Hello,

If you are not familiar with keno game, you can read from <https://en.wikipedia.org/wiki/Keno> and play sample game here: <http://www.kenoonline.org/>,

And you may also want to read: <http://www.elem.com/~btilly/kelly-criterion/> and <https://en.wikipedia.org/wiki/Kelly_criterion>

Now lets look at a keno game with;

i) a total of 80 numbers, from 1 to 80

ii) System drawing 20 numbers.

iii) you pick 10 different numbers

xi) you will be paid down to 5 correct selection. (>= 5)

1: Write a program in any language you prefer that can simulate this game. (with the following parameters, and output requirements)

i)                    Game setup: Total number is 80 and Number of draws is 20

ii)                   Selections: a list of you selected numbers (default length 10).

iii)                  Result should include 20 randomly draw numbers and total numbers of selections being matched

2: Compute the probability for each category: Matching 5, 6, 7, 8, 9, 10 numbers, and what Odds (Decimal odds) do you think is fair for each winning category independently? (5,6,7,8,9,10)

Suppose I am offering a keno game, with a table of pay-outs as follows:

For Matching 5: pay-out is 3.00

For Matching 6: pay-out is 15.00

For Matching 7: pay-out is 100.00

For Matching 8: pay-out is 1,000.00

For Matching 9: pay-out is 25,000.00

For Matching 10: pay-out is 2,500,000.00

The unit stake is 1£.

3: Suppose you are a gambler would you like to play the keno game I offered and why?

4: Suppose you are a director of an insurance company with 20 million capital (Kelly bankroll). The game provider asking you to give an insurance quote for matching 10 numbers for the above keno game. (If somebody wins matching exact 10 numbers, the insurance company pay the full 2.5 Million). How much do you want to charge (insurance premium) to insure each 1£ entry?

5: Compute the expected value: a(i,j), (with the above Keno pay-outs and unit stake settings)

where i denote the number of draws that have already placed

and j denote the total number of matched selection after ith draw.

More specifically, a(i,j) denote the expected value at ith draw given you have j numbers of matched selection at that moment.

For simplicity, you can assume 7 <= i <= 19, and 7 <= j <= 9

6 Imagine a keno machine experiencing some technical problems, some numbers are being selected with a slightly higher probability.

i)                   Describe How can you mathematically/statistically justify which number(s) is being overly selected?

ii)                 Writing a code to justify your answer (optional)

Please write a short report for above questions. Please kindly includes necessary outputs, codes (or excel work book), explanations, and discussions.