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Poker Ratings Algorithm - General Overview

Initial Rating & Training

- **Starting Rating:** New players enter training to assess fundamental poker skills, leading to an initial rating between **8,000-12,000**. Players may skip training and start at **10,000**.
- **Rating Range:** Minimum Rating - **4,000**, Maximum Rating - **None**.

Rating Components

- **ROI (Return on Investment):** 50% weight.
 - Formula: $\text{ROI in decimal} * 15,000$
- **Level of Play:** 50% weight.
 - Statistical analysis of in-game decision-making.

Key Percentages in Algorithm

- **Showdown Value:** Percent of all possible hands a given hand can beat.
- **Win Percentage:** Chance of winning a specific hand against opponents.
- **Pot Odds Formula (POF):** The ratio of the current size of the pot to the cost of a contemplated call. It is used to assess the value of a call in relation to the potential return of the pot

Rating Adjustments

- Correct decisions are rewarded less, and incorrect decisions penalized more as the rating increases.
- **Example Adjustment Formula:**
 - $\text{TSD (Total Sum Decision)} > 0: (\text{TSD}) * Z = \text{FSD}$
 - $\text{TSD} < 0: (\text{TSD}) * Y = \text{FSD}$ (Negative outcome)

Betting & Calling Analysis

- **Betting:**
 - **Best Hand:** Assessed based on post-call winning percentages.
 - **Bluffing:** Successful bluffs are rewarded, failed bluffs penalized.
- **Calling:**
 - Analyzed by pot odds and categorized into Good, Bad, or Horrible calls.

Showdown Value & Card Rankings

- **Showdown Value:** This percentage represents how often your hand has a 50% or greater chance of winning against all possible hands at any given time, considering all known information including community cards on the flop, turn, and river. It measures how your hand performs relative to every possible opponent's hand.
- Categorized from "Horrible" ($\leq 5\%$) to "Amazing" ($\geq 95\%$).

River Play

- **Specific Rules:** Special points for betting, folding, or calling based on the hand's strength and all past information is taken into account.

A 10 page detailed overview of the code in fairly readable format is below.

Poker Ratings Algorithm

Every new player enters training. The training will place players into multiple scenarios where fundamental poker skills & knowledge is tested. Based on their performance, players will receive an initial rating between 8,000-12,000. Players can deny training and start at 10,000.

Minimum Rating- 4,000

Maximum Rating- None

Players rating is split into 2 parts. ROI & Level Of Play. Each weighed at 50% respectively.

ROI = Players Lifetime Return On Investment Ratio. Formula = (ROI in decimal)(15,000)

Level Of Play = Statistical analysis on in game decision making.

The Algorithm uses 2 Percentages:

1. Percent of possible hands that a given hand will currently beat (A statistic that any player can calculate). We call this percentage Showdown value.
2. Percent chance of winning a specific hand against an opponent (s). This data is used to determine whether players make correct or incorrect decisions.

As A Player's Rating increases, each correct decision is rewarded less and each incorrect decision is penalized more. Exact Numerical Breakdown Is Below.

Rating Categories

<u>Level</u>	<u>Category</u>	<u>Z/Y</u>	<u>Accuracy</u>
Rookie	Under 4,000	+1/1	50%
Advanced	4,000-6,000	+0.9/1.1	55%
Advanced	6,000-8,000	+0.8/1.2	60%
Bronze	8,000-10,000	+0.55/1.45	72.5%
Bronze	10,000-12,000	+0.5/1.5	75%
Silver	12,000-14,000	+0.45/1.55	77.5%
Silver	12,000-16,000	+0.4/1.6	80%
Gold	16,000-18,000	+0.35/1.65	82.5%
Gold	18,000-20,000	+0.3/1.7	85%
Platinum	20,000-22,000	+0.25/1.85	88%
Platinum	22,000-24,000	+0.2/2.0	91%
Diamond	24,000-26,000	+0.175/2.0	92%
Diamond	26,000-28,000	+0.15/2.0	93%
Master	28,000-32,000	+0.12/2.0	94.5%
Goated	32,000+	+0.1/2.0	95.23%

