# Detailed Analysis: Pseudocode Execution Counts

This document provides a detailed analysis of the number of times 'Ping' is executed for each given pseudocode. The analysis includes calculating exact counts and determining time complexity. Each pseudocode's performance is also compared based on these metrics.

## Pseudocode 1:

for j in 0 . . . n do  
 for k in 0 . . . j + 1 do  
 Ping

Analysis: The outer loop iterates from 0 to n, inclusive, resulting in n+1 iterations. For each iteration of j, the inner loop runs from 0 to j+1, inclusive, resulting in j+2 iterations of 'Ping' for each j.

Calculation of Total 'Ping' Executions:

Total Executions = 2 (when j=0) + 3 (when j=1) + 4 (when j=2) + ... + (n+2) (when j=n).

This is an arithmetic series with the first term 2 and the last term n+2, over n+1 terms.

Sum of the series = (n+1)(2 + (n+2))/2 = (n+1)(n+4)/2.

Time Complexity: O(n^2).

## Pseudocode 2:

i ← 1  
while i ≤ n do  
 Ping  
 j ← n  
 while j > i do  
 Ping  
 j−−  
 i++

Analysis: The outer loop runs n times, with one execution of 'Ping' per iteration. For each i, the inner loop runs n-i times, decrementing j from n to i+1.

Total Executions = n (from outer loop) + (n-1) + (n-2) + ... + 1 (from inner loop).

Sum of the series = n + n(n-1)/2 = n(n+1)/2.

Time Complexity: O(n^2).

## Pseudocode 3:

Ping  
i ← 1  
while i ≤ n do  
 Ping  
 j ← 1  
 while j ≤ i × i do  
 Ping  
 j++  
 i++

Analysis: Starts with a single 'Ping'. The outer loop runs n times, executing 'Ping' once per iteration. For each i, the inner loop runs i^2 times.

Total Executions = 1 (initial) + n (outer loop) + 1^2 + 2^2 + ... + n^2 (inner loop).

Sum of squares = 1 + n + n(n+1)(2n+1)/6.

Time Complexity: O(n^3).

## Comparison of Pseudocodes:

Pseudocode 1 and 2 both exhibit quadratic time complexities (O(n^2)), suitable for medium-sized datasets. Pseudocode 3, with its cubic time complexity (O(n^3)), is less efficient for larger datasets due to the exponential increase in executions. This makes Pseudocode 1 and 2 preferable for larger inputs where performance is a critical factor.