How to win Professional Craps

The only fair bet in the house, a museum of bad ideas, and eight million simulated sessions on the felt.

Winfield

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Living Edition 1.0 — July 2026 · First edition, Chapters 1–13.

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Chapter 1 — The 36-Outcome Decomposition

Craps is the loudest game in the casino and the simplest to decompose. Two six-sided dice produce exactly 36 equally likely ordered outcomes, and every bet on the felt — from the pass line to the most obscure hop bet — is a linear function of how those 36 outcomes are partitioned. There is no shuffle to track, no dealer decision to model, no hidden state of any kind. The entire game fits in one triangular table, and the honest way to learn craps is to memorize that table before learning a single rule (Wizard of Odds[1]).

The totals 2 through 12 are not equally likely. A total of 2 can be made one way (1-1), a total of 7 can be made six ways (1-6, 2-5, 3-4, 4-3, 5-2, 6-1), and the counts rise and fall in a triangle between those extremes: one way each for 2 and 12, two ways for 3 and 11, three for 4 and 10, four for 5 and 9, five for 6 and 8, and six for 7 (Wizard of Odds[1]; Wikipedia[2]).

Total	Ways	Probability	Percent
2	1	1/36	2.78
3	2	2/36	5.56
4	3	3/36	8.33
5	4	4/36	11.11
6	5	5/36	13.89
7	6	6/36	16.67
8	5	5/36	13.89
9	4	4/36	11.11
10	3	3/36	8.33
11	2	2/36	5.56
12	1	1/36	2.78

Seven is the modal total, appearing once every six rolls on average, and that single fact is the root of nearly every house edge in the game. The seven resolves bets faster than any other number, kills every place bet and every odds bet at once, and is the only number the casino needs the shooter to roll to sweep the table clear (Wizard of Odds[1]).

The triangle also encodes the game's most famous convention. Point numbers 4 and 10 can each be made three ways, 5 and 9 four ways, and 6 and 8 five ways. That 3/4/5 pattern of ways is the

direct origin of the modern "3-4-5x odds" structure, in which the allowed odds multiple varies by point precisely so that every full-odds win pays the same amount (Wikipedia[2]).

This book follows the same doctrine as the earlier volumes in the series: compute everything, trust nothing that cannot be recomputed, and treat every figure that survives both the algebra and a large simulation as settled. The engine behind this volume models the 36-outcome lattice exactly with rational arithmetic, derives every house edge as a fraction before converting it to a percentage, and then confirms the fractions with Monte Carlo campaigns of up to one million sessions per strategy. Where a published figure and the engine disagree, the discrepancy is stated. None were found.

Sources

1. https://wizardofodds.com/games/craps/basics/
2. https://en.wikipedia.org/wiki/Craps

Chapter 2 — The Point Cycle: Deriving 1.41 Percent Exactly

The pass line is the spine of craps. On the come-out roll it wins even money immediately on 7 or 11, which happens in 8 of 36 outcomes, and loses immediately on 2, 3, or 12, which happens in 4 of 36. The remaining 24 outcomes — two-thirds of all come-out rolls — establish a point, and the bet then wins if the point repeats before a 7 and loses otherwise (Wizard of Odds[1]).

Once a point is established, every roll that is neither the point nor a 7 is noise. The conditional probability of making the point is therefore a simple ratio of ways. Point 4 has 3 ways against the seven's 6, so the make probability is 3/(3+6), which is 1/3. Point 5 gives 4/(4+6), which is 2/5. Point 6 gives 5/(5+6), which is 5/11. The points 10, 9, and 8 mirror 4, 5, and 6 exactly (Wizard of Odds[1]).

Summing the full tree gives the exact win probability of the pass line:

P(win) = 8/36 + 2 x (3/36 x 1/3 + 4/36 x 2/5 + 5/36 x 5/11) = 244/495

The complement, 251/495, is the loss probability, and the expectation per unit is (244 - 251)/495, which is -7/495, or -1.4141 percent. That is the famous 1.41 percent house edge, and it is not an approximation: it is the exact fraction 7/495, confirmed by the bet-by-bet derivations in the published literature and reproduced to fifteen decimal places by the engine's rational-arithmetic module (Wizard of Odds appendix[3]).

The come bet is the same wager with a delayed start: it treats whatever roll it is placed on as a fresh come-out, and its mathematics are identical, edge and all (Wizard of Odds[1]).

Two more exact quantities matter for everything that follows. First, a pass line decision takes on average 557/165 rolls, about 3.38, because two-thirds of come-outs lead into a point cycle whose length is geometrically distributed (Wikipedia[2]). Second, at the industry-standard pace of roughly 102 rolls per hour at a full table, that average cycle length implies about 30 pass line decisions per hour, which converts any per-decision edge into an hourly cost with one multiplication (Wikipedia[2]).

The 1.41 percent figure deserves one moment of respect before the book spends eleven chapters working around it. Among flat, even-money wagers available in an American casino, the pass line is one of the cheapest tickets in the building — cheaper than every roulette bet, cheaper than nearly everything on the baccarat layout except the banker bet, and cheaper than blackjack played with anything less than accurate basic strategy. A game decided by two dice in public view, with no skill component whatsoever, prices its headline bet at less than a percent and a half. The catch, as always, is everything else on the felt.

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3. https://wizardofodds.com/games/craps/appendix/1/

Chapter 3 — Free Odds: The Only Fair Bet in the House

After a point is established, a pass line bettor may place an additional wager behind the line. This is the free odds bet, and it is unique in American casino gaming: it pays true mathematical odds and carries a house edge of exactly zero (Wizard of Odds[1]; Wizard of Odds house-edge table[4]).

