

Minimum Size Subarray Sum

For this problem we need the shortest subarray whose sum \geq target.

Approach 1: Sliding Window ($O(n)$):

- Key Idea:
- Use two pointers (start, end) to maintain a sliding window.
 - Expand end to increase sum.
 - Shrink start when sum \geq target to minimize length.

Algorithm:

1. Initialize:
 - sum = 0
 - minLen = INT_MAX
 - start = 0
2. Loop end from 0 to $n-1$:
 - Add $\text{nums}[\text{end}]$ to sum
 - While sum \geq target:
 - Update $\text{minLen} = \min(\text{minLen}, \text{end} - \text{start} + 1)$.
 - Subtract $\text{nums}[\text{start}]$ and increment start.
3. Return minLen if found, else 0.

Complexity:

- Time: $O(n)$ (each element visited at most twice)
- Space: $O(1)$

Follow-up: $O(n \log n)$ Solution:

Idea: Use prefix sums + binary search:

- Build prefix sum array.
- For each i , binary search for the smallest j such that $\text{prefix}[j] - \text{prefix}[i] \geq \text{target}$.