Problems
Recursive Design

Design and implement using C++, the solution to the following problems, using recursive algorithms:

Problem 1
> Calculate the maximum of an integer sequence of size n, being $n \geq 1$. Consider that the sequence is stored in an array in memory.

Problem 2
> Calculate the average of an integer sequence of size n, being $n \geq 1$. Consider that the sequence is stored in an array in memory.

Problem 3
> Calculate the factorial of n, being $n \geq 0$.

Problem 4
> Calculate the product of two positive integers without using the product operator.

Problem 5
> Calculate the power of two positive integers without using the power operation.

Problem 6
> Calculate the quotient and the residue from the integer division of two positive integers, without using neither the integer division nor the residue operations.

Problem 7
> Determine if a sequence of integer values of size n, being $n \geq 0$, is in ascending order. Consider that the sequence is stored in an array in memory.

Problem 8
> Determine if a sequence of integer values of size n, being $n \geq 0$, is populated only with positive values. Consider that the sequence is stored in an array in memory.

Problem 9
> Determine if a sequence of integer values of size n, being $n \geq 0$, contains a value x. Consider that the sequence is stored in an array in memory.

Problem 10
> Calculate the maximum common divisor of two positive integers $x > 0$ i $y > 0$. Use the recursive approach from the Euclides theorem.

Problem 11
> Determine if a sequence of integer values of size n, being $n \geq 0$, is palindrome. Use the string class and acces the characters by position us the [] operator.

Problem 12
> Determine if two sequences of integer values of size n, being $n \geq 0$, are equal. Use the string class and acces the characters by position us the [] operator.

Problem 13
> Determine if an integer value k is in a superior level (value greater or equal) than a sequence of integer values with size n, being $n \geq 0$. Use the vector class.

Problem 14

Determine if a sequence of integer values of size n, being n ≥ 0, contains a value x. Use the search strategy. Consider that the sequence is stored in an ascending array in memory. Use the vector class.

Problem 15

Modify the previous solution for the scenario where the sequence is ordered in descending order.

Algorisme 16

Show the permutations of the elements in a sequence. Consider that the sequence is stored in an array of size n, being n ≥ 0, in the main memory. Moreover, consider that sequence doesn't containd duplicated values.

Problem 17

Implement the quicksort algorithm. Consider the data to order stored in an integer sequence with size higher than 0 an being located the in main memory.

Problem 18

Implement the mergesort algorithm. Consider the data to order stored in an integer sequence with size higher than 0 an being located the in main memory.

Problem 19

Implement the heapsort algorithm. Consider the data to order stored in an integer sequence with size higher than 0 an being located the in main memory.

Problem 20

Implement an algorithm for the efficient power calculation using the product operation. We consider the calculation of a, being a > 0 and n ≥ 0.

Problem 21

Implement an algorithm for the efficient product calculation using the sum operation. We consider the calculation of x*y, being x ≥ 0 and y ≥ 0.

Problem 22

Implement an algorithm for the efficient integer division calculation using the substract operation. We consider the calculation of x div y, being x ≥ 0 andy > 0.