Problem Set 4—Due Friday, April 28

Problem 1. Consider the following EVEN-SPLIT problem: given a set S of N numbers, $S = \{a_1, \ldots, a_N\}$, partition it into two halves, T and $S - T$, such that the sum of the numbers in T is as close as possible to the sum of the numbers in $S - T$. That is, you want to minimize $|\sum_{i \in T} - \sum_{i \in S-T}|$. Use dynamic programming to solve this problem. Make your algorithm as efficient as possible. Compute the running time of your algorithm. Then write a computer program to solve the the following instance:

```
2837, 2742, 1992, 1999, 2108, 2123, 2652, 3214, 3367, 3855,
3912, 4115, 4188, 4723, 5623, 5777, 5909, 6000, 6108, 6756
```

Do you find the answer surprising? Explain.

Problem 2. Let $x = x_1 \ldots x_n$ and $y = y_1 \ldots y_m$ be strings. We say that $z = z_1 \ldots z_{n+m}$ is a *shuffle* of x and y if z can be formed by interspersing the characters from x and y in a way that maintains the left-to-right ordering of the characters from each string. For example, `thhelerloe` is a shuffle of `hello` and `there`. Devise an algorithm that, given strings x, y and z, determines if z is a shuffle of x and y. Analyze your algorithm's running time. *Hint: the values in the table you construct can be Boolean.*

Code up your algorithm and use it to answer the following instances:

```
thhelerloe  hello  there
aababaaaaababbabbbbabaaa  aaaaababbabaa  babaabbbaba
aababaaababababbabbbbabaaa  aaaaababbabaa  babaabbbaba
aaaabbabbbabababbbababababaaaaaababbbabbbbbbba  aabababababababaabbabbba  aabbbabbbabaaaaababbbb
```