The payouts track the lattice from Chapter 1 precisely. Points 4 and 10 are made 3 ways against the seven's 6, so odds on those points pay 2 to 1. Points 5 and 9 pay 3 to 2. Points 6 and 8 pay 6 to 5. In each case the payout ratio is the exact inverse of the win probability ratio, so the expected value of the odds bet in isolation is zero on every point (Wizard of Odds[1]).

The engine confirms this with rational arithmetic: for every point p, the odds expectation is p_make x payout - (1 - p_make) x 1, and substituting 1/3 with 2:1, 2/5 with 3:2, or 5/11 with 6:5 gives exactly zero in all three cases. There is no rounding, no fine print, and no other wager in the building with this property.

Don't pass bettors have the mirror image: laying odds, which bets that the seven arrives first and pays the inverse ratios of 1 to 2 on 4/10, 2 to 3 on 5/9, and 5 to 6 on 6/8. Laid odds behind the don't pass line are likewise a zero-edge wager (Wizard of Odds appendix[3]; Wikipedia[2]).

Why does a business built on negative expectation offer a fair bet at all? Because the odds bet cannot be placed alone. It exists only as a rider on a flat bet that has already paid its toll, and the casino knows the expected dollar loss on the combined position is anchored entirely to the flat portion. The odds bet costs the house nothing in expectation, fills the table with action and noise, and lets marketing truthfully advertise a bet with no edge. The player's side of that transaction is the subject of the next chapter, and it is the closest thing craps has to a professional doctrine.

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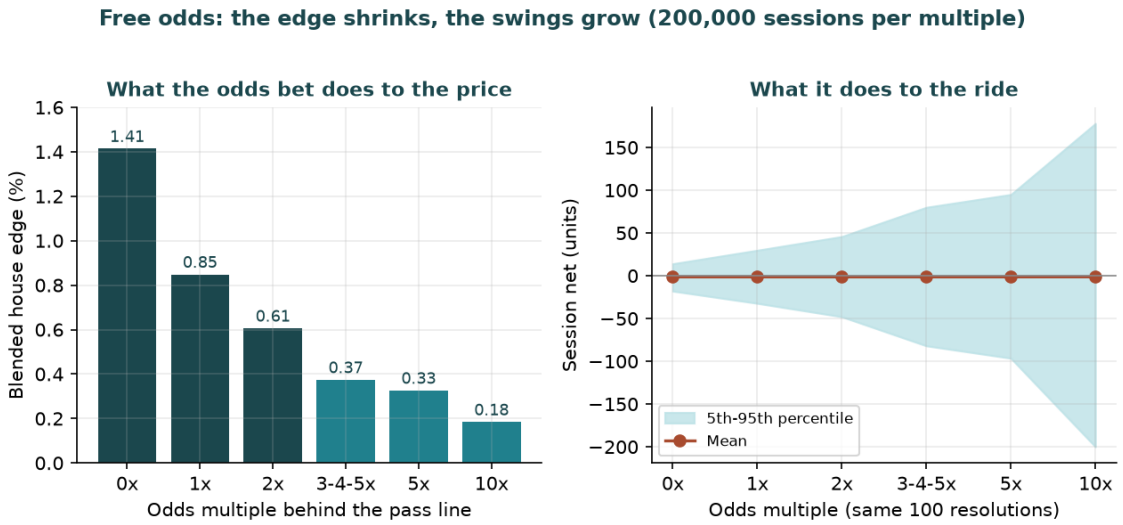
Chapter 4 — The Blended Ladder: Pass Plus Odds at Every Multiple

The expected loss of a pass line bet with any amount of odds behind it is always the same: 7/495 of the flat unit, roughly 1.41 cents per dollar of flat bet, per decision. Odds never change the dollar cost. What they change is the denominator — total money at risk — and therefore the percentage price of the combined position (Wizard of Vegas forum[5]).

The engine computes the blend exactly. A point is established two-thirds of the time, so at a flat multiple m the expected total stake is 1 + (2/3)m flat units, with the 3-4-5x convention averaging a multiple of 25/6 across the six points. Dividing the fixed 7/495 loss by expected stake gives the blended ladder, validated against the published anchors at 1x and 2x (Wizard of Vegas forum[6]):

Odds taken	Blended house edge	Expected stake (units)	SD per decision (units)
None	1.414 percent	1.00	1.00
1x	0.848 percent	1.67	1.89
2x	0.606 percent	2.33	2.86
3-4-5x	0.374 percent	3.78	4.92
5x	0.326 percent	4.33	5.82
10x	0.184 percent	7.67	10.81
20x	0.099 percent	14.33	20.80
100x	0.021 percent	67.67	100.79

The standard deviation column is the part most books omit, and it is the honest half of the story. At 3-4-5x odds the per-decision standard deviation is 4.92 flat units — the engine's exact figure matches the published 4.915632 to the last digit (Wizard of Odds betting systems[7]). A 10x odds player endures swings nearly eleven times larger than a flat bettor for the same expected dollar loss. The odds bet is free in expectation and expensive in variance, and both halves of that sentence must be priced.



Free odds: the edge shrinks, the swings grow

The chart above shows both faces at once from the engine's campaign of 200,000 simulated 100-decision sessions per multiple: the blended percentage falls monotonically as odds rise, while the 5th-to-95th percentile band of session outcomes fans open around an essentially constant mean loss.

The professional reading of the ladder is straightforward. If the goal is the lowest percentage price on total action, take the maximum odds the table and the bankroll allow — the published verdict is blunt on this point: make pass, don't pass, come, and don't come bets and always take maximum odds (Wizard of Odds betting systems[7]). If the goal is minimum dollars lost per hour, the flat bet is what costs money, so the correct move is the smallest flat bet the table minimum permits, with odds sized to the swing the bankroll can absorb. The two goals point to the same table position: minimum flat, maximum affordable odds. Chapter 10 turns that principle into specific bankroll numbers.

