9	18.00/18.10	20.26/20.35	22.94/23.02	25.77/25.81	28.15/28.67
	-45.76/-46.14: S	-44.26/-44.59: S	-42.64/-42.96: S	-41.27/-41.41: S	-39.61/-41.59: S
BJ	23.63/23.65	26.01/26.04	28.51/28.53	31.11/31.12	33.35/33.49
	-126.37/-126.35: S	-123.99/-123.96: S	-121.49/-121.47: S	-118.89/-118.88: S	-116.65/-116.51: S

Player Hand	Dealer Upcard				
	7	8	9	T	A
8	H	h	h	h	h
9	5.80	[0.37]	–	–	–
	-11.76: H	[-10.73: H]	h	h	h
10	20.06	14.53	7.37	[0.53]	[0.85/1.90]
	-5.95: H	-5.45: H	-4.31: H	[-2.62: H]	[-3.22/-6.60: H]
11	23.30	17.46	11.36	8.85	6.01/6.28
	-5.96: H	-5.42: H	-4.28: H	-2.90: H	-4.77/-8.46: H
A2	H	H	h	h	h
A3	H	H	h	h	h
A4	H	h	h	h	h
A5	h	h	h	h	h
A6	[0.71]	–	–	–	–
	[-5.26: H]	h	h	h	h
A7	11.18	–	–	–	–
	-29.00: S	S	h	h	h
A8	16.03	9.70	–	–	–
	-45.55: S	-49.89: S	S	S	S
A9	19.30	13.87	6.93	–	–
	-58.03: S	-65.19: S	-69.02: S	S	S
BJ	23.19	17.39	11.29	8.66	5.43/5.73
	-126.81: S	-132.61: S	-138.71: S	-141.34: S	-144.57/-144.27: S

Where different, S17 follows slash.

T = Any Ten-valued card (10, J, Q, K). D = Double down, H = Hit, S = Stand.

Uppercase letters indicate a player advantage.

Numbers in brackets are for 1-deck.

* If civilian would have hit (once), scavenger's double costs civilian nothing.

! In 6-deck H17, this hand is worth 0.10% to the scavenger, and -7.28% to the civilian.

Scavenger Splits: 6-deck H17/S17

Scavenger's Gain (%)

Civilian's Gain (%): Alternative Play

Player Hand	Dealer Upcard				
	2	3	4	5	6
AA	24.27/24.29	26.64/26.66	29.11/29.14	31.69/31.70	33.98/34.12
	16.07/15.91: H	16.19/16.06: H	16.19/16.24: H	15.60/15.62: H	15.03/15.32: H
RSA	30.50/30.58	32.93/32.99	35.46/35.52	38.10/38.13	40.41/40.80
	22.21/22.10: H	22.39/22.29: H	22.43/22.52: H	21.92/21.96: H	21.36/21.90: H
55	18.56/18.66: D	21.19/21.28: D	23.97/24.06: D	26.98/27.02: D	29.38/29.94: D
	-0.21/-0.26: H	-0.07/-0.11: H	0/0: H	0/0: H	0/0: H
TT	17.67/17.82	20.09/20.23	22.62/22.70	25.46/25.50	27.79/28.34
	-45.62/-45.97: S	-44.27/-44.57	-42.81/-43.14: S	-41.43/-41.59: S	-39.87/-41.94: S
DAS					
22	–	[1.97/1.96]	3.67/3.48	8.82/8.71	13.39/12.02
	p	[9.92/10.14: h]	8.09/8.14: h	9.18/9.19: H	10.34/10.53: H
33	–	–	2.72/2.48	7.83/7.71	12.35/10.83
	p	p	9.27/9.35: h	10.48/10.51: H	11.34/11.67: H
44	–	–	0.70/0.43: P2	5.72/5.57: P	10.33/8.38: P
	h	H	-3.93/-4.37: H	-2.57/-2.80: H	-1.01/-4.06: H
66	–	–	0.52/0.24	5.76/5.63	9.60/7.93
	p	p	20.19/20.44: s	21.18/21.30: s	21.75/23.38: s
77	–	–	3.64/3.62	8.04/8.04	12.50/12.46
	p	p	23.44/23.96: s	24.25/24.49: s	24.81/28.04: s
88	3.74/4.11	7.42/7.75	10.93/11.20	15.09/15.22	18.71/20.31
	32.08/33.08: s	31.67/32.55: s	31.50/32.30: s	31.45/31.82: s	31.14/36.00: s
99	9.74/9.90	12.50/12.63	15.95/16.03	19.66/19.70	22.66/23.21
	-1.54/-2.53: S	-0.99/-1.86: S	-0.50/-1.39: S	0.09/-0.32: S	0.62/-4.89: S
NoDAS					
22	–	–	–	2.66/2.55	6.23/4.88
	h	h	p	3.03/3.04: h	3.19/3.40: H
33	–	–	–	1.42/1.31	5.03/3.52
	h	h	p	4.10/4.12: h	4.03/4.37: H
44	–	–	[2.19/2.21: D]	1.35/1.38: D	4.65/5.18: D
	h	H	[-7.47/-7.58: H]	-6.94/-6.98: H	-6.69/-7.26: H
66	–	–	–	–	1.70/p
	h	p	p	p	13.87/p: s
77	–	–	–	1.01/1.02	4.53/4.69
	p	p	p	17.24/17.49: s	16.86/20.28: s
88	p/0.37	3.21/3.54	6.25/6.51	9.91/10.03	13.03/14.67
	p/29.34: s	27.47/28.34: s	26.83/27.62: s	26.28/26.65: s	25.48/30.37: s
99	7.69/7.85	10.18/10.31	13.40/13.48	16.87/16.91	19.66/20.20
	-3.59/-4.58: S	-3.30/-4.17: S	-3.05/-3.93: S	-2.69/-3.11: S	-2.37/-7.89: S