A Few More Definitions:

- **TSSD**: Total STREET Sum Decision
- **FSSD**: Final STREET Sum Decision

Formula:

- If $TSSD > 0$, then $FSSD = TSSD * Z$
- If $TSSD < 0$, then $FSSD = TSSD * Y$ (FSSD should be negative)
- **FSD**: Final Sum Decision is the sum of all FSSD values from each street.

Example Calculation:

Player 1 Ratings:

- **Pre-Flop:**
 - Rating: +60
 - Calculation: $+60 * 0.1 = +6$
 - Adjusted: $+6 * 0.8 = +4.8$
- **Flop:**
 - Rating: -30
 - Adjusted: $-30 * 1.2 = -36$
- **Turn:**
 - Rating: +60
 - Adjusted: $+60 * 0.8 = +48$
- **River:**
 - Rating: +0 (no adjustment needed)

Final Sum Decision:

- **FSD** = $+4.8$ (Pre-Flop) - 36 (Flop) + 48 (Turn) + 0 (River) = **+16.8**

Each time a player calls a bet. The accuracy of the corresponding decision will be analyzed by pot odds. Pot odds are the ratio of the current size of the pot to the cost of a contemplated call. Call chart below.

CALL CHART BELOW:

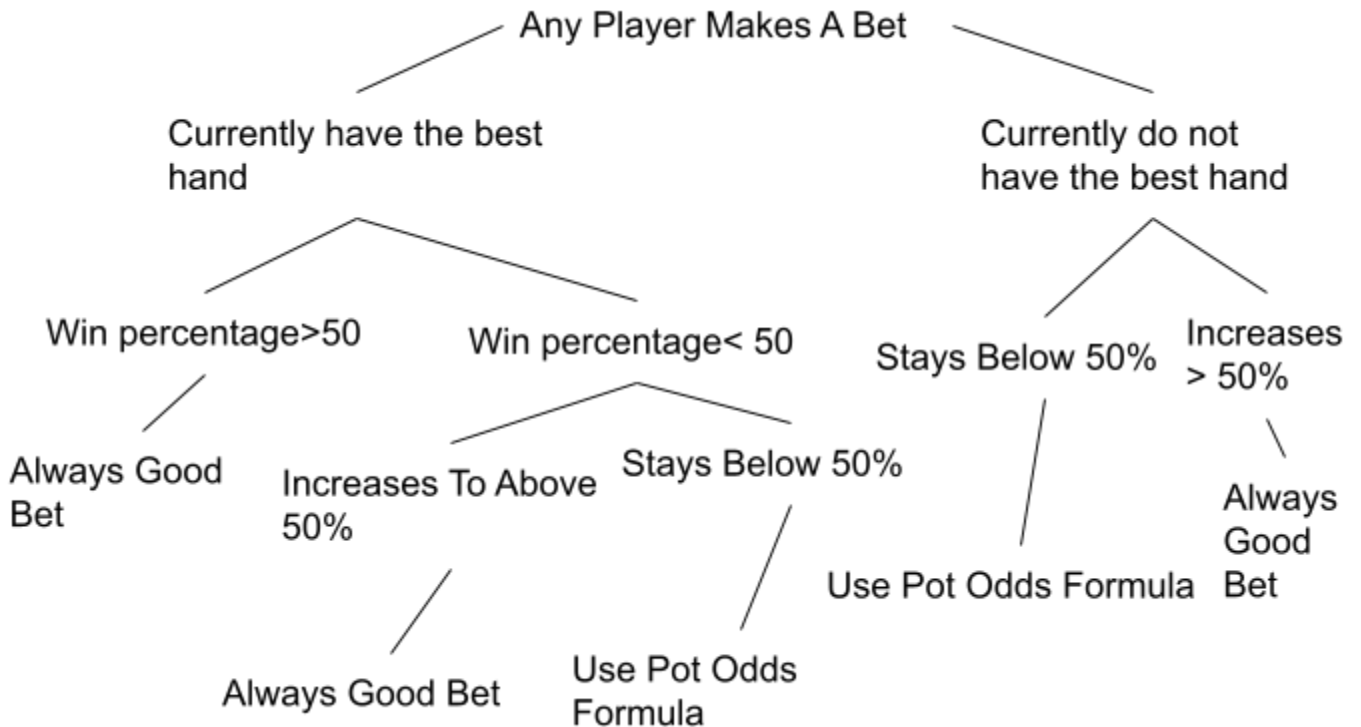
Call Type	POF	Showdown
Horrible Call	≥ 150	
Terrible Call	$75 > \text{POF} \geq 150$	
Bad Call	$75 > \text{POF} \geq 20$	
Non-Penalized Call	$20 > \text{POF} \geq 0$	
Good Call	Negative POF	$100 > \text{Shodown} \geq 80$
Great Call	Negative POF	$80 > \text{Shodown} \geq 30$
Insane Call	Negative POF	$30 > \text{Shodown} \geq 0$

