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Data Analysis (excel/screenshots):

A screenshot of a cell phone

Description automatically generated

A screen shot of a computer

Description automatically generated

Figure Example output for recursive call excel data

A screenshot of a cell phone

Description automatically generated

A screen shot of a computer

Description automatically generated

Figure Example output for non-recursive call and excel data

Analysis:

The data created from both non-recursive and recursive algorithms of tower of Hanoi concluded in a very interesting result. We created both programs with a timer to see the duration between points in the program when the tower of Hanoi method is called and completed. The recursive program has a count variable to assure our disks were being moved correctly and was performing the correct moves. Figure 1 provides the data collected for recursive tower of Hanoi and figure 2 is for the non-recursive call.

For the recursive program, we found that as the n disks increased, the program was faster than the non-recursive program from figures 1 and 2. However, the smaller n was, the faster the non-recursive program was than the recursive program. Around n = 6, is when the recursive call performs tower of Hanoi faster than the non-recursive from the figures above. Depending on the input values for both programs, we assume that the recursive call is generally a more efficient program due to its reliability on more disks.

A screenshot of a cell phone

Description automatically generatedWe believe the reason the recursive call was slower with smaller n values was because of how the recursive call was performed. In this screenshot, we highlighted the code fragement we think caused the longer duration. Because of this code, the program cycles through every n value recursively, until it reaches n = 1. Then it begins to move disks from each rod, after all those movements were created. Due to this, it takes a little bit longer for smaller numbers of n to completely finish the method call.



In conclusion, the recursive tower of Hanoi is faster if we exclude the time it takes for the program to set n = 1 to begin moving the first disk. The non-recursive method takes an exponentially longer time than the recursive, and we see greater differences in times the bigger n gets. It was interesting to see both data’s exponentially growing as n increased for both method calls.

The work was split up 50/50 for this assignment between Nico and Fernando.