

## **Recursion Assignment**

### **1. What are the criteria for a recursive solution?**

An iterative solution must have a way of reducing the problem to smaller and repetitive elements, a way of identifying, recognizing, and dealing with the endpoint of the solution, and a way of achieving the larger result from the component elements. Otherwise, if the criteria aren't met, the recursive method won't function properly and will result in a stack overflow error.

### **2. Think of another everyday example. NOT mentioned on this assignment or during the lesson!**

A pyramid is an example of recursion. You start at the bottom, with a base that will have the largest length and width of all the layers in the pyramid. For it to be the largest, all the lengths and widths of layers that are above the base must be reduced. This is an example of reducing the problem to smaller and repetitive elements since the length and width are reduced by a set amount each time a new layer is added. The endpoint is the last layer, which is the smallest of them all. Once that layer is built, there are no more, and the final result is a pyramid.

### **3. Give two specific problems associated with recursion, and two reasons for using recursion.**

Two specific problems associated with recursion are time and space. The process of recursion is very time-consuming as it has multiple nested calls to a method which involves allocating and releasing local memory, copying values into local memory and parameters, and returning the method. Additionally, nested calls to a method may need a large amount of space to store parameters and local variables and for an indication of where to return when the method is finished. The reason is that this space is allocated on the stack and is released automatically when the method is returned, and if many methods are paused to wait for a return from nested calls then it results in large amounts of space taken up. Two reasons for using recursion are that it is clean and it is algorithmic. Recursive methods are clearer, simpler, shorter, and easier to understand than non-recursive methods. Algorithms are procedures which are definite. They also use a set logic to provide a solution, which makes the code compact and simple.

### **4. What does iterative solution mean?**

An iterative solution is a solution that involves the repetition of operations. The final result is achieved by reducing the problem to smaller and repetitive elements with each iteration.