SE assignment **Univ. Rennes 1**

Algorithmic complexity

Question 1

Given a vector $x \in \Re^n$, what is the time complexity for evaluating the following formula?

$$\sum_{i \neq j} (x_i \times x_j).$$

Please explain.

Question 2

The code below computes the value of variable `x`, which corresponds to the number of iterations of the inner for loop that are executed.

```
int x = 0;
for (int i = n; i > 0; i /= 2)
   for (int j = 1; j < n; j *= 2)
      x++
```

What is the value of `x` if `n` is 8? Can you write the time complexity in function of `n`?

Question 3

We have a similar piece of code.

```
int y = 0;
for (int i = 1; i <= n; i++)
   for (int j = i; j > 0; j--)
      y++
```

Again, what is the algorithm time complexity in function of `n`?

Question 4

We have now a recursive method.

```
int recursive(int n,boolean b)
{
   if (n == 0)  return 1;
   if (b)
      return recursive(n-1,b) + 2*recursive(n-1,!b);
   else
      return recursive(n-1,b);
}
```

Please write the returning value of the method in function of `n`. Does this value correspond to the complexity of running `recursive(n,false)` ?

Question 5

Explain the difference in time complexity for accessing and for removing entries in the standard `ArrayList` and `LinkedList` implementations in Java.