DP, like dijkstra.
1. $O(n^2)$. there's a pruning strategy: let $f[i]$ denote the best result when i is the last number, U be the largest number in input and $t \le t^*$ be the current best solution, if $f[i] + \log_2 \frac{U}{i} \le t$ then the number i is not useful.
2. the number of divisors of U is $2^{O(\frac{\log U}{\log \log U})}$, where the exponent is $\approx \log 2 \cdot \frac{\log U}{\log \log U}$.
https://en.wikipedia.org/wiki/Divisor_function
the total running time is $n \cdot 2^{O(\frac{\log U}{\log \log U})}$.

References