BPL

Problem Description:

“It’s been a tremendous match going on. Dhaka Dynamites against Rangpur Riders. Rangpur Riders created a history by making 206 runs in T-20 format. Dhaka is chasing with their full sole.And now,yes!The most crucial moment of the match,the death over will start.Dhaka needs 37 runs from 6 balls and mighty Shakib Al Hasan is at the crease. Well it’s impossible at this moment.”

“Well, that surely was a surprise.Nobody ever imagined Dhaka will do this. They just did the impossible and won the match and no other Shakib Al Hasan again proved himself why he is a top class player. Dhaka won by making 6 sixes back to back and with the wide ball they managed to take 37 runs in the last over.That was surely eye pleasing.”

Actually the description which you were reading, that was commentator saying at the final of BPL. He said, it was impossible but at the end it wasn’t,the result was different.This kind of predictions like “winning/losing/if there is chance” can be predicted mathematically by the idea of average and probability. Average is basically an idea of normal distribution,which actually calculates all the possible scenarios, then computes an approximate value which centralizes all the other values meaning that all the other values will be something near this value.

Now, here we will predict something like this. But much more simpler.

In our cricket, in each ball either players can take

**a single run(1 run),**

**double runs(2 run)**

**three runs(3 run)**

**four runs(4 run):** Four runs can be taken in many ways like by hitting a boundary or taking four singles

**five runs(5 run):** Five runs can be taken in many ways like taking five singles at a stretch

**Six runs(6 run):** Six runs can be taken in many ways like by hitting a boundary or taking six singles at a stretch

There are some extra additional ways to have runs. Like by

**Wide ball -** A free ball which will give you an additional free run and number of balls will not reduce. And in wide balls it’s also possible to take other runs.So in these cases balls will not be counted and only runs will be counted and by this in wide ball we can have runs from 1 to 7. (For simplicity here we are just summing the runs like wide ball is 1 free run plus other runs)

**No Ball** - This type of ball will give you an additional free run plus this ball will not be counted and he will get another free ball. Definition of free ball is he will not get out but he can have any amount of run from 1 to 7[including the chance of having wide ball] and also including another no ball. But remember two free runs are never given in each ball.Like the ball which is a no ball actually gives wide and the player also take some runs in the ball. Then the runs taken by the batsman and no ball is counted altogether.A no ball will never intermingle with a wide ball.It has greater preference.But it can intermingle with other ways of taking runs.

In our problem we will give you the probabilities of scoring 1,2,3,4,5,6 runs and having a wide ball and having a no ball in each delivery delivered by the baller denoted as **one,two,three,four,five,six,wide,no**. **For simplicity we are assuming all the events are independent of each other. Also in our simpler version a player can have at most 7 runs in a single ball where maximum run will be if he is able to take six runs in a no ball or in a wide ball.Look “wide ball” and “no ball” they never occur at a time and “no ball” has greater preference over “wide ball” and so if they occur all together it will be counted as “no ball” and will get free ball and run for it.He can also increase his run in “no-ball” if he can take some additional runs (from 1 to 6) in that ball.Same thing can happen by taking some extra runs in an wide ball.**

We will also give four parameters like,

**str\_wide** - maximum number of wide balls can occur at a stretch

**max\_wide =** maximum number of wide balls can occur at the match

**Str\_no =** maximum number of no balls can occur at a stretch

**max\_no** = maximum number of no balls can occur at the match

Then we will give you a score **scr** and remaining wicket number **wkt and** probability of falling wicket in each delivery as **pwkt**. Under these probabilities you have to say in an average case how many numbers of balls are needed to do this score at least. **Remember we are considering here in each ball either a player will get some runs or he will get out , leaving a ball or not taking any run is not considered here. So each ball must provide some run to the batsman or it will out him.When at a ball the team achieves the score which is greater or equal to target, the game stops at that ball.**

Solution:

Dynamic Programming,Expectation value

Given the probabilities we need to calculate the expected number of balls which are needed to do the targeted score.And definitely game stops at that ball, if the team has already acquired the targeted score.

Our all the events are independent.So we know the probability of two independent events occurring is the multiplication of two events’ probabilities. which is P(A and B) = P(A) \* P(B)

Now in this problem we just need to simulate the cases for each ball. When a player scores some runs in a ball, suppose he scored four run, it means other runs are not taken by him.

so probability of four occuring and others not occuring will be multiplied here. so the total probability of scoring four in a ball is

P(scoring 4) \* p(not scoring 1)\*p(not scoring 2) \* p(not scoring 3) \* p(not scoring 5) \* p(not scoring 6)\*p(not having a wide ball) \* p(not having no ball)

if the score is x then after scoring 4 runs we need to calculate