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Chapter 5 — The Dark Side: Don't Pass Mathematics and Sociology

The don't pass line inverts the pass line: it wins on come-out 2 or 3, loses on 7 or 11, and after a point is established it wins when the seven arrives first. Symmetry would make this a positive-expectation bet — the seven is the favorite against every point — so the house inserts one asymmetry: a come-out 12 is a push for the don't bettor rather than a win. That single barred number converts a would-be player edge into a house edge of exactly 3/220, or 1.3636 percent (Wizard of Odds appendix[3]; Wikipedia[2]).

The engine's exact figures: the don't pass wins with probability 0.4793, pushes with probability 1/36, and loses the rest. Per unit resolved it is very slightly cheaper than the pass line — 1.364 against 1.414 percent — and with 2x lay odds behind it the blended price falls to 0.455 percent, marginally better than the equivalent pass blend at the same multiple because laid odds put more money on the felt per point cycle.

Mathematically, then, the dark side is the correct side by a whisker. Sociologically it is another matter. Craps is the most communal game in the casino: nearly everyone bets with the shooter, cheers the same numbers, and groans at the same seven-out. The don't bettor wins precisely when the table loses, visibly and loudly, decision after decision. The etiquette literature treats open celebration on the dark side as the cardinal social offense of the game (Wizard of Vegas[8]). The half-tenth of a percent saved is real, and the engine prices it honestly; whether it is worth playing every session as the table's designated antagonist is a question mathematics cannot answer.

There is also a structural nuance worth understanding even for pass line loyalists. After the point is established the don't bettor holds the favorite — the seven beats any point head to head — which is why the don't side pushes its advantage by laying odds, betting more to win less at true prices. The dark-side player suffers on come-outs, where 7 and 11 outnumber 2 and 3 two to one, and collects during point cycles. The pass bettor lives the mirror image: euphoric come-outs, doomed point cycles. Neither side escapes the barred twelve's toll; the game simply lets the player choose which half of the ride feels good.

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2. https://en.wikipedia.org/wiki/Craps
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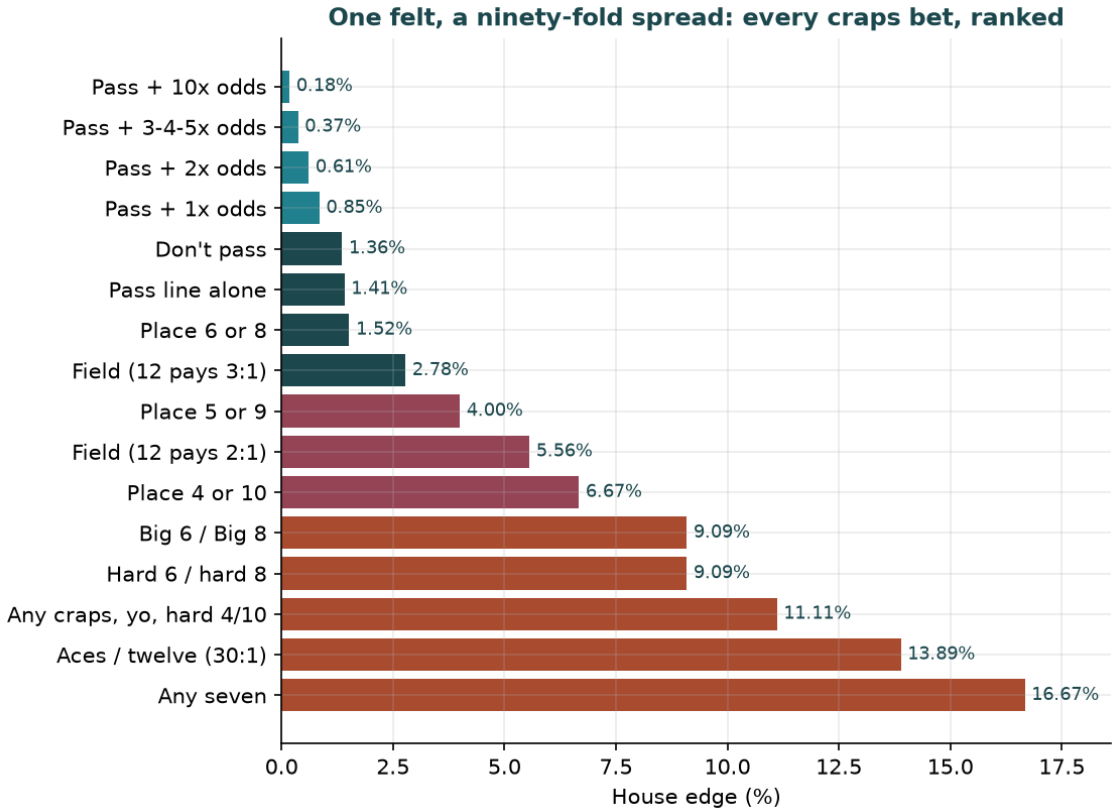
8. https://wizardofvegas.com

Chapter 6 — The Bet Ledger: Every Wager on the Felt, Ranked

A craps layout offers more distinct wagers than any other standard table game, and their prices span a ninety-fold range on a single piece of felt. The ledger below is the engine's exact computation for every standard bet, sorted from cheapest to most expensive, with each figure verified against the published derivations (Wizard of Odds appendix 1[3]; Wizard of Odds appendix 2[9]; Wikipedia[2]).