Player Hand	Dealer Upcard				
	7	8	9	T	A
AA	23.78	17.99	11.89	9.10	6.05/6.36
	7.35: H	8.53: H	11.92: H	15.74: H	12.52/8.58: H
RSA	31.45	25.03	18.19	14.96	11.57/12.46
	14.90: H	15.45: H	18.12: H	21.52: H	17.97/14.60: H
55	20.24: D	14.65: D	7.46: D	[0.90: D]	[1.33/2.75: D]
	-5.80: H	-5.30: H	-4.21: H	[-2.46: H]	[-2.94/-6.30: H]
TT	25.44	19.44	11.24	2.60	2.74/7.63
	-51.76: S	-59.60: S	-64.37: S	-53.31: S	-57.30/-57.82: S
DAS,NoDAS: Alternative Play					
22	0.44,–	–	–	–	–
	9.31,p: h	h	h	h	h
88	15.97,13.23	–	–	–	–
	56.74,54.01: h	p	p	p	p
99	18.45,17.17	11.50,10.44	–	–	–
	-22.02,-23.71: S	1.56,0.51: S	p	s	s

Where different, S17 follows slash. Numbers in brackets are for 1-deck.

T = Any Ten-valued card (10, J, Q, K). D = Double down, H = Hit, S = Stand, P = sPlit.

Uppercase letters indicate a player advantage.

No scavenger opportunity against 7-Ace up for 33, 44, 66, or 77.

