Activity 1. [Calculate the years that we can continue using System.currentTimeMillis()]

First, in one year there are 100x60x60x24x365=3,153,600,000 milliseconds. This has been going on since 1st January, 1970, so 55 years =173,448,000,000.

Long uses 64 bits, so it can represents till the number 18,446,744,073,709,551,615, buts as it is signed = 9,223,372,036,854,775,807.

We subtract both values and the pass the milliseconds to years to check how many years left. 9,223,371,863,406,775,807/ 3,153,600,000 = 2,924,712 years.

Activity 2. [Time is 0]

The return could be zero when the compiler ignores the routine or if the time is faster than milliseconds.

From 781250, the time is different than 0.

Activity 3. [Repetitions]

If the size is multiplied by 2, then the time is approximately the double of the time of the first size. This happens for any k, the time is almost k\*times of first size.

Those are the times expected for a linear complexity of O(n), As they increase in a linear way.

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| --- | --- | --- |
| **n** | **Tsum (ms)** | **Tmaximum** |
| 10000 | 257\*10^-5 | 157\*10^-5 |
| 20000 | 503\*10^-5 | 345\*10^-5 |
| 40000 | 1006\*10^-5 | 693\*10^-5 |
| 80000 | 2017\*10^-5 | 1457\*10^-5 |
| 160000 | 4062\*10^-5 | 3236\*10^-5 |
| 320000 | 7831\*10^-5 | 5594\*10^-5 |
| 640000 | 163\*10^-3 | 99\*10^-3 |
| 1280000 | 331\*10^-3 | 194\*10^-3 |
| 2560000 | 1774\*10^-3 | 400\*10^-3 |
| 5120000 | 3785\*10^-3 | 1005\*10^-3 |
| 10240000 | 7.84 | 2385\*10^-3 |
| 20480000 | 15.41 | 5.15 |
| 40960000 | 30.9 | 10.5 |
| 81920000 | 60 | 21 |

|  |  |  |
| --- | --- | --- |
| **n** | **Tmatches1** | **Tmatches2** |
| 10000 | 18.7 | 245\*10^-5 |
| 20000 | 67.7 | 464\*10^-5 |
| 40000 | 245.5 | 931\*10^-5 |
| 80000 | 967.7 | 1930\*10^-5 |
| 160000 | 4535 | 3765\*10^-5 |
| 320000 | 18110 | 7875\*10^-5 |
| 640000 | 72543 | 164\*10^-3 |
| 1280000 | OoT | 332\*10^-3 |
| 2560000 | OoT | 816\*10^-3 |
| 5120000 | OoT | 1994\*10^-3 |
| 10240000 | OoT | 4357\*10^-3 |
| 20480000 | OoT | 9.2 |
| 40960000 | OoT | 18.4 |
| 81920000 | OoT | 35.7 |

Using memory of 16GB and Processor of 2.5GHz.

Tsum and Tmax both increase the time by 2 each time, following the given computational complexity of O(n). Also, Tmatches2 also increase by 2. Tmatches1 increase by 4 each time, but also follows a O(n).