

NBA Hackathon Problem 1

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(a)

Approach 1: Exact answer

The exact probability that the Warriors would never lose consecutive games at any point during an 82-game season is as follows,

$$\sum_{x=41}^{82} \binom{x+1}{82-x} 0.8^x 0.2^{82-x}$$

Above sum is approximately 0.0588169.

Approach 2: Simulation

(Note: code for simulation see separate attached file). We build a simulator that simulates many 82-game seasons. Each 82-game season is binomially distributed with a success probability of 0.8 ($p = 0.8$) and a failure probability of 0.2 ($q = 1 - p = 0.2$). We draw random samples of size 100 from the binomial distribution and count the number of samples where the Warriors does not lose consecutive games at any point in a given 82-game season. This way we obtain an approximated probability. We repeat this process n times (we choose n to be 1000 to ensure that law of large numbers applies). After repeating for 1000 times, we obtain an averaged probability of 0.05913 and a standard error (variability) of 0.0236876. We are 95% confidence that the true probability lies within the interval (0.0544872, 0.0637728). @

(b)

The null hypothesis is that the Warriors would never lose consecutive games at any point during an 82-game season, that is $P(\text{no consecutive losses}) = 100\%$. From above simulations, we can calculate a 95% confidence interval, which is (5.4487223%, 6.3772777%). Since it does not contain 100%, we reject the null hypothesis.

(c)

This question is easy to derive from the exact solution in the form presented in (a). The answer is calculated to be 90.3772241%.