Basic Strategy: Critical Fractions for Doubles and Splits										
1-deck H17/S17										
Player	Dealer Upcard									
Hand	2	3	4	5	6	7	8	9	T	A
7	h	h	h	H	H	h	h	h	h	eh
8	h	H	4281/4208	914/916	845/857	H	h	h	h	h
9	575/584	407/412	264/265	189/190	184/192	1209	28884	h	h	h
10	004/006	D	D	D	D	243	342	443	4961	3802/3475
11	003/005	D	D	D	D	225	299	303	312	285/599
A2	H	3634/3966	893/916	493/496	414/464	H	H	h	h	h
A3	H	5889/7094	639/664	340/342	291/327	H	H	h	h	h
A4	h	6569/15858	428/448	232/233	184/199	H	h	h	h	h
A5	h	h	203/214	108/108	070/071	h	h	h	h	h
A6	D/066	D	D	D	D	7415	h	h	h	h
A7	1053/1129	724/766	270/305	266/274	189/363	2430	S	h	h	h/s
A8	2365/2387	1414/1427	1210/1228	1031/1035	917/999	2778	5392	S	S	S
A9	2446/2455	2278/2285	1841/1849	1543/1545	1444/1481	3403	5831	12856	S	S
BJ	5166/5161	4598/4594	4045/4042	3527/3525	3418/3398	5416	8018	12858	20570	20864/19663
AA	P	P	P	P	P	P	P	P	P	P
TT-RS4	11471/11394	5514/5504	3611/3649	2437/2445	2241/2348	3531	14627	S	S	S
TT-RS2	3048/3046	2492/2491	2079/2090	1710/1713	1634/1681	2172	3427	7098	18599	S/12187
DAS										
22	5104/5242	P	P	P	P	P	589	232	210	193/223
33	1734/1670	9644/8971	P	P	P	6240	1077	561	380	373/441
44	h	H	460/583	249/265	284/576	H	h	h	h	h
55	[001/003]	D	D	D	D	[195]	[286]	[362]	[2734]	[2213/2285]
66	4114/3720	P	P	P	P	1717	751	412	202	214/237
77	8508/8879	P	P	P	P	13870	1137	741	646	566/665
88	P	P	P	P	P	P	1302	1410	1273	1233/2077
99	259/346	092/158	057/114	018/034	023/278	1228	P	2923	017	1024/581
NoDAS										
22	717/760	1295/1354	33055/12483	P	P	2535	318	155	189	166/204
33	505/505	857/853	P	P	P	1993	749	476	351	336/412
44	h	H	H	2367/2485	1941/3862	H	h	h	h	h
55	[001/003]	D	D	D	D	[195]	[286]	[362]	[2734]	[2213/2285]
66	1456/1366	2459/2377	59329/23014	P	P/81436	978	555	348	182	178/205
77	2381/2483	5016/5200	P	P	P	5951	934	682	609	523/632
88	P	P	P	P	P	P	8636	1269	1217	1171/2010
99	504/603	359/439	249/317	173/192	180/470	1379	P	2574	s	949/547

Where different, S17 follows slash.

T = Any Ten-valued card (10, J, Q, K). D = Double down, H = Hit, S = Stand, P = sPlit.

Uppercase letters indicate a player advantage. Surrender not shown.

For non-pairs and 55, number represents critical fraction (in thousandths) when doubling for less/more.

For pairs, number represents critical fraction (in thousandths) when splitting for less/more.

Basic Strategy: Critical Fractions for Doubles and Splits										
6-deck H17/S17										
Player Hand	Dealer Upcard									
	2	3	4	5	6	7	8	9	T	A
7	h	h	h	H	H	h	h	h	h	eh
8	h	H	H	5656/5508	1504/1446	H	h	h	h	h
9	1215/1206	609/614	384/384	276/276	221/229	2029	H	h	h	h
10	012/015	004/006	D	D	D	297	376	585	H	H
11	010/012	003/005	D	D	D	256	311	377	328	794/1348
A2	H	74188/H	1955/2049	952/964	631/732	H	H	h	h	h
A3	H	H	1375/1444	664/672	440/505	H	H	h	h	h
A4	h	H	862/905	408/412	265/295	H	h	h	h	h
A5	h	H	332/343	156/157	097/095	h	h	h	h	h
A6	h/H	022/037	D	D	D	H	h	h	h	h
A7	946/1050	617/686	398/449	317/336	248/466	2594	S	h	h	h
A8	2205/2226	1660/1679	1362/1381	1134/1142	958/1057	2842	5144	S	S	S
A9	2542/2550	2185/2192	1859/1866	1602/1605	1408/1451	3008	4699	9966	S	S
BJ	5349/5342	4767/4762	4261/4257	3823/3821	3498/3479	5469	7626	12281	16322	26627/25171
AA	P	P	P	P	P	P	P	P	P	P
TT-RS4	5214/5200	3589/3589	2667/2687	2052/2059	1680/1762	3015	8594	S	S	S
TT-RS2	2583/2580	2204/2204	1893/1901	1628/1631	1435/1481	2035	3065	5727	20469	20938/7575
DAS										
22	1819/1892	21512/24102	P	P	P	P	791	291	206	186/230
33	1141/1123	3407/3227	P	P	P	4735	908	413	293	273/332
44	h	H	7656/22583	491/540	164/523	H	h	h	h	h
55	[012/015]	[004/006]	D	D	D	[287]	[362]	[564]	H	H
66	1619/1533	3781/3507	P	P	P	763	388	212	143	132/152
77	3505/3624	14636/15347	P	P	P	11727	939	561	493	360/433
88	P	P	P	P	P	P	27092	1554	1235	1089/1763
99	217/308	142/205	098/149	064/084	043/265	1183	P	3367	166	834/513
NoDAS										
22	499/531	678/723	1698/1532	P	P	2556	497	236	184	182/230
33	398/401	585/584	1460/1358	P	P	1782	653	360	270	268/332
44	h	H	H	H	2846/11772	H	h	h	h	h
55	[012/015]	[004/006]	D	D	D	[287]	[362]	[564]	H	H
66	902/857	1399/1330	2497/2408	9703/8892	P/121913	457	279	179	128	127/152
77	1792/1876	2688/2815	6797/7046	P	P	5019	778	518	469	354/433
88	548901/P	P	P	P	P	P	11950	1443	1188	1081/1763
99	505/613	371/445	281/341	217/240	181/433	1364	023	2826	133	826/513

