Stack & Monotonic Stack — Illustrated Guide

Monotonic Stack Patterns

- Decreasing stack (values downwards): helps find "next greater" to the right.
- Increasing stack (values upwards): helps compute spans or areas (histogram).
- Always consider pushing indices (not values) to derive widths and distances.

Included Problems

1) Next Greater Element — decreasing stack of indices
2) Daily Temperatures — decreasing stack of temperatures
3) Largest Rectangle in Histogram — increasing stack; sentinel 0 flush
4) Stock Span — decreasing stack of prices
5) Valid Parentheses — classic push/pop matching

Complexities

All stack scans are O(n) time (each index pushed/popped ≤ 1), O(n) space.

Implementation Tips

- For histogram area: width = current_index - last_smaller_index - 1
- For distance-to-next-warmer: store indices to compute i - j
- Append sentinel when you need to flush remaining stack content