```
MATRIX-CHAIN-ORDER(p,n)
1  let m[1:n, 1:n] and s[1:n-1, 2:n] be new tables
2  for i = 1 to n                         // chain length 1
3      m[i,i] = 0
4  for l = 2 to n                         // l is the chain length
5      for i = 1 to n - l + 1             // chain begins at A_i
6          j = i + l - 1                  // chain ends at A_j
7          m[i,j] = ∞
8          for k = i to j - 1             // try A_{i:k} A_{k+1:j}
9              q = m[i,k] + m[k+1,j] + p_{i-1} p_k p_j
10             if q < m[i,j]
11                 m[i,j] = q             // remember this cost
12                 s[i,j] = k             // remember this index
13 return m and s
```

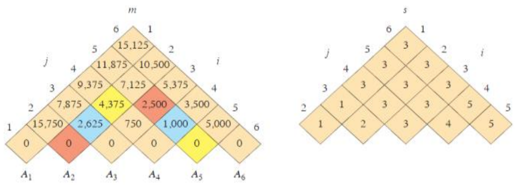

Figure 14.5 The m and s tables computed by MATRIX-CHAIN-ORDER for $n = 6$ and the following matrix dimensions:

matrix	A_1	A_2	A_3	A_4	A_5	A_6
dimension	30×35	35×15	15×5	5×10	10×20	20×25

The tables are rotated so that the main diagonal runs horizontally. The m table uses only the main diagonal and upper triangle, and the s table uses only the upper triangle. The minimum number of scalar multiplications to multiply the 6 matrices is $m[1,6] = 15{,}125$. Of the entries that are not tan, the pairs that have the same color are taken together in line 9 when computing

$$m[2,5] = \min \begin{cases} m[2,2] + m[3,5] + p_1 p_2 p_5 = 0 + 2500 + 35 \cdot 15 \cdot 20 = 13{,}000 , \\ m[2,3] + m[4,5] + p_1 p_3 p_5 = 2625 + 1000 + 35 \cdot 5 \cdot 20 = 7125 , \\ m[2,4] + m[5,5] + p_1 p_4 p_5 = 4375 + 0 + 35 \cdot 10 \cdot 20 = 11{,}375 \end{cases}$$
$$= 7125 .$$

```
PRINT-OPTIMAL-PARENS(s, i, j)
if i == j
    print "A"_i
else print "("
    PRINT-OPTIMAL-PARENS(s, i, s[i, j])
    PRINT-OPTIMAL-PARENS(s, s[i, j] + 1, j)
    print ")"
```