Recursion is a programming technique where a function calls itself to solve a problem by breaking it down into smaller, similar sub-problems.

Benefits:

- **Simplifies** problems like tree traversal, factorials, Fibonacci, etc.
- Easier to read/understand in problems with repetitive patterns.

Setup: Recursive Future Value Calculation

Problem:

Given:

- Initial value (e.g. investment amount)
- Annual growth rate (e.g. 5%)
- Number of years

Analysis

1. **Time Complexity:**
    - **O(n)** where `n = number of years`.
    - Each recursive call reduces the problem by 1.
2. **Problem:**
    - **Stack overflow risk** for large `n`
    - **Redundant calculations** (if extended to more complex forecasting)

Optimization: Use Memoization or Iteration

```
public static double PredictFutureValueIterative(double initialAmount,
double rate, int years)
{
    double result = initialAmount;
    for (int i = 0; i < years; i++)
    {
        result *= (1 + rate);
    }
    return result;
}
```

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