

1. specifications

n people are on hold, waiting for a single tech support operator. Let t_i be the time it will take to solve person i 's problem. (The t_i times are known in advance.) In what order should the operator handle the calls in order to minimize the total waiting time? (The total waiting time is the sum of the times each person has to wait until the operator answers her call.)

input: n people with length of call (t_i) for each person

output: ordering of the people

legal solution: everyone is included and not repeated in the ordering

optimization goal: minimize total waiting time

2. examples

3. targets

4. tactics

5. approaches

flavor – ordering

process input – for each caller, put them in the proper place in the ordering of calls to answer

produce output – repeatedly pick the next call to answer

greedy choice

process input – what's the proper place for a particular call?

produce output – what's the next call to answer?

a) greedy strategies

what's the next call to answer?

- any one, it doesn't matter
- **shortest first – maybe? it's not longest! plausible**
- longest first – definitely not plausible ...
- most averageist – doesn't seem compelling

b) counterexamples

6. main steps

repeatedly

pick the shortest remaining call to answer next

7. exit condition

when all the calls have been answered

8. setup

ordering is initially empty

9. wrapup

nothing to do – ordering is what we want

10. special cases

what if all the calls are the same length? doesn't how the tie of shortest is broken

11. algorithm

the ordering is empty

repeat

pick the shortest remaining call to answer next

until all the calls have been answered

12. termination

a) measure of progress

b) making progress

c) reaching the end

13. correctness

a) loop invariant

after k calls have been answered, no repeated calls and the total waiting time due to the k calls so far in algorithm's solution so far is less than or equal to the total waiting time ... in the optimal's so far

b) establish the loop invariant

c) maintain the loop invariant

d) final answer

14. implementation

15. time and space