**#1) REQUIRED: After the Golden State Warriors acquired former MVP Kevin Durant in 2016, some NBA fans speculated that the Warriors would not lose consecutive games at any point of the season.\***

**a) If you wanted to determine the probability that this prediction would be true (i.e., that the Warriors would never lose consecutive games at any point during an 82-game season), what is one approach (or a few approaches) you may use to solve the problem? What answer do you get? Exact answers are of course welcome, but approaches that lead to approximations (and those approximations) are fine, too (please specify the precision of your estimate). Assume the Warriors have an 80% chance of winning each individual game.**

There were two approaches taken to solve this question:

1. Brute force method where a computer program would calculate all the permutations and then check for the probabilities of two losses in a row. This ended up becoming a big problem as the number of games increased as the total number of permutations is 2n where n is the number of games. Python could not exceed 25 games on a regular CPU. The decision to either go with a more powerful computer (ie. Using a GPU to do parallel processing) or to create a curve based off the first 25 games. The latter was picked and an approximation of 80% for game 82 was predicted.
2. The second approach was not as computationally expensive. Rather, it required some analytical engineering of the problem into an equation that could eventually be solved recursively.  
   The idea behind this approach is that a function can be created to recursively calculate F(82) by checking the previous outcomes since we need to have two losses in a row.

A(n) = P\_W \* A(n-1) + P\_L \* ( P\_L + P\_W \* A(n-2))

The first part of the equation states that if game n is a win, you multiply the probability it's a win times the outcome of the previous game. The second part states that if game n is a loss, you the probability it's a loss times the probability that the previous game was a loss (hence two losses in a row) plus the probability that two games before it was a win and thus you continue recursively.

Given the formula, two methods can be employed to solved for n = 82. The first is to start at A(1) and A(2) to calculate A(3) and then iteratively calculate for A(4), A(5),… A(82). This would require a simple loop and can be found in the attach Recursions.pdf file. The second method is that lazy-man approach by plugging the equation and the two initial points into WolframAlpha to get a Recurrence Equation Solution and then plug in n=82 into that formula.

**A(82) = 0.9411831355860754**

Hence, the probability of getting two losses in a row for the Golden State Warriors in 82 games is approximately **94%** given that Warriors have an 80% chance of winning each individual game.

