3.

1.Let’s call the optimal set, O.

2.Let’s call our algorithm, A.

3.For all indices r ≤ k we have f (ir) ≤ f (jr).

we will simply show

that |A| = |O|, that is, that A contains the same number of trucks as O and

hence is also an optimal solution.

Let i1, . . ., ik be the set of boxes in A in the order they were added to A. Note that |A| = k. Similarly, let the set of boxes in O be denoted by j1, . . ., jm. Our goal is to prove that k = m.

I prove this by Contradiction.

Hence, we assume that A is not optimal, then an optimal set O must have more requests, that is, we must have m > k.

Applying 3 with r = k, we get that f (ik) ≤ f (jk). Since m > k, there is a

request jK+1 in O. This request starts after request jk ends, and hence after

ik ends. So, after deleting all trucks that are not compatible with trucks

i1, . . ., ik, the set of possible trucks R still contains jK+1. But the greedy

algorithm stops with request iK, and it is only supposed to stop when R is

empty—a contradiction.

7.

First sort the tasks based on pi, as in the shortest time be the first one to feed into the supercomputer and the longest one be the last one to be fed into the supercomputer

Then

For each job in the sorted array, J1,…,Jn

If Pi is over

Then pass this job to a PC

endIF

increment the job in the array, J++

endfor

This is O(n) which is polynomial

12.

a. FALSE,

Let’s have (b1, t1) = (500, 1), (b2, t2) = (1000, 1) and r=800

Here, the combination of two is less then rt: 500+1000 < 800\*2

But the second stream itself is larger than r: 1000>800

b.

The algorithm should check if the btotal<r\* ttotal

First, Sort the streams based on their bits from the shortest to the longest.

For each stream, b1,…,bn

bitTotal= bitsTotal + bi

if bitTotal > r

then return false // didn’t meet the requirement

endif

endfor

return true // there is a valid schedule

16.

First sort times of Xs in non-decreasing order and sort other intervals by ending times

Then For each time in x

Match each x with the earliest ending unmatched interval.

If that was possible and xi > ti -ei

Then we have our match, return true

Endif

Endfor

Return false, nothing found