Bet	Pays	House edge (per resolution)
Pass + 10x odds	blend	0.18 percent
Pass + 3-4-5x odds	blend	0.37 percent
Pass + 2x odds	blend	0.61 percent
Pass + 1x odds	blend	0.85 percent
Don't pass (bar 12)	1:1	1.36 percent (3/220)
Pass / come	1:1	1.41 percent (7/495)
Place 6 or 8	7:6	1.52 percent (1/66)
Lay 4 or 10 (5 percent vig)	1:2	2.44 percent
Field, 12 pays 3:1	varies	2.78 percent (1/36)
Place 5 or 9	7:5	4.00 percent (1/25)
Buy 4 or 10 (vig upfront)	2:1	4.76 percent
Field, 12 pays 2:1	varies	5.56 percent (1/18)
Place 4 or 10	9:5	6.67 percent (1/15)
Big 6 / Big 8	1:1	9.09 percent (1/11)
Hard 6 / hard 8	9:1	9.09 percent (1/11)
Hard 4 / hard 10	7:1	11.11 percent (1/9)
Any craps	7:1	11.11 percent (1/9)
Yo (11) or ace-deuce (3)	15:1	11.11 percent (1/9)
Horn (2/3/11/12 split)	blend	12.50 percent (1/8)
Aces (2) or twelve, 30:1	30:1	13.89 percent (5/36)

Bet	Pays	House edge (per resolution)
Any seven	4:1	16.67 percent (1/6)



One felt, a ninety-fold spread: every craps bet, ranked

Three features of the ledger organize the entire strategy of the game.

First, the top of the table is genuinely excellent. Pass with full odds, don't pass with lays, and the place bet on 6 or 8 all price below 1.6 percent per resolution. The place 6 and 8 deserve particular respect: at 7:6 they carry a 1.52 percent edge per resolution, and because they sit through many unresolved rolls their per-roll cost is only about 0.46 percent, making them the only non-line bets a disciplined player ever needs (Wizard of Odds betting systems[7]).

Second, cosmetic similarity conceals price chasms. Big 6 pays even money for the identical event that place 6 pays 7:6 — same dice, same resolution, six times the edge. The field looks friendly because it covers seven numbers, but the seven numbers it covers are the rare ones; it loses to the fat middle of the lattice on 20 of 36 rolls and prices at 5.56 percent under the standard paytable, softening to 2.78 only where the 12 pays triple (Wizard of Odds appendix 2[9]). Buying the 4 with a commission beats placing it, but both remain several times the price of the 6 and 8.

Third, everything below the field in the table is entertainment priced like entertainment. The bottom half of the ledger is examined bet by bet in the next chapter, because the gap between

the felt's best and worst wagers — 0.18 percent to 16.67 percent, a factor of roughly ninety — is the single most important fact a craps player can carry to the table.

The ledger also explains why craps rewards study far more than its neighbors. Roulette offers dozens of bets at one identical price; nothing the player chooses matters. Craps offers one price per bet across a two-order-of-magnitude range, so bet selection is the entire game. A player who touches only the top seven rows of the ledger plays one of the cheapest games in the casino. A player who grazes the bottom half plays one of the most expensive.

Sources

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Chapter 7 — Proposition Bets: A Museum of Bad Ideas

The center of the layout, under the stickman's control, is a museum of expensive exhibits. Every proposition bet resolves fast, pays spectacularly, and prices catastrophically, and each one earns its placard.

The any seven bet is the museum's centerpiece: the most likely single total on the dice, paying 4:1 against true odds of 5:1, for a 16.67 percent house edge — one dollar in six, surrendered per resolution, on a bet that resolves every roll. It is the most expensive standard wager in the building and the exhibit least worth visiting (Wizard of Odds appendix 1[3]).

The hardways ask a number to arrive as doubles before it arrives any other way and before a seven. Hard 6 and hard 8 pay 9:1 against 10:1 true odds for 9.09 percent; hard 4 and hard 10 pay 7:1 against 8:1 for 11.11 percent. The one-roll naturals — yo-eleven and ace-deuce at 15:1 for 11.11 percent, aces and twelve at 30:1 for 13.89 percent — price a two-way or one-way lattice slice at roughly ten times the cost of the pass line. The horn splits a unit across 2, 3, 11, and 12 and blends to 12.5 percent, buying four bad bets in one motion (Wizard of Odds appendix 1[3]; Wizard of Odds appendix 2[9]).

The modern side-bet family is more expensive still. The fire bet, which pays up to 999:1 for a shooter making four or more distinct points, carries edges of 20 to 25 percent depending on paytable; the small, tall, and all bets run 7.5 to 20.6 percent depending on the pay schedule (Wizard of Odds fire bet[10]; Wizard of Odds bonus craps[11]).

The economics of the museum explain the soundtrack. The stickman's patter — hard eight easy money, yo-leven, any craps protects the line — is a continuous sales channel for the highest-margin inventory on the felt, and it is structurally why the crew works the center of the table hardest (Wizard of Vegas[8]). None of it is cheating; all of it is pricing. The professional response is a standing policy decided before the session, when the mind is quiet, rather than at the table, when it is not: proposition bets placed, zero. Chapter 12 writes that policy into the field-test protocol as a hard rule, and the protocol treats a single violation as a failed session regardless of financial outcome.

One exhibit deserves a sympathetic footnote. The dealers will suggest a two-way hardway — half for the crew — as a tip. Tipping the crew is good practice and Chapter 11 endorses it; routing the tip through an 11 percent bet is simply an expensive envelope. A pass line bet for the dealers delivers the same goodwill at a twelfth of the price.