Where different, S17 follows slash.

T = Any Ten-valued card (10, J, Q, K). D = Double down, H = Hit, S = Stand, P = sPlit.

Uppercase letters indicate a player advantage. Surrender not shown.

For non-pairs and 55, number represents critical fraction (in thousandths) when doubling for less/more.

For pairs, number represents critical fraction (in thousandths) when splitting for less/more.

Tipping Strategy: Critical Ratios for Doubles and Splits										
1-deck H17/S17										
Player	Dealer Upcard										
Hand	2	3	4	5	6	7	8	9	T	A
8	h	H	H	164.5/ 168.5	86.1/86.4	H	h	h	h	h
9	41.9/42.1	17.6/17.6	9.6/9.6	6.6/6.6	6.5/6.3	H	H	h	h	h
10	4.8/4.8	4.1/4.1	3.7/3.7	3.2/3.2	3.3/3.2	6.0	9.7	21.9	H	H
11	3.7/3.7	3.4/3.4	3.1/3.1	2.8/2.8	2.8/2.8	5.4	8.4	12.9	18.0	13.3/23.3
A2	H	H	158.3/ 204.8	18.6/18.7	13.9/16.3	H	H	h	h	h
A3	H	H	49.1/54.4	14.9/15.0	11.8/13.4	H	H	h	h	h
A4	h	H	39.3/42.7	14.9/14.9	11.2/12.5	H	h	h	h	h
A5	h	h	37.6/40.7	15.1/15.2	9.3/10.0	h	h	h	h	h
A6	140.3/ 160.7	25.8/26.3	12.9/13.0	7.2/7.2	7.6/7.6	H	h	h	h	h
A7	S	38.7/45.3	8.9/9.2	7.9/7.9	6.9/8.2	S	S	h	h	h/s
A8	S	S	S	S	51.2/ 3676.1	S	S	S	S	S
AA	2.2/2.2	2.1/2.1	2.0/1.9	1.9/1.9	1.9/1.8	2.7	3.2	3.5	4.2	3.5/4.0
RSA	2.0/2.0	2.0/2.0	1.9/1.9	1.8/1.8	1.8/1.8	2.4	2.8	3.0	3.6	3.3/3.6
DAS										
22	14.0/13.5	9.2/9.0	7.0/7.1	4.2/4.2	3.8/4.0	10.3	h	h	h	h/eh
33	26.5/27.5	11.0/11.0	5.4/5.5	3.7/3.7	3.6/3.8	9.1	122.1	h	h	h
44	h	H	28.1/39.0	9.5/9.9	8.2/14.8	H	h	h	h	h
55	[4.6/4.5]	[4.0/4.0]	[3.5/3.4]	[2.9/2.9]	[2.9/2.8]	[5.4]	[8.7]	[18.0]	H	H
66	7.0/7.4	5.0/5.0	3.8/3.8	2.9/2.9	3.2/3.2	15.1	h	h	h	h
77	5.3/5.1	4.2/4.1	3.2/3.1	2.9/2.9	2.9/2.6	3.1	39.8	h	s	h
88	2.9/2.8	2.7/2.6	2.5/2.5	2.3/2.2	2.2/2.0	1.7	2.9	12.7*	17.1*	19.4*/ 6.2*
99	13.7/15.3	10.8/11.5	7.3/7.7	5.3/5.4	5.3/6.9	S	7.6	10.7	s	469.7/s
NoDAS										
22	h	102.3/ 85.2	34.8/36.3	10.7/10.8	9.3/10.6	26.7	h	h	h	h
33	h	h	16.6/17.2	9.1/9.1	8.9/10.1	19.5	h	h	h	h
44	h	H	H	[114.5/ 119.3]	[47.8/ 55.9]	H	h	h	h	h
55	4.6/4.5	4.0/4.0	3.5/3.4	2.9/2.9	2.9/2.8	5.4	8.7	18.0	H	H
66	22.6/27.0	12.4/12.5	7.9/7.9	5.8/5.8	6.5/6.5	h	h	h	h	h
77	10.0/9.4	7.6/7.3	5.7/5.5	5.2/5.2	5.2/4.4	3.8	h	h	s	h
88	3.6/3.5	3.4/3.3	3.3/3.2	2.9/2.9	2.9/2.5	1.8	3.1	18.1*	20.9*	25.5*/ 6.4*
99	24.7/30.3	19.3/21.7	10.9/11.9	7.3/7.4	7.3/10.8	S	8.7	11.9	s	s

