Yatzee has a few rules You throw 6 dice and then pick out a subset of those dice and can do that 2 times. Total dice throws is therefore 3.

One can after any dice throw then decide from a set of rules to try and maximize ones points. Examples could be 3 dice who have the same value, or full house. I will now preceed to make an algorithm that can closely determine the optimal way of playing Yatzee

Let's begin with a greedy algorithm. It will not reroll any dice and pick whatever gives the highest reward in the near term. For rulepoint i, point function q and dice X, for each round of the game

$$\max_{i \in I_t} q_i(X_1, ..., X_6), I_{t+1} = I_t - i$$

1 Irreducability

My intuition tells me that the game of Yatzee is irreducable, and adding or subtracting rules would mean a completely different solution. i.e, there is no general closed solution to a yatzee game, but instead has to either be analyzed one by one or use maybe some form of reinforcment learning algorithm that approximates the outcomes.

However if you do have a solution to subsets of rules then you could recursively solve the game. Once a rule has been played, the game is now smaller. The optimization algorithm can ignore previous scores for they don't matter anymore. Hence solving simpler systems and the building up like a tree would work.

2 Closed solution to a basic yatzee game

I will begin with this, but I doubt it's generalizable. The only part of the ruleset allowed for now will be the number of dice times their number if they all have the same number.

$$S_t = c*$$

It's a stochastic process