ADS HOMEWORK 11

Problem 11.2

B)

We have two nested “for” loops making the time complexity $O(n^2)$. A brute force approach would take exponential time as it needs to go through and check every possible path to find the maximum sum. Hence, Dynamic Programming is better than the brute force approach.

C)

A greedy algorithm would basically start from the first element in the triangle and follow a path choosing the largest element out of the two below to the right and left of it and continue doing this for each newly added element of the path till the end. Using the example given in the homework, the greedy approach would choose 7 8 1 7 5 as the path based on this criteria resulting in the sum “28” which is not the best solution since “30” is the globally optimal solution achievable through Dynamic Programming. Hence, a greedy algorithm would not work for this problem.

DEMO:

```
                7
             3     8
          8     1     0
       2     7     4        4
    4     5     2     6     5
```

Greedy result: 7 then below it 3, 8

8 > 3 so 7, 8 below 1 0

1 > 0 so 7, 8, 1 below 7 4

7 > 4 so 7, 8, 1, 7 below 5 2

5 > 2 so 7, 8, 1, 7, 5 done

Path: 7 8 1 7 5

Sum = 28 (which is less than the optimal sum 30)

This proves that the greedy approach is not optimal and does not work well for this problem.