The prediction markets will work in a constant product formula module which balances the options odds based on the cash injected in the game.

**Liquidity Pool**

Each game starts with liquidity providing for equal amount of assets for both options.

Assume that the liquidity provided for option 1 is X and or option 2 is Y. by multiplying both values, we produce K. X\*Y=K

K is a constant that does not change, and it is the value that determines the assets inside the liquidity pool.

The module will work in a manner that will extract tokens from the option in opposition to the option betted on. So, if the player bets on option 1, tokens from option 2 are extracted from the liquidity pool. These tokens are the USDT or whatever tokens are used for betting and providing liquidity. The extraction of these tokens is used for the purpose of calculations. The extracted tokens are reserved for calculations of further bets.

Assume X0 is the initial liquidity for option 1 and Y0 is the initial liquidity for option 2. A player betting on option 1 for the amount X. The new balance of option 1 liquidity is X1 and for option 2 liquidity is y1 where x1=x0+x and y1= y0-y

To determine the value of y we shall first determine the value of y1 which is k/x1. Once y1 is obtained, we calculate y which is y=y1-y0.

The amount y extracted from the liquidity pool is reserved aside. Tokens reserved aside always refer to the option having less bets than the other. If players bet on option 1 more than option 2, then tokens of option 2 are extracted from the liquidity pool and the balance of option 2 in the liquidity pool is less than its initial balance.

**Odds**

The odds that appear to the user while betting for each option is the sum of balances of both options in the liquidity pool divided by the balance of the option itself: Odds of option 1=(x+y)/x

And odds of option 2=(x+y)/y.

These are the odds that appear on the screen but not the locked odds given to the player as price slippage occurs here.

The odds given and locked to the player are determined based on the liquidity extracted from the option opposite to the bet and divided by the bet amount after deducting fees. So, if a player bets 1000$ on option 1 and based on the constant product formula the token extracted from the liquidity pool of option 2 are 500 then the locked odds are 1.5 before fees.

The player should know the odds he is locking.

**Reserved Tokens**

Tokens extracted from the liquidity pool are USDT or whatever token is used for the betting in the liquidity pool.

The extraction of tokens from the liquidity pool is for the purpose of calculating the new balance of tokens in the liquidity pool and giving the liquidity the next odds for the next bet.

On a side sheet, calculate the difference between total bets on option 1 and option 2. There should always be reserved tokens for the options that have fewer total bets. If option 1 total bets exceed that of option 2 then option 2 has the reserved tokens and not 1.

Assume that the difference between total bets on the two options is called the net value.

In liquidity pool, through the constant product formula, the tokens that enter the liquidity pool are the order performed by the buyer or player, the tokens that get out of the liquidity pool of this order are determined by the constant product formula. Then in our case we will determine the tokens that get extracted from liquidity pool or enter it.

We will have two scenarios where players are betting on one side and each scenario shows either positive or negative net value for an option of the two.

Assume a player is betting on option 1:

* If the net value of option 1 is positive, then historically players bet on option 1 more than 2. In this case any new bet occurring on option 1, the bet amount will be added to the balance of option 1 which is x and the new balance of y is determined by k/x1. Y tokens are extracted to the reserve pool. Y is the difference between Y tokens before and after the bet.
* If net value of option 1 is negative then historically players better on option 2 more then 1. In this case any new bet occurring on option 1, the new balance of option 1 in the liquidity pool which is x is determined by returning tokens from the reserve. The number of tokens to be returned from the reserve is determined by how much this bet represents the previous net value in absolute terms which is . This way we obtain a ratio and multiply this ratio by the reserve tokens to know how many tokens are to be returned to the liquidity pool.

**Fees**

Fees are collected from the winning part of the bet which means the odds given to the players will be net of fees. These fees will depend on the input in the backend that the team sets. It can vary from 0% to 10% or higher depending on the team’s revenue strategy. Fees are calculated as a percentage of the tokens extracted from the liquidity pool of the option opposite to the one bet on. If user bets on option 1 for 1000$ and the liquidity pool extracted 500$, we deduct the percentage set by the team from the 500$ and the player wins the 500$ net of fees. If fees were set at 5% then the reward of the player if he wins will be 475$. Then the locked odds of the player are 1.475.

Fees are collected separately to an account to be distributed between the team and liquidity providers.

**Liquidity Providers**

Liquidity pool is provided by providers or by the team. Anyone can provide liquidity and even more than one participant. They all must provide it before the game starts.

Liquidity shall start with equal balances on both sides, which means equal amounts for options 1 and 2 which gives equal odds of 2 for each option.

LP collects the fees generated in the game and then collects the remaining assets in the LP after the game finishes. They might lose a portion of their investments in the game due to reward distribution but never more than their investment.

LP fees and remaining assets are collected by providers proportional to what they provided initially.