

HomeWork 2

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Problem 3 **Solution:**

let's assume that array A is the array of all package's weight stored by their coming order. Function $MinTruck(X)$ is the minimum number of truck to send all package in A . $A[a:]$ means the A 's sub-array which its index from a to the end.

First I want to argue that $MinTruck(A[a:]) \leq MinTruck(A[b:])$ if $b \leq a$. Consider the best arrangement of $MinTruck(A[b:])$. Taking all items in $A[a:b]$ out and after that if a truck is empty then discard it. Now we get an possible arrangement of $A[a:]$ which called X . So, $MinTruck(A[a:]) \leq X \leq MinTruck(A[b:])$ holds.

Then, let's said after arrange some trunks, company still have $A[b:]$ item left. If company make last truck less full, which means it push some item before b , and let's say it become $A[a:]$. As I argue before $MinTruck(A[a:]) \leq MinTruck(A[b:])$ always holds. Thus company can never make it better in this way.

Problem 4 **Solution:**

```
def Subsequence(S, S_prime):
    j = 0
    for event in S:
        if S_prime[j] == event:
            j += 1
        if j == len[S_prime]:
            break
    if j == len[S_prime]:
        return "Yes"
    return "No"
```

Problem 8 **Solution:**

Assume that T and T' is two different minimum spanning trees. An edge $e \in T$, and $e \notin T'$. Let's add e into Tree T , then there are two different situation.

- (a) e is the most expensive among the circle
Because all weights are different, at least one edge's weight larger than e , let's assume it is e' . Substitute e for e' , it forms a new tree with smaller weight. Contradict with T' is a minimum spanning tree.
- (b) e is not the most expensive among the circle
There must be an edge in the circle which is not belong to tree T (Otherwise e form a circle in the tree T). Let assume it is e'' . By substituting e'' for e in tree T , we construct a new tree with smaller sum weight. It contradicts with the assumption.

In conclusion, G 's minimum spanning tree is unique.

Problem 9 **Solution:**

(a)

(b)

Problem 11 **Solution:**

Problem 17 **Solution:**

Problem 27 **Solution:**