Activity 1. FACTOR 1 (problem size)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| n | 10000 | 20000 | 40000 | 80000 | 160000 | 320000 | 640000 |
| PythonA1 (ms) | 1640 | 6633 | 26513 | 103737 | OoT | OoT | OoT |

As can be seen, increasing the size of the problem makes it longer to solve.

Activity 2. FACTOR 2 (computer power)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| n | 10000 | 20000 | 40000 | 80000 | 160000 | 320000 | 640000 |
| PythonA1 (ms)  CPU: Intel Core i5-11400  Ram: 16GB | 1640 | 6633 | 26513 | 103737 | OoT | OoT | OoT |
| PythonA1 (ms)  CPU: Intel Core i5-12400  Ram: 16GB | 1545 | 6373 | 25630 | 101599 | OoT | OoT | OoT |

As can be seen, the performance is increased with a better processor.

Activity 3. FACTOR 3 (implementation environment)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| n | 10000 | 20000 | 40000 | 80000 | 160000 | 320000 | 640000 |
| PythonA1 (ms) | 1640 | 6633 | 26513 | 103737 | OoT | OoT | OoT |
| JavaA1 (ms) | 333 | 1306 | 5008 | 19920 | OoT | OoT | OoT |

As can be seen, the performance using Java is better than the performance in Python due to Java being a lower level programming language than Python.

Activity 4. FACTOR 4 (algorithm that is used)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| n | 10000 | 20000 | 40000 | 80000 | 160000 | 320000 | 640000 |
| PythonA1 (ms) | 1545 | 6373 | 25630 | 101599 | OoT | OoT | OoT |
| PythonA2 (ms) | 195 | 709 | 2678 | 9688 | 36085 | OoT | OoT |
| PythonA3 (ms) | 92 | 344 | 1312 | 4868 | 17958 | OoT | OoT |

Without Optimization

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| N | 10000 | 20000 | 40000 | 80000 | 160000 | 320000 | 640000 |
| JavaA1 (ms) | 333 | 1306 | 5008 | 19920 | OoT | OoT | OoT |
| JavaA2 (ms) | 40 | 144 | 508 | 1911 | 6897 | 26062 | OoT |
| JavaA3 (ms) | 26 | 94 | 326 | 1245 | 4527 | 17343 | OoT |
| JavaA4 (ms) | 2 | 5 | 13 | 32 | 81 | 203 | 503 |

With Optimization

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| n | 10000 | 20000 | 40000 | 80000 | 160000 | 320000 | 640000 |
| JavaA1 (ms) | 77 | 278 | 1109 | 4417 | 17492 | OoT | OoT |
| JavaA2 (ms) | 10 | 33 | 115 | 427 | 1578 | 5842 | 21798 |
| JavaA3 (ms) | 5 | 17 | 61 | 210 | 781 | 2966 | 10920 |
| JavaA4 (ms) | 1 | 1 | 3 | 4 | 12 | 24 | 63 |

As can be seen, improving the algorithm reduces