Sources

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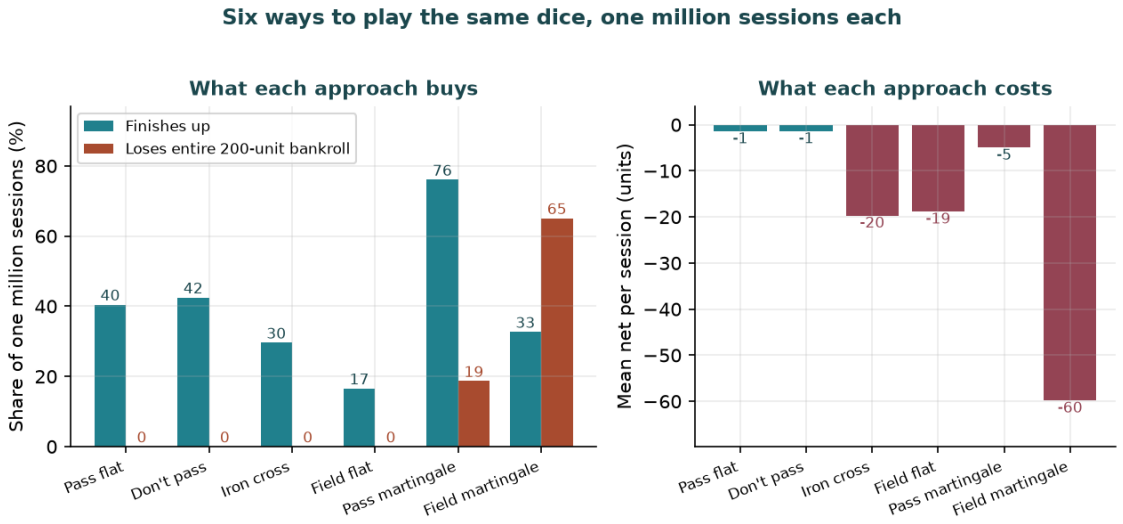
Chapter 8 — Systems Under the Microscope

No betting system changes the price of a single wager, because every roll is independent and every bet's edge is fixed by the lattice of Chapter 1. What systems change is the shape of the session — which sessions win, which lose, and how badly. The engine ran one million sessions of each of six approaches under identical conditions: a 338-roll budget (about 100 pass line decisions), a 200-unit bankroll, and a 500-unit table maximum.

System	Mean net	P(finish up)	P(ruin)	Median
Pass line, flat	-1.40	40.5 percent	0.0 percent	-2
Don't pass, flat	-1.38	42.5 percent	0.0 percent	-1
Pass martingale	-4.96	76.1 percent	18.7 percent	+45
Iron cross	-19.69	29.6 percent	0.0 percent	-19
Field, flat	-18.81	16.6 percent	0.0 percent	-19
Field martingale	-59.81	32.7 percent	65.1 percent	-200



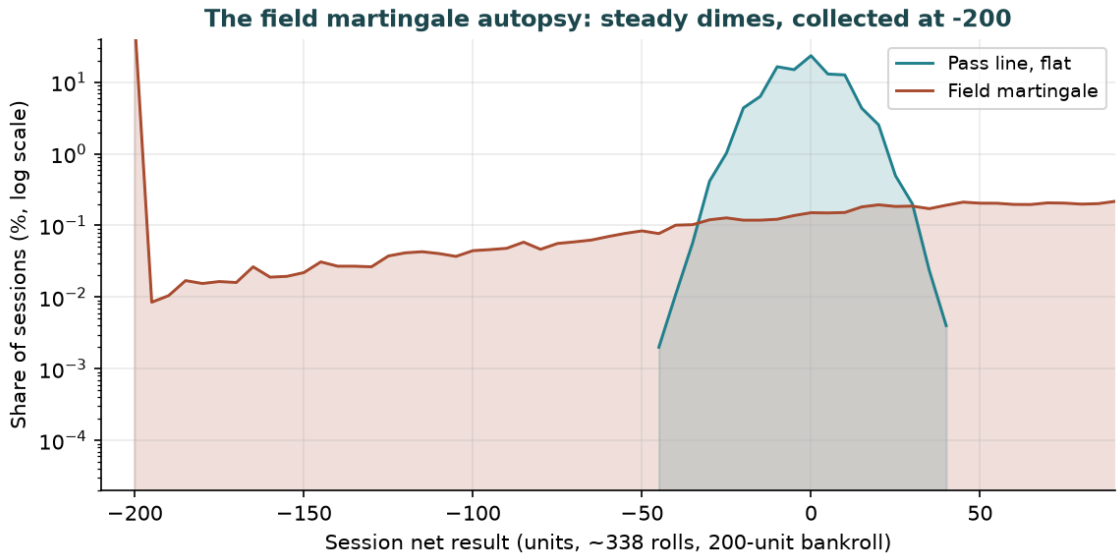
Six ways to play the same dice, one million sessions each

The two flat line bets are the control group, and they behave exactly as Chapters 2 and 5 predict: about 1.4 units lost per hundred decisions, four sessions in ten finishing ahead, and ruin essentially impossible at this bankroll. The don't side's small mathematical advantage shows up as two extra winning sessions per hundred.

The pass martingale is the seducer of the group. It converts the session distribution into three-quarters winners — the median session finishes 45 units up — while more than tripling the mean loss and losing the entire 200-unit bankroll in nearly one session in five. Doubling after each loss does not fight the house edge; it feeds the edge more action, with the geometric certainty that a losing streak eventually outruns either the bankroll or the table maximum (Wizard of Odds martingale analysis[12]). Seventy-six winning sessions per hundred is a psychological product, priced at three and a half times the honest game's cost plus a one-in-five chance of total loss.

