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Question 3

Firstly, we count the number of trains that stay overnight (i.e. arrive before midnight and depart after midnight). These trains will obviously already have a clash. We set this number as our initial number of platforms.

Then, we store a trains' arrival and departure times as an array within the list of our schedule

$$L = [\{a_0, d_0\}, \{a_1, d_1\}, \ldots \{a_{N-1}, d_{N-1}\}]$$

i.e.: $[\{1130, 0640\}, \{1050, 0600\}, \{0520, 0730\}]$

And we sort the list from in ascending order based on a trains' departure time (second index of each element)

This is completed in $O(logn)$ time

Then, we enter a loop and compare the departure time of our first train, d_0 with each arrival time of the remaining trains in our list (ignoring the trains as stated at the beginning). If the arrival time $a_{1\ldots N-1}$ is earlier than the departure time d_0, there must be an overlap and hence another platform must be added.

This is completed in $O(n)$ time.

Pseudocode:

Sum total trains which arrive before midnight, arrive after midnight = p

Enter arrival and departure times into a list L as $\{a_i, d_i\}$ for each train, simultaneously sort this in ascending order respective to departure time.

for (int i = 1; i < N; i++)

(ignoring all pre-midnight arrival & post-midnight departure trains)

if $a_i \leq d_0$ p++

endif

end for