

What to do

1. Implement the DP version of MCM algorithm. Show commented code.

```

16 private static int[] topen = new int[25];
17 //A matrix to be shown. eno get it from the matrix lol.
18 private static int[][] eno;
19
20
21
22 /***** LAB 3 *****/
23
24 /**
25  * This is my DP matrix chain multiplication method for lab 3
26  * of CS 361 I had found this code on GeeksForGeeks.com at
27  * http://www.geeksforgeeks.org/dynamic-programming-set-8-matrix-chain-multiplication/
28  * This code is contributed by Rajat Mishra.
29  *
30  * @param p is the array of the sizes of the matrixes.
31  * @param n is the length of the array of p.
32  * @return
33  */
34 public int matrixChainOrder(int[] p, int n){
35
36     eno = new int[n][n]; // Initialize the matrix.
37
38     int i,j,k,L,q; // Variables to be described and/or used later.
39
40     for(i=1;i<n;i++){ // i will be used through out as just an indexing.
41         eno[i][i] = 0; // Fill in the diagonal of the matrix.
42     }
43
44     for(L=2;L<n;L++){ // L is to keep track of the length of the chain.
45         for(i=1;i<n-L+1;i++){
46             for(j=i+L-1; j<n; j++){
47                 if(j==n) continue;
48                 eno[i][j] = Integer.MAX_VALUE;
49                 for(k=i;k<=j-1;k++){
50                     q = eno[i][k] + eno[k+1][j] + // k and j are also just indexers.
51                       p[i-1]*p[k]*p[j]; // q is the cost to multiply.
52                     if(q<eno[i][j]){
53                         eno[i][j] = q;
54                     }
55                 }
56             }
57         }
58         return eno[1][n-1];
59     }
60 }
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```

2. Implement the memoization version of MCM algorithm, using -1 for ∞ . Show commented code.

```

19 //A test field that will indicate whether the matrix has been made.
20 private static boolean matrixMade = false;
21
22
23
24 /***** LAB 3 *****/
25 /**
26  * This in my memoization matrix chain multiplication method for lab 3
27  * of CS 361 I was helped with this code from GeeksForGeeks.com
28  * http://www.geeksforgeeks.org/dynamic-programming-set-8-matrix-chain-multiplication/.
29  * Slite changes have been mad by Nathan Stark.
30  */
31 * @param p is the array of the sizes of the matrixes.
32 * @param i is the lower bound index.
33 * @param j is the upper bound index.
34 * @return the value of the work needed to multiply the matrices.
35 */
36 public int matrixCainMemo(int[] p, int i, int j){
37
38     if(!matrixMade){
39         eno = new int[j + 1][j + 1];           // Initialize the matrix.
40         matrixMade = true;                     // Once the matrix in made don't make another.
41     }
42     if(i==j){
43         return eno[i][j] = 0;                 // Check to see if you are on the diagonal
44     }                                         // If you are set the value to 0 and return the value.
45     int min = -1;                             // Set the min to an impossible value so that it is easily checked for.
46
47     for(int k=i;k<j;k++){
48         int count = matrixCainMemo(p,i,k) +    // Do the math using recursive calls.
49
50         int count = matrixCainMemo(p,i,k) +    // Do the math using recursive calls.
51         matrixCainMemo(p,k+1,j) + p[i-1]*p[k]*p[j];
52         if((min == -1) || (count<min)){
53             min=count;                         // Check the min to see if it makes sense and check in the count is less than the min.
54             eno[i][j]=min;                     // Change the min to the count value.
55         }                                     // Set the value at the ith and jth place.
56     }
57     return min;                               // Return the min.
58 }

```

3. Show the output for your DP version of MCM algorithm for p being < 30, 4, 8, 5, 10, 25, 15>, including where the parenthesis should be located.

```

<terminated> CS361Labs [Java Application] C:\Program Files\
-----]0 960 760 1560 4360 4660
-----]0 160 360 1360 2860
-----]0 400 2250 3725
-----]0 1250 3125
-----]0 3750
-----]0

```

4. Show the output for your memoization version of MCM algorithm for p being < 30, 4, 8, 5, 10, 25, 15>, including where the parenthesis should be located.

Problems @ Javadoc Declaration Console

```
<terminated> CS361Labs [Java Application] C:\Program
-----]0 960 760 1560 4360 4660
-----]0 160 360 1360 2860
-----]0 400 2250 3725
-----]0 1250 3125
-----]0 3750
-----]0
```

5. Implement a breadth first search using an adjacency list. Show commented code.

```
20 private static boolean underChange = false;
21 // The number of vertices.
22 private int V;
23 // The adjacency list.
24 private LinkedList<Integer> adj[];
25
26
27
28 /***** LAB 3 *****/
29
30 /**
31  * This is the setting up method for the graph the be traversed.
32  * This code is found on GeeksForGeeks.com
33  * https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/
34  *
35  * @param vert the number of vertices there are in the given graph.
36  */
37 @SuppressWarnings("unchecked")
38 public void graph(int vert){
39
40     V = vert;
41
42     adj = new LinkedList[vert];           //Set the adjacency list to have vert number of vertices
43     for(int i=0;i<vert;i++){
44         adj[i] = new LinkedList<Integer>(); // Initialize the linkedLists into the adj.
45     }
46 }
47
48 /**
49  * The method to add an edge in in the graph.
50  * This code is found on GeeksForGeeks.com
51  * https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/
52  *
53  * @param vert which vertex the edge is getting a set to.
54  * @param w the other vertex to which will be connected.
55  */
56 public void addEdge(int vert, int w){
57     adj[vert].add(w);
58 }
59
60 /**
61  * This is the breath first search using the adjacency list.
62  * This code is found on GeeksForGeeks.com
63  * https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/
64  *
65  * @param s the root of the breath first search.
66  */
67 public void bfsAdjLinked(int s){
68
69     boolean visited[] = new boolean[V]; // By default all values will be set to false a loop could used but is unneeded.
70
71     LinkedList<Integer> queue = new LinkedList<Integer>(); // The queue for the bfs is initiated.
72
73     visited[s]=true; // The first/root vertex is visited.
74     queue.add(s); // The first/root in now in the queue.
75
76     while (queue.size() != 0)
77     {
78         s = queue.poll(); // Take the fist vertex out of the queue and print it
79         System.out.print(s+" ");
80
81         // Get all adjacent vertices of the dequeued vertex s
```

```

77         System.out.print(s + " ");
78     }
79     // Get all adjacent vertices of the dequeued vertex s
80     // If a adjacent has not been visited, then mark it
81     // visited and enqueue it
82     Iterator<Integer> i = adj[s].listIterator();
83     while (i.hasNext())
84     {
85         int n = i.next();
86         if (!visited[n])
87         {
88             visited[n] = true;
89             queue.add(n);
90         }
91     }
92 }
93 }
94 }
95 }
96 }

```

6. Implement a breadth first search using an adjacency matrix. Show commented code.
7. Show the output for the bfs using the adjacency list on the graph below.

Let it be noted that I am converting the alphabetical letters to numeric values. Therefore, letting a=0 and so on. Thus, my results are as follows a, b, d, c, e, f, g, n, m, h, j, i, k, and l.

```

<terminated> CS361Labs [Java Application] C:\Progr
0 1 3 2 4 5 6 13 12 7 9 8 10 11

```

8. Show the output for the bfs using the adjacency matrix on the graph below.