The iron cross covers every number except seven — field plus place bets on 5, 6, and 8 — and produces a win on roughly five rolls in six while a point is on. The published per-roll figure for the always-working cross is 1.136 percent of the combined stake under a field paying triple on twelve (Wizard of Odds betting systems[7]); the engine's variant, with the field paying double on twelve and a pass unit on come-outs, prices at about 1.74 percent of working stake per roll, and its exact expectation of -1477/7425 units per pass-resolution-equivalent was verified against the simulation to two decimal places. Either way the structure is the same trade as the field alone, refined: constant small wins, a 4.4-unit amputation at every seven-out, and a mean session cost fourteen times the flat pass line. Winning most rolls is not the same as winning money.

The flat field bet is the ledger's warning made concrete: 5.56 percent per roll, every roll, compounds to a mean loss of nearly 19 units per session and only one session in six ahead. And the field martingale is the museum piece of the systems world. Its million-session autopsy shows 65 percent of sessions ending in total ruin — the median outcome is the loss of the entire 200-unit bankroll — against a mean cost of 60 units per session, forty times the flat pass line, with the surviving minority collecting spectacular but insufficient wins.



The field martingale autopsy: steady dimes, collected at -200

The histogram above renders the trade explicitly on a logarithmic scale: the flat pass line is a narrow spire centered near zero; the field martingale is a low plateau of profitable sessions with a monstrous spike at -200 where two-thirds of a million simulated bankrolls died.

The 5-Count, popular in the dice-setting literature, deserves its own verdict. It is a timing filter — bet nothing until a new shooter has survived five counted rolls — and its honest effect is to reduce total action to roughly 43 percent of continuous play, which reduces expected loss in dollars by the same fraction while leaving every edge untouched. A simulation study found it selects genuinely skilled shooters barely more often than random ones while simply eliminating 57 percent of all shooters from betting consideration (Wizard of Odds betting systems[7]). As bankroll conservation it works the way betting less always works. As edge generation it is empty.

The chapter's conclusion is the published verdict, confirmed independently at one million sessions per claim: the best craps play is combinations of pass, don't pass, come, and don't come backed by the maximum affordable odds, and no arrangement of the other bets improves on it (Wizard of Odds betting systems[7]).

Sources

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12. https://wizardofodds.com/gambling/martingale/

Chapter 9 — Controlled Shooting: The Edge That Would Exist

Craps has one live claim to a genuine player edge: controlled shooting, the assertion that a practiced shooter can grip, set, and throw the dice consistently enough to depress the frequency of sevens. The commercial school around Golden Touch Craps teaches that a trained shooter can push the sevens-to-rolls ratio, or SRR, from the random 1-in-6 to 1-in-6.5 or beyond, validated by a 20,000-roll practice regimen (Golden Touch Craps[13]). Stanford Wong's book on the subject takes the claims seriously enough to have staked money on them. The skeptical literature, led by the Wizard of Odds, has tested shooters directly and remains unconvinced (Wizard of Odds appendix 3[14]; Wizard of Odds FAQ[15]).

Rather than adjudicate the empirical dispute by rhetoric, the engine models the counterfactual exactly: suppose a shooter really could reduce the seven's probability by a given factor, redistributing the removed mass proportionally across the other totals. What edge would exist, on which bets, and how many rolls would it take to prove?

Seven reduction	SRR	Pass line EV	Place 6 EV	Rolls to detect
None (random)	6.00	-1.41 percent	-1.52 percent	never
2 percent	6.12	-1.04 percent	-0.21 percent	130,545
5 percent	6.32	-0.45 percent	+1.78 percent	20,683
8 percent	6.52	+0.20 percent	+3.84 percent	7,998
10 percent	6.67	+0.67 percent	+5.24 percent	5,083
15 percent	7.06	+1.94 percent	+8.86 percent	2,219

Three findings organize the table. First, the pass line is a stubborn instrument: even a 5 percent reduction in sevens — an SRR of 6.32, beyond what most proponents claim as typical — leaves the pass line negative, because come-out rolls actively want sevens and dilute the point-cycle benefit. The pass line does not flip positive until the reduction approaches 8 percent. Second, the place 6 and 8 respond roughly three times faster, flipping positive somewhere below a 2.5 percent reduction, because they face the seven purely as an enemy on every roll. This asymmetry is exactly why the dice-setting school bets place sixes and eights rather than the line, and on this narrow point the engine and the proponents agree (Wizard of Odds appendix 4[16]).

Third — and decisively — the detection column. Distinguishing a real 2 percent effect from randomness at conventional statistical power requires on the order of 130,000 recorded rolls; even the generous 5 percent effect needs more than 20,000. A 2025 arXiv paper formalizing the

hypothesis test under two statistical models reaches the same order of magnitude: sample sizes run into the tens of thousands of rolls before a mild effect separates from noise (arXiv[17]). The most famous live experiment, Stanford Wong's 500-roll challenge, needed fewer than 79.5 sevens to win; the probability of passing that bar by pure chance was 32.66 percent, and Wong's narrow success is therefore evidence of almost nothing — a coin that lands heads once has not demonstrated bias (Wizard of Odds appendix 3[14]). A 1,500-roll follow-up produced results matching randomness almost exactly (Las Vegas Advisor[18]).

The verdict of this book is the skeptic's verdict with a precise shape. Controlled shooting is not physically absurd — the required effect is small, and the edge it would create is computed above, real and exploitable if it existed. But the claim has never survived a test with enough rolls to mean anything, the sample sizes required are beyond any published validation, and every properly sized test to date has matched randomness. The doctrine for the field test is therefore: assume random dice, bet accordingly, and treat any tablemate's hot streak as what the lattice says it is — variance wearing a costume.

