Activity 1. [Loop1.java, Loop2.java, Loop3.java and Loop4.java times in milliseconds and WITHOUT OPTIMIZATION):]

| **N** | **time\_Loop1** | **time\_Loop2** | **time\_Loop3** | **time\_Loop4** |
| --- | --- | --- | --- | --- |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 100 | 0.01 | 0.1 | 1 | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 200 | 0.01 | 0.6 | 4 | 5 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 400 | 0.02 | 2.9 | 15 | 37 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 800 | 0.05 | 12.4 | 62 | 283 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1600 | 0.1 | 47.8 | 260 | 2152 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 3200 | 0.22 | 217.9 | 1081 | 16856 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 6400 | 0.44 | 865.4 | 4488 | Oot |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 12800 | 1 | 3918.6 | 19123 | Oot |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 25600 | 2.03 | 1757 | Oot | Oot |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 51200 | 4.36 | 7000.8 | Oot | Oot |
|  |  |  |  |  |
|  |  |  |  |  |

Loop1 = O(log^2(n))

Loop2 = O(n\*log^2(n))

Loop3 = O(n\*log^2(n))

Loop4 = O(n^3)

Activity 2. [Loop5.java, Loop6.java, Loop7.java times in milliseconds and WITHOUT OPTIMIZATION

| **N** | **Loop5** | **Loop6** | **Loop7** |
| --- | --- | --- | --- |

|  |  |  |  |
| --- | --- | --- | --- |
| 100 | 5 | 73 | 526 |

|  |  |  |  |
| --- | --- | --- | --- |
| 200 | 27 | 602 | 8088 |

|  |  |  |  |
| --- | --- | --- | --- |
| 400 | 131 | 5078 | OoT |

|  |  |  |  |
| --- | --- | --- | --- |
| 800 | 607 | 43995 | OoT |

|  |  |  |  |
| --- | --- | --- | --- |
| 1600 | 2803 | OoT | OoT |

|  |  |  |  |
| --- | --- | --- | --- |
| 3200 | 12953 | OoT | OoT |

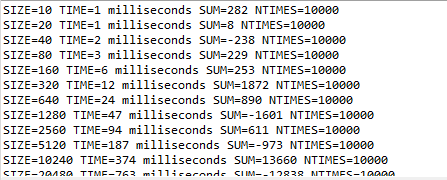
|  |  |  |  |
| --- | --- | --- | --- |
| 6400 | 58494 | OoT | OoT |

Activity 3. [From what size of problem (n) do we start to get reliable times?]

200000

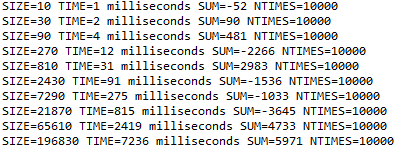
Activity 4. [What happens with time if the problem size is multiplied by 2?]

Time nearly duplicates:

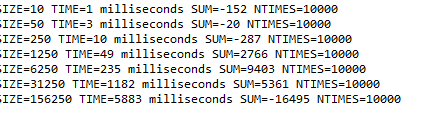


Activity 5. [What happens with time if the problem size is multiplied by a value k other than 2? (try it, for example, for k=3 and k=4 and check the times obtained)

K=3



K=5



Activity 6. [Tables MAXIMUM)

CPU1: 12th Gen Intel(R) Core(TM) i5-12400 2.50 GHz

RAM1: 16,0 GB

| **Size** | **T(max)** | **T(sum)** |
| --- | --- | --- |

|  |  |  |
| --- | --- | --- |
| 10000 | 0.058 | 0.0377 |

|  |  |  |
| --- | --- | --- |
| 20000 | 0.113 | 0.0743 |

|  |  |  |
| --- | --- | --- |
| 40000 | 0.220 | 0.1482 |

|  |  |  |
| --- | --- | --- |
| 80000 | 0.445 | 0.2927 |

|  |  |  |
| --- | --- | --- |
| 160000 | 0.890 | 0.5873 |

|  |  |  |
| --- | --- | --- |
| 320000 | 1.769 | 1.1747 |

|  |  |  |
| --- | --- | --- |
| 640000 | 3.566 | 2.3510 |

|  |  |  |
| --- | --- | --- |
| 1280000 | 7.095 | 4.7113 |

|  |  |  |
| --- | --- | --- |
| 2560000 | 14.125 | 9.4374 |

|  |  |  |
| --- | --- | --- |
| 5120000 | 28.621 | - |

|  |  |  |
| --- | --- | --- |
| 10240000 | 57.170 | - |

|  |  |  |
| --- | --- | --- |
| 20480000 | 114.491 | - |

|  |  |  |
| --- | --- | --- |
| 40960000 | 231.155 | - |

|  |  |
| --- | --- |
| 81920000 | 461.136 |

Activity 7. [Tables MATCHES)

CPU1: 12th Gen Intel(R) Core(TM) i5-12400 2.50 GHz

RAM1: 16,0 GB

| **Sum** | **T(matches2)** | **T(matches1)** |
| --- | --- | --- |

|  |  |  |
| --- | --- | --- |
| 10000 | 0 | 513 |

|  |  |  |
| --- | --- | --- |
| 20000 | 0 | 2023 |

|  |  |  |
| --- | --- | --- |
| 40000 | 0 | 8079 |

|  |  |  |
| --- | --- | --- |
| 80000 | 0 | 32244 |

|  |  |  |
| --- | --- | --- |
| 160000 | 1 | 130349 |

|  |  |  |
| --- | --- | --- |
| 320000 | 2 | - |

|  |  |  |
| --- | --- | --- |
| 640000 | 3 | - |

|  |  |  |
| --- | --- | --- |
| 1280000 | 8 | - |

|  |  |  |
| --- | --- | --- |
| 2560000 | 14 | - |

|  |  |  |
| --- | --- | --- |
| 5120000 | 28 | - |

|  |  |  |
| --- | --- | --- |
| 10240000 | 55 | - |

|  |  |  |
| --- | --- | --- |
| 20480000 | 111 | - |

|  |  |  |
| --- | --- | --- |
| 40960000 | 217 | - |

Matches2 to complete in table /1000:

SIZE=10000 TIME=53 milliseconds Matches2=10000 NTIMES=1000

SIZE=20000 TIME=106 milliseconds Matches2=20000 NTIMES=1000

SIZE=40000 TIME=209 milliseconds Matches2=40000 NTIMES=1000

SIZE=80000 TIME=420 milliseconds Matches2=80000 NTIMES=1000

SIZE=160000 TIME=838 milliseconds Matches2=160000 NTIMES=1000

SIZE=320000 TIME=1669 milliseconds Matches2=320000 NTIMES=1000

SIZE=640000 TIME=3367 milliseconds Matches2=640000 NTIMES=1000

SIZE=1280000 TIME=6738 milliseconds Matches2=1280000 NTIMES=1000

T(Sum) is linear O(n)

T(Max) is is linear O(n)

T(matches1) is squared O(n^2)

T(matches2) is linear O(n^2)