When two requirements they both must satisfy

Betting:

All of the possible categories of bets are listed below. Under the list is a detailed explanation when each of those bets happen.

1. Good Bet
2. Bad Bet
3. Horrible Bet
4. Bad Bluff (Failed Bluff)- Extra points deducted based on circumstances
5. Horrible Bluff (Failed Bluff)- Extra points deducted based on circumstances
6. Successful Bluff (Everyone Folds). If you do not have the best hand and you make a bet and everyone folds. Extra points rewarded based on circumstances.



When Betting there are only 2 potential categories that you are currently in: Either you have the best hand, or you do not have the best hand. When explaining all the different 5 bets, we will split each scenario into 2. Betting with the best hand or betting without the best hand. With the best hand, you either have a greater than 50% winning percentage or currently less than 50.

Best Hand Betting Above 50%

If you make a bet when you have a greater than 50% chance of winning the pot then this bet is a Good bet.

Best Hand Betting But Below 50% Winning Percentage:

Betting with the best hand is not always the right decision. For example, 3 Players & their winning percentage. **Player A 40%** **Player B 30%** **Player C 30%**.

Even though Player A has the best hand, not every bet is a statistically correct bet. For example, if he bets and both players call he will only win the pot 4/10 times. Therefore, the accuracy of his bet is determined by the amount of players that call his bet and the associated pot odds. The reason why you cannot use ONLY pot odds for betting is because It is possible to bet over 100% of the pot. However you cannot have more than

a 100% chance to win, so the Pot Odds Formula could penalize that bet even though it is a statistically correct bet. On the contrary, when calling a bet, you cannot have more than 50% equity so the calling formula always works.

Using the example above. **Player A 40% Player B 30% Player C 30%**. If Player A bets, and only one player calls (either Player B or C) it will Always be a good bet since his winning % will be greater than 50%. Therefore the following rule is in place: If you make a bet (regardless of the amount) and after X people call, and your winning percentage becomes greater than 50% then this is automatically rewarded as a good bet. (Even though your winning percentage was below 50% when you made the bet).

If after betting your winning percentage is still below 50% then your bet runs through the regular Pot Odds Formula. The results are assessed below:

POF NEGATIVE	$20 > \text{POF} \geq 0$	$50 > \text{POF} \geq 20$	$75 > \text{POF} \geq 50$	$\text{POF} \geq 75$
GOOD BET	Non-Penalized Bet	Bad Bet	Terrible Bet	Horrible Bet

Bad/Horrible BET is only for betting with the best hand.