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Chapter 10 — Session Engineering: Bankroll by Odds Multiple

A session is a fixed number of decisions survived with a finite bankroll, and craps sessions can be engineered with unusual precision because every input is exact. This chapter fixes the session at 100 pass line decisions — roughly three and a half hours at a full table's 30 decisions per hour (Wikipedia[2]) — and asks what each odds multiple does to the experience.

The flat-bet baseline is exact, computed from the binomial distribution over 244/495: expected result -1.41 units, standard deviation 10.0 units, probability of finishing ahead 40.4 percent, with the middle half of sessions landing between -8 and +6 units and the 5th-to-95th percentile span running from -18 to +16.

The engine's campaign of 200,000 simulated sessions per multiple, all with a 200-unit bankroll, fills in the rest of the ladder:

Strategy	Mean net	P(finish up)	P(ruin)	5th pct	95th pct
Pass flat	-1.40	40.4 percent	0.0 percent	-18	+14
Pass + 1x	-1.40	46.9 percent	0.0 percent	-32	+30
Pass + 2x	-1.39	47.9 percent	0.0 percent	-48	+46
Pass + 3-4-5x	-1.41	48.3 percent	0.002 percent	-82	+80
Pass + 5x	-1.38	48.6 percent	0.03 percent	-97	+95
Pass + 10x	-1.29	48.9 percent	5.6 percent	-200	+178

The mean column is the whole doctrine in one line: it does not move. Every multiple costs the same 1.4 units per hundred decisions, because the odds bet is free. Everything else moves dramatically. The probability of a winning session climbs from 40 to 49 percent as odds increase — more sessions end ahead because the distribution widens symmetrically around a nearly fixed, slightly negative center. The price is the tails: at 10x odds, one session in eighteen loses the entire 200-unit bankroll before the hundredth decision, a fate essentially impossible for the flat bettor. The 5th percentile at 10x is the bankroll itself.

Bankroll sizing follows directly. The engine's percentile table says a 3-4-5x player needs roughly 100 to 120 flat units to make ruin negligible over 100 decisions, a 5x player needs about 150, and a 10x player needs materially more than 200 — figures consistent with the community guidance of 20 to 40 times the average total wager for a low risk of ruin (Wizard of Vegas[19]). In dollar terms at a Maryland $15 table with 3-4-5x odds, the average total position is about $57 per decision, the expected session cost is about $21, and the recommended session bankroll is $1,500 to $1,800 —

most of which is working capital for variance, not expected loss.

Hourly cost closes the chapter. A $15 flat bettor at 30 decisions per hour expects to lose about $6.40 per hour with no odds, and the same $6.40 per hour with full 3-4-5x odds while giving action averaging $57 — a lower percentage price than any roulette bet and most blackjack played imperfectly (Wizard of Odds house-edge table[4]). The odds bet buys entertainment volume, win-session frequency, and comp exposure at zero marginal expected cost. What it cannot buy, at any multiple, is a positive sign.

Sources

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Chapter 11 — The Table: Etiquette, Pace, and the Rating Game

Craps is staffed like a small theater: a boxman seated at center supervising the bankroll, a stickman running the dice and the center props, and two base dealers paying the outside, with a floor supervisor above them for markers, disputes, and comps (Wizard of Vegas[8]). The choreography has rules, and breaking them is the fastest way to mark oneself a tourist.

The physical protocol: buy in by laying cash on the layout between rolls, never into a dealer's hand. Keep late bets off the felt once the stickman has pushed the dice to the shooter. When shooting, use one hand, keep the dice visible, and hit the back wall — the bounce off the pyramid rubber is the randomization guarantee, a direct inheritance from the street game's wall, and a soft roll that misses the wall invites a warning (Wikipedia[2]). A new shooter must have a line bet working before receiving the dice, and declining to shoot is always permitted — the dice simply pass to the next player. For a field-test protocol built on observation and small stakes, declining the dice is the recommended default: it removes performance pressure and keeps attention on the ledger.

Tipping is customary and cheap goodwill: a pass line bet placed for the dealers serves the crew far better than the two-way hardways the stickman may suggest, for the pricing reasons Chapter 7 computed. The stickman's continuous auction of proposition bets is not hospitality; it is the casino's highest-margin sales channel operating at conversational volume, and the professional response is a friendly, permanent no.

The rating game rewards the odds player disproportionately. Casino comp systems compute theoretical loss from the rated average bet, and the standard convention is to exclude or zero-weight the odds portion because it carries no edge (Wizard of Vegas[20]). A player with $15 on the line and $75 behind it is typically rated as a $15 player while giving $90 of action at a blended 0.37 percent — accruing seat time and comp credit against a real cost of pennies per decision. Craps with full odds is, for this reason, among the best comp-per-real-dollar-of-edge propositions in the building. The field test logs comps received as data, not as income; but the asymmetry is worth knowing, because it is one of the few places the house's own accounting works in the player's favor.

Pace is the final variable under partial player control. A packed table produces perhaps 40 to 50 rolls per hour; an empty one can exceed 80, with the standard full-table planning figure at 102 rolls per hour (Wikipedia[2]). Since expected loss scales linearly with decisions per hour, the slow, crowded table is mathematically the cheap one — the rare case in a casino where the fun choice and the frugal choice coincide.

Sources

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Chapter 12 — The Field Test: Protocol and Predictions

Doctrine untested is opinion. This chapter specifies a live low-stakes field test of the book's central claims, written before the session so that the session grades the book rather than the reverse — the same discipline the earlier volumes in this series applied to blackjack, poker, and roulette.