Where different, S17 follows slash.
T = Any Ten-valued card (10, J, Q, K). D = Double down, H = Hit, S = Stand, P = sPlit.
Uppercase letters indicate a player advantage. Surrender options not shown.
Number represents required minimum multiple of tip size to double down or split (see text).
* Late surrender is better than hitting.
Numbers in brackets for 55 and 44 NoDAS represent multiples for doubling, not splitting.
Stand on BJ, TT, A9. Hit hard 7 or less.

Tipping Strategy: Critical Ratios for Doubles and Splits 6-deck H17/S17										
Player Hand	Dealer Upcard									
	2	3	4	5	6	7	8	9	T	A
8	h	H	H	H	H	H	h	h	h	h
9	H	39.2/39.1	16.6/16.4	10.5/10.5	8.1/7.9	H	H	h	h	h
10	5.6/5.5	4.8/4.8	4.3/4.3	3.8/3.8	3.5/3.5	7.1	11.1	32.7	H	H
11	4.2/4.2	3.8/3.8	3.5/3.5	3.2/3.2	3.0/3.0	5.8	8.4	14.2	16.9	80.7/H
A2	H	H	H	293.1/ 396.9	26.6/39.6	H	H	h	h	h
A3	H	H	H	42.7/44.1	17.6/21.7	H	H	h	h	h
A4	h	H	221.2/ 334.0	25.1/25.5	13.7/15.6	H	h	h	h	h
A5	h	H	48.7/52.0	18.2/18.4	11.0/11.9	h	h	h	h	h
A6	h/H	35.8/35.8	16.3/16.2	10.2/10.2	8.0/7.8	H	h	h	h	h
A7	317.4/S	29.8/35.5	13.6/14.6	9.7/10.0	7.5/9.8	S	S	h	h	h
A8	S	S	S	S	101.4/S	S	S	S	S	S
AA	2.5/2.5	2.4/2.4	2.3/2.3	2.2/2.2	2.1/2.1	3.3	3.8	4.3	4.1	5.4/6.7
RSA	2.3/2.3	2.1/2.1	2.1/2.0	2.0/2.0	1.9/1.9	2.6	2.9	3.2	3.2	3.9/4.3
DAS										
22	33.6/31.1	15.8/15.3	9.9/10.0	6.5/6.5	4.9/5.2	11.9	h	h	h	h
33	118.0/ 130.8	19.3/19.6	9.7/9.9	6.4/6.4	4.9/5.2	11.3	h	h	h	h
44	h	H	H	36.9/41.9	12.5/26.9	H	h	h	h	h
55	[5.5/5.5]	[4.8/4.8]	[4.2/4.2]	[3.8/3.8]	[3.5/3.4]	[7.0]	[10.7]	[30.8]	H	H
66	18.4/20.6	8.4/8.8	5.7/5.7	4.4/4.4	3.7/3.7	h	h	h	h	h
77	7.2/6.9	5.5/5.4	4.3/4.3	3.6/3.6	3.2/2.9	4.1	h	h	h	h
88	3.3/3.2	3.0/2.9	2.8/2.7	2.5/2.5	2.4/2.1	1.6	2.8	10.0*	19.3*	46.9*/ 7.8*
99	14.2/15.8	10.1/10.8	7.6/8.0	5.9/6.0	5.0/6.4	S	8.9	11.1	s	s
NoDAS										
22	h	h	95.7/111.4	20.5/20.8	12.4/14.1	28.7	h	h	h	h
33	h	h	89.4/104.8	21.1/21.4	12.9/14.8	25.5	h	h	h	h
44	h	H	H	H	H	H	h	h	h	h
55	[5.5/5.5]	[4.8/4.8]	[4.2/4.2]	[3.8/3.8]	[3.5/3.4]	[7.0]	[10.7]	[30.8]	H	H
66	h	28.3/33.2	13.3/13.4	9.2/9.2	7.5/7.6	h	h	h	h	h
77	13.8/12.6	10.1/9.6	7.8/7.5	6.4/6.3	5.5/4.7	5.1	h	h	h	h
88	4.1/4.0	3.8/3.7	3.6/3.4	3.3/3.2	3.1/2.6	1.8	3.0	11.9*	23.5*	51.4*/ 7.8*
99	28.3/35.5	16.9/18.9	11.3/12.2	8.2/8.5	6.8/9.5	S	10.6	12.6	s	s

