Problem 4

Matrix Chain Product

If we are given a sequence of matrices to multiply, A_1, A_2, A_3, ..., A_n, we can multiply them in any order, since matrix multiplication is associative, to generate the product.

If we have three matrices A_1, A_2 and A_3. The product can be generated in two ways, $A_1(A_2A_3)$ or $(A_1A_2)A_3$.

The cost of multiplying a *nxm* by an *mxp* matrix is *nxmxp*

So the choice of parenthesis could affect the cost of multiplying a sequence of matrices.

For example, if we have the matrices A_1, a 5 x 50 matrix, A_2, a 50 x 10 matrix and A_3, a 10 x 8 matrix, the cost of $A_1(A_2A_3)$ would be: (A_2A_3) 50 x 10 x 8 = 4000, a resulting 50 x 8 matrix
                                         $A_1(A_2A_3)$ 5 x 50 x 8 = 2000, a resulting 5 x 8 matrix
                                         Total Cost = 4000 + 2000 = 6000

the cost of $(A_1A_2)A_3$ would be: (A_1A_2) 5 x 50 x 10 = 2500, a resulting 5 x 10 matrix
                                         $(A_1A_2)A_3$ 5 x 10 x 8 = 400, a resulting 5 x 8 matrix
                                         Total Cost = 2500 + 400 = 2900

The input file (**DATA41.txt** for the first submission and **DATA42.txt** for the second submission) will contain 5 lines of data. Each line will contain a matrix chain. Each chain is represented by a series of positive integers, p, $0 < p <= 100$, terminated by a 0. For example the chain above would be "5 50 10 8 0". Note that N matrices are represented by N + 1 non-zero numbers. $2 <= N <= 10$.

The output file (**OUT41.txt** for the first submission and **OUT42.txt** for the second submission) will contain five lines of data. Each line will contain the lowest and highest cost of multiplying the matrix chain, in that order, separated by a single space. The highest cost will not exceed 2000000000.

Sample Input (3 sets of data only)	Sample Output
5 50 10 8 0 4 12 6 9 12 0 25 30 10 5 0	2900 6000 936 2520 5250 8750