HOMEWORK 3

COMP3121 - ALGORITHM DESIGN

QUESTION 3

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SOLUTION

```
def platform(trainTimes):
      # store the arrival and departure times separately
      arrivals = []
      departures = []
      for time in trainTimes:
            arrival, departure = time[0], time[1]
            # if train arrives on previous day and leaves next day
            # split the arrival and departure times to treat as different trains
            # (arrival, 12 AM) and (12 AM, departure)
            if arrival > departure:
                  arrivals.append(0)
                  departures.append(24)

            arrivals.append(arrival)
            departure.append(departure)

      MergeSort(arrivals)
      MergeSort(departures)

      # keep track of minimum platforms required at a given time
      minPlatforms = 0
      # starting from the first departure to the last one
      for departureIndex in range(0, numDepartures):
            count = 0
            # count the number of trains that arrived before this departure
            for arrival in arrivals:
                  if arrival < departures[departureIndex]:
                        count ++
                  else:
                        break
            # We get a tally of all trains that arrived before the departure time
            # and then we remove the number of trains that have departed
            platforms = count - departureIndex

            # The max platforms we need is the maximum number of trains seen so far
            minPlatforms = max(trains, maxPlatforms)

      return minPlatforms
```

EXPLANATION:

To find the minimum number of platforms required, we need to accommodate for the maximum number of trains that can be seen at any given time during the day.

To calculate the max number of trains at the station, we can count the number of trains at the station at the departure time of every train. As we check all departure times we keep track of the maximum number seen so far. This will give us the count of the minimum number of platforms necessary.

The simplest way to execute the above solution would be to sort the departure and arrival times. Starting from the earliest departure time, we count the number of arrivals before that departure and that is the number of trains at the station currently. As we check for other departure times, we also subtract the number of trains that have already departed so that we aren't double counting.

This solution works if all trains are only allowed to arrive and depart on the same day.

If not, then one way to apply this solution would be to split up the one train into two trains the way it has been illustrated in the diagram. This does not change the count of the number of trains at the station in those hours and can be easily applied.