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Number represents required minimum multiple of tip size to double down or split (see text).
* Late surrender is better than hitting.
Numbers in brackets for 55 represent multiples for doubling, not splitting.
Stand on BJ, TT, A9. Hit hard 7 or less.

Tipping Strategy: Deviations from Basic Strategy				
1-deck H17/S17				
Tip Size:	1	2.5	1	5
Main Bet:	100	100	25	100
Critical Multiple:	(100)	(40)	(25)	(20)
(Deviations are cumulative)	8 v. 5 H A2 v. 4 H A6 v. 2 H A8 v. 6 D/S	8 v. 6 H 9 v. 2 H A3 v. 4 H A4 v. 4 D/H A5 v. 4 D/H A7 v. 3 D/S A8 v. 6 S	A4 v. 4 H A5 v. 4 H A6 v. 3 H A7 v. 3 S	10 v. 9 H 11 v. A D/H
DAS				
	33 v. 8 H 99 v. A S		33 v. 2 H 44 v. 4 H 77 v. 8 H	
NoDAS				
	22 v. 3 H/P 44 v. 5 H	22 v. 3 H 44 v. 6 H	22 v. 4 H 22 v. 7 H 66 v. 2 p/h 88 v. A rh/p 99 v. 2 P/S	66 v. 2 H 88 v. T rh 99 v. 2 S

Where different, S17 follows slash.
Deviations are *cumulative* as we proceed to the right.
For example, with a bet of $100 and tip of $2.50, we would hit 8 v. 6,
  and also hit 8 v. 5, and so on. With a bet of $100 and a $5 tip,
  we would apply all strategy deviations listed in the entire chart.				

Tipping Strategy: Deviations from Basic Strategy 6-deck H17/S17				
Tip Size:	1	2.5	1	5
Main Bet:	100	100	25	100
Critical Multiple:	(100)	(40)	(25)	(20)
(Deviations are cumulative)	A2 v. 5 H A4 v. 4 H A7 v. 2 S A8 v. 6 S	11 v. A H A3 v. 5 H A5 v. 4 H	9 v. 3 H 10 v. 9 H 55 v. 9 H A2 v. 6 H A4 v. 5 H A6 v. 3 H A7 v. 3 S	A3 v. 6 D/H
DAS				
	33 v. 2 H	88 v. A rh/p	22 v. 2 H 44 v. 5 H 44 v. 6 P/H	66 v. 2 p/h
NoDAS				
	22 v. 4 p/h 33 v. 4 p/h	88 v. A rh/p	22 v. 7 h 33 v. 7 h 66 v. 3 H 99 v. 2 S	22 v. 5 h 33 v. 5 h 88 v. T rh
Where different, S17 follows slash. Deviations are *cumulative* as we proceed to the right. For example, with a bet of \$25 and tip of \$1, we would hit A2 v. 6, and also hit A2 v. 5, and so on. With a bet of \$100 and a \$5 tip, we would apply all strategy deviations listed in the entire chart.				