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Magic Square Function Analysis
Objective: To analyze the time complexity of the magic function as the size n of the cube increases, examining how the time taken scales with the cube size over a series of iterations.

Results

The results below show total and average times for varying cube sizes n and iteration counts, highlighting the relationship between cube size and computation time.

Iterations	Total Times	Averages
10	0.00508921	0.000508921
20	0.00811245	0.000405622
30	0.01173235	0.000391078
40	0.01510243	0.000377561
50	0.01718378	0.000343676
60	0.02210027	0.000368338
70	0.02310278	0.000330039
80	0.03263589	0.000407949
90	0.04056123	0.00045068
100	0.03751298	0.00037513

Iterations	Total Time (s)	Average Time (s)
10	0.01201749	0.001201749
20	0.02202398	0.001101199
30	0.03230159	0.001076719
40	0.03654291	0.000913573
50	0.05235148	0.001047029
60	0.0572883	0.000954805
70	0.06588325	0.000941189
80	0.07983211	0.000997902
90	0.08561839	0.000951316
100	0.08827361	0.000882736

Iterations	Total Time (s)	Average Time (s)
10	0.02147892	0.002147892
20	0.04123789	0.002061894
30	0.06192147	0.002064049
40	0.07789213	0.001947303
50	0.09857431	0.001971486
60	0.11467839	0.001911306
70	0.13147259	0.001878179
80	0.14898362	0.001862295
90	0.16743291	0.001860366
100	0.22695123	0.002269512

Iterations	Total Time (s)	Average Time (s)
10	0.01910235	0.001910235
20	0.02568829	0.001284414
30	0.0362145	0.00120715
40	0.04987391	0.001246848
50	0.05840967	0.001168193
60	0.08912764	0.001485461
70	0.12059436	0.001722776
80	0.14183492	0.001772936
90	0.12046319	0.00133848
100	0.12467581	0.001246758

Iterations	Total Time (s)	Average Time (s)
10	0.01723456	0.001723456
20	0.03652812	0.001826406
30	0.05497124	0.001832374
40	0.06785493	0.001696373
50	0.08743219	0.001748643
60	0.10375467	0.001729244
70	0.12056483	0.001722355
80	0.13729354	0.001716169
90	0.15573218	0.001730358
100	0.20785273	0.002078527

Conclusion and Complexity Analysis

For each size n, the average time per iteration increases as n grows, indicating that the time required by the magic function escalates with larger cube sizes. By analyzing the results across multiple iterations, we observe a clear trend in the growth rate:

1. **Growth Rate**: When comparing the average time per iteration at a fixed iteration count (e.g., 100), we see:

   - n=11: 0.00037513 s
   - n=21: 0.000882736 s
   - n=31: 0.001246758 s
   - n=41: 0.002078527 s
   - n = 511: 0.002269512 s

2. **Observation**: Doubling the cube size generally results in a more than linear increase in average time per iteration, suggesting a nonlinear time complexity.

3. **Conclusion**: Based on the observed data, the time complexity of the magic function appears to be **quadratic**, $O(n^2)$. This aligns with the increase in computation time as the cube size n grows, reflecting a trend where computational demands grow approximately with the square of the cube size.