NOT Best Hand Betting:

If your winning percentage becomes greater than 50 after people fold and someone else calls then automatically a good bet which =SUCCESSFUL BLUFF points

If your winning percentage stays below 50 then your bet is analyzed through POF.

BET/BLUFF CHART BELOW

POF Negative	$20 > \text{POF} > 0$	$50 > \text{POF} \geq 20$	$50 > \text{POF} \geq 75$	$\text{POF} \geq 75$
Good Bet	Non Penalized Bet	Bad Bluff	Terrible Bluff	Horrible Bluff

SHOWDOWN VALUE:

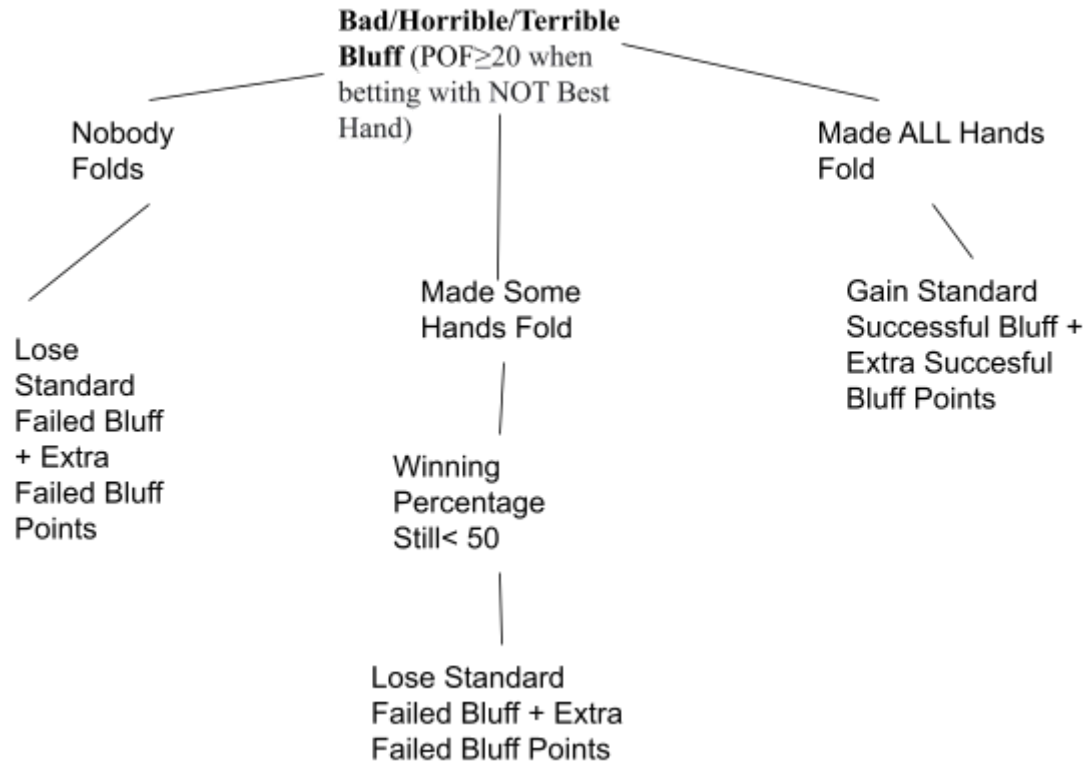
This percentage is the percentage of all possible hands that your given hand is ahead of at any given time. Meaning, out of every possible hand how many of them does your hand have a 50% or greater chance of winning against. All information is taken into account including any cards on the flop, turn, or river. (All information the player knows himself and could theoretically estimate).

Showdown Chart For Card Rankings

Horrible	Less Than 5%
Terrible	5-15%
Bad	15-30%
Ok	30-50%
Good	50-70%
Great	70-95%
Amazing	More than 95

Getting Cracked

Not betting or not re-raising the best hand (by 50% or higher USING WINNING PERCENTAGE) than second highest winning percentage and your hand loses statistical superiority & lose the hand (either fold or at the river).



