

Adrian deCola  
Professor Mwaura  
CS 5008  
Jan 23, 2023

## Guessing Game Write-Up

In the worse case, how many guesses would our guessing game take to get the right answer if we had no hints at all? Explain.

In the worst case scenario, each round of our guessing game would take 10 guesses for a total of 50 guesses. This is because we could guess each of the numbers wrong before eventually guessing the right number if there are no hints.

In the worst case, how many guesses does it take to get the right number if we get a hint of "higher or lower" when guessing numbers 1-10 **and** guess intelligently (always picking in the middle of the remaining set of numbers)?

Suppose we get a hint, "higher or lower", when guessing the numbers 1-10 and guess by always picking the middle of the remaining set of numbers. In this case, the worst case number of guesses each round will be 4. This is because we can always eliminate half the set by guessing in the middle of the set. We can do this until there are no more numbers remaining. As we explored in CS 5002, the worst case number of guesses takes the form of  $\text{floor}(\log(10)+1)$  as we have 10 numbers to guess from. The log is related to the fact that we halve our remaining numbers each time and the  $\text{floor}(x + 1)$  rounds this integer up and also makes this consistent on powers of 2 like 2, 16, or 32 where we would need 2, 5, and 6 guesses respectively.  $\text{floor}(\log(10)+1) = 4$  so in the worse case scenario, each round, we will need 4 guesses if we guess intelligently.