Activity 1. [Measuring execution times]

**Calculate how many more years we can continue using this way of counting.**

We can make in java **Long.MAX\_VALUE - System.currentTimeMillis()** and then we convert the number to years and its 292,471,208 years.

**What does it mean that the time measured is 0?**

That the time of the execution is so fast that it can't be measured, so it is not reliable.

**From what size of problem (n) do we start to get reliable times?**

From 7.000.000 aprox

Activity 2. [Taking small execution times]

**What happens with the time if the problem size is multiplied by 2?**

As it has a linear complexity, the time will be aprox the previous time \*2.

**What happens with the time if the problem size is multiplied by a value k other than 2?**

The time will be the previous time \*k as the algorithm has a linear complexity.

**Explain whether the times obtained are those expected from the linear complexity O(n)**

An algorithm with a complexity of O(n), or linear complexity, scales in a way that as the input size (n) increases, the time or space required by the algorithm also increases proportionally.

matches1: O(n^2) as it has two for loops anidated

matches2: O(n) as it only iterates just one time.

maximum: O(n) as it only iterates with just one for loop.

sum: O(n) as it only uses one for loop.

Time in the measurements is expressed in seconds.

|  |  |  |
| --- | --- | --- |
| **N** | **Tsum** | **Tmaximum** |
| 1000 | 0,052 | 0,052 |
| 2000 | 0,087 | 0,085 |
| 4000 | 0,166 | 0,163 |
| 8000 | 0,356 | 0,334 |
| 16000 | 0,697 | 0,660 |
| 320000 | 1,392 | 1,299 |
| 640000 | 2,752 | 2,619 |
| 1280000 | 5,890 | 5,208 |
| 2560000 | 14,803 | 10,244 |
| 5120000 | 22,915 | 20,349 |
| 10240000 | 43,445 | 40,792 |
| 20480000 | Oot | Oot |
| 40960000 | Oot | Oot |
| 81920000 | Oot | Oot |

|  |  |  |
| --- | --- | --- |
| **N** | **Tmatches1** | **Tmatches2** |
| 1000 | 696 | 0,054 |
| 2000 | 2728 | 0,092 |
| 4000 | 10862 | 0,174 |
| 8000 | 43761 | 0,336 |
| 16000 | Oot | 0,677 |
| 320000 | Oot | 1,354 |
| 640000 | Oot | 2,733 |
| 1280000 | Oot | 5,530 |
| 2560000 | Oot | 10,722 |
| 5120000 | Oot | 21,333 |
| 10240000 | Oot | 42,504 |
| 20480000 | Oot | Oot |
| 40960000 | Oot | Oot |
| 81920000 | Oot | Oot |

Procesor: Intel(R) Core(TM) i5-1035G1 CPU @ 1.00GHz 1.19 GHz

Ram: 16,0 GB