COS212 (Data Structures and Algorithms)

Tutorial Exercise 2
2022/03/08

Question 1 Self-Organizing Lists ..... (8 marks)

1.1 [2 points] The following list uses the `Transpose` self-organizing strategy:

`A -> B -> C -> M -> N -> O`

Give the final order of elements in the list after the following elements have been accessed/added: `C, M, A, D, D, E` and `M`

1.2 [6 points] Assume the following `Node` class is defined:

```
public class Node<T> {
        public Node (T d, Node<T> n) { data = d; next = n; }
        public Node<T> next;
        public T data;
}
```

The `Node` class is used to implement a self-organizing list using the `Move-to-front` strategy for node accesses. The class has a single `head` reference to the first element in the list. Implement the following public method which will search for the given element in the list, and update the list accordingly:

`Node<T> access(T elem) {...}`

Question 2 Recursion ..... (8 marks)

2.1 [5 points] Consider the following recursive method:

```
public int method (int x, int y)
{
        if((y <= x) && (x % y == 0)) return y;
        if(x < y) return method(y, x);
        return method(y, x % y);
}
```

Write down the series of method calls (first to last) in the form of `method(x,y)`, where `x` and `y` are substituted for parameter values, should this method be called initially with the parameters `x = 43` and `y = 34`.

2.2 The pseudo code for the recursive N-queens problem is given as:

```
placeQueen(row)
  for all positions col in the same row
    if col is open
      place queen in board[row][col]
      if(row < N)
        placeQueen(row+1)
      else
        done
      remove queen from board[row][col]
```

Answer the following:

a) [1 point] What is the base- or anchor case for this algorithm?

b) [2 points] Is this an example of tail recursion? Motivate your answer.