

1. Let t denote the total number of laps. The time for each lap grows exponentially, so the optimal solution uses each tire at most $O(\log U)$ laps. Let $c[i]$ denote the minimum time for i laps, we can compute c in $O(n \log U)$ time. Then perform DP in $O(t \log U)$ time. $O((n + t) \log U)$.
 2. $O(n \log \log U)$. <https://leetcode-cn.com/problems/minimum-time-to-finish-the-race/solution/on-log-log-ude-zuo-fa-by-hqztrue-3vpx/>
- We can further get $O(n + \text{polylog } U)$ for integers, by [1].

References

- [1] Mihai Pătraşcu and Mikkel Thorup. Dynamic integer sets with optimal rank, select, and predecessor search. In *2014 IEEE 55th Annual Symposium on Foundations of Computer Science*, pages 166–175. IEEE, 2014.