Premise: If they call you are in a worse position than before.

A bluff is a Bad/Horrible bet with NOT the best hand. A Bad/Horrible Bet is only applicable when having the best hand.

Below are extra river rules as the river is a game in itself.

RIVER

1. On the river you are beat but you bet. Scenarios with you betting first or Re-raise
Successful/Unsuccessful Bluff Extra points apply

Horrible Hand:	Terrible Hand	Bad Hand	Ok hand:	Good Hand:	Great Hand:	Amazing Hand:
Successful Bluff: +50 Failed Bluff: -60	+55, -55	+50, -50	Successful Bluff: +50 Failed Bluff: -45	Successful Bluff: 45 Failed Bluff: -40	Successful Bluff: 40 Failed Bluff: -35	Successful Bluff: 30 Failed Bluff: -30

2. On the river you are beat and he bets and you call- **Bad Call Extra Points Apply**

Horrible Hand: Less than 35%	Terrible Hand	Bad Hand	Ok hand: 35-50%	Good Hand: 50-66%	Great Hand: 66-88%	Amazing Hand: 88%
-65	-60	-55	-45	-40	-35	-25

3. You are beat and he bets and you fold- **correct fold Extra Points Apply**

Horrible Hand: Less than 35%	Terrible Hand	Bad Hand	Ok hand: 35-50%	Good Hand: 50-66%	Great Hand: 66-88%	Amazing Hand: 88%
+10	+15	+20	+30	40	50	60

4. You have winning hand and he bets and you fold- **Incorrect fold Extra Points Apply**

Horrible Hand: Less than 35%	Terrible Hand	Bad Hand	Ok hand: 35-50%	Good Hand: 50-66%	Great Hand: 66-88%	Amazing Hand: 88%
-10	-15	-20	-30	-40	-50	-60

5. You have winning hand and you check and he checks (failed trap, you are any position except last here)= 0, 0, 0, 0, 0, 0, -22
6. You have a winning hand and he bets and you do not re-raise only call) = 0, 0, 0, 0, 0, -10, -15 **(NA)**
7. You have winning hand and he checks and you check (you are last position here)= 0, 0, -5, -10, -15, -20, -30 **(NA)**
8. Opponent bets and You raise on the river with the best hand in order to try to get max value= +60, +55, +50, +45, +40, +40, +30 **(Good Bet Extra Points)**
9. You have winning hand and you bet= +50, +45, +40, +35, +35, +30, +25 **(Good Bet Extra Points)**
10. You are beat and you bet, he re-raises, you re-raise and everyone folds. First bet is a successful bluff and you get +20 for each successful re-raise. If you end up getting called then failed bluff points subtracted and -20 for each failed re-raise. **(Successful bluff/unsuccessful bluff extra points)**
11. You bet, he raises, you re-raise with best hand to try to get max value so each re-raise is= +50, +40, +38 +35 +30, +30, +20 **(NA since initial bet got good bet points already)**

All-in Bet: All Chips

The numbers above are in order from Horrible Hand -> Amazing Hand

Yet to be implemented: Hopefully will be done soon.

1. If unsuccessful bluff (s) leads to you winning hand at any point in future then those bluff (s) turn into +10 each
2. Almost every Rule for River now has “major rule” written next to it. The extra points for river will just use the associated major rule.
3. If New Rule 1 applies, then extra points for bad/terrible/horrible bluffs are not deducted.
4. Created correct/incorrect fold categories (extra points for folding apply as before)

Pre-Flop

1. The first round of Pre-flop you can only lose or gain 10% of gained/lost points
2. The second round of Pre-flop you can only lose or gain 20% of gained/lost points
3. Every round after that you can only lose or gain 30% of gained/lost points

Flop:

60% Of Total Gained/Lost Points

Turn:

70% Of Total Gained/Lost Points

River

80% Of Total Gained/Lost Points