The venue is a Maryland casino craps table at the lowest posted minimum available. Maryland's six casinos all spread live craps: Ocean Downs and Rocky Gap post $10 minimums with 3-4-5x odds, Live! offers odds up to 10x, and Horseshoe Baltimore offers the state's best price structure at up to 100x odds (US Casino Advantage[21]; Live! Casino[22]; CasinosAvenue[23]). MGM National Harbor and Live! also operate electronic craps terminals with reported minimums of $1 to $5, an acceptable fallback if live minimums are unfavorable, with the caveat that reported terminal minimums are patron-sourced and should be confirmed on site (COMAR Subtitle 05[24]). Table games including craps have been legal in Maryland since the 2012 amendment to the state gaming law, regulated by the Maryland Lottery and Gaming Control Commission (American Gaming Association[25]).

The protocol, fixed in advance:

1. Bets permitted: pass line at the table minimum, with 2x odds behind every point. Nothing else. No come bets in the first test, to keep the ledger auditable by hand at table pace.
2. Proposition bets placed: zero, regardless of stickman invitation, table mood, or streaks observed. A single prop bet fails the session on protocol grounds whatever the financial result.
3. Session length: 100 pass line resolutions or the stop rule, whichever comes first.
4. Bankroll: 40 flat units. Stop-loss at 20 units down; stop-win at 20 units up. At a $10 table this is a $400 bankroll with stops at plus and minus $200.
5. The dice are declined when offered; the test measures the game, not the tester's throwing arm.
6. Records: every come-out outcome, every point established and its fate, every odds payout, running net after each resolution, plus comps offered and rating behavior.

The engine simulated this exact configuration — pass plus 2x odds, 40-unit bankroll, 20-unit stops, 100-resolution budget — one million times. The predictions, registered here before any chips move:

Quantity	Predicted value
Sessions ending at stop-loss	45.0 percent

Quantity	Predicted value
Sessions ending at stop-win	41.4 percent
Sessions reaching 100 resolutions	13.6 percent
Probability of finishing ahead	48.0 percent
Mean session result	-0.69 units
Median session result	-4.2 units
Middle 90 percent of sessions	-22.4 to +23.0 units
Mean session length	167 rolls, roughly 1.6 to 2 hours

Secondary predictions from the exact lattice: a point will be established on two-thirds of come-out rolls; among established points, the split will run close to 3:4:5 across the 4/10, 5/9, and 6/8 pairs; naturals will outnumber come-out craps two to one; and roughly 37 percent of all resolutions will end in a seven-out after a point is on. Each is checkable from the session log.

The stop rules deserve a note of intellectual honesty: stops do not change expected value — the simulated mean of -0.69 units is simply the exact -1.41 units per hundred resolutions scaled by the shorter average session the stops produce. What stops buy is a hard ceiling on the worst case (-23 units in a million simulated sessions) and a scripted exit, which is behavioral engineering rather than mathematics. The single most likely session shape is a grind to one stop or the other with the ledger deciding by a coin's width — the game is engineered so that nearly half of short sessions feel like vindication regardless of the long-run price.

Grading is mechanical. The session log's observed frequencies are compared against the predicted table; the financial result is compared against the middle-90-percent band; and the protocol items — zero props, stops honored, dice declined — are pass-fail. A session that loses $180 inside the predicted band with a clean protocol grades as a success for the book. A session that wins $200 on a violated protocol grades as a failure. The lattice does not care which outcome makes the better story, and neither should the grade.

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Chapter 13 — Appendix: The Engine and the Tables

Every number in this book traces to one of two places: a published derivation cited inline, or the gamestats engine — an open Python codebase whose craps module computes the game from the 36-outcome lattice up.

The module is organized in three layers. The dice layer represents the lattice with exact rational arithmetic: outcome counts, point-cycle make probabilities, and the 557/165 average rolls per pass decision are all fractions, never floats, so quantities such as 7/495 and 3/220 are produced exactly rather than approximated. The bets layer derives the full ledger of Chapter 6 — line bets, odds blends at any schedule, place, buy, lay, field, hardways, and one-roll propositions — each as a closed-form expectation over the lattice, plus the biased-lattice model of Chapter 9, which reduces the seven's probability by a chosen factor, redistributes the mass proportionally, and reprices every bet under the counterfactual. The simulation layer runs sessions: a pass or don't session with any odds schedule, martingale variants, field and iron cross strategies, with bankroll limits, stop-loss and stop-win rules, and table maximums enforced roll by roll.

Validation gates everything. The test suite asserts the engine's pass line win probability equals 244/495 exactly, the don't pass edge equals 3/220 exactly, every odds bet prices to zero, the blended ladder matches the published anchors at 1x, 2x, 3-4-5x, and 10x, and the ledger reproduces the appendix figures for all 27 bets (Wizard of Odds appendix 1[3]; Wizard of Odds appendix 2[9]). Monte Carlo output is then checked against the exact figures it should converge to: the biased-lattice simulation at a 5 percent seven reduction, for example, returned a mean of -0.4595 percent against the exact -0.4477 percent, within sampling error at the campaign's size. Where an exact distribution is computable — the flat-bet session of Chapter 10, a binomial over 244/495 — the book uses the exact figure and reserves simulation for what algebra cannot reach.

The simulation campaigns behind Chapters 4, 8, 10, and 12 are reproducible from fixed seeds: 200,000 sessions per odds multiple for the session ladder, one million sessions per strategy for the systems chapter, and one million sessions of the field-test configuration. The charts were rendered directly from the campaign output files with no manual adjustment.

The engine's craps module joins the blackjack, poker, roulette, and decomposition modules of the same codebase, and the full source — dice model, ledger, simulators, tests, and campaign scripts — ships alongside this book so that any figure can be recomputed, any assumption varied, and any future table condition repriced without trusting the author's arithmetic. That is the standing invitation of the series: the tables above are not claims, they are outputs, and the reader holds the machine that produces them.

Sources

3. https://wizardofodds.com/games/craps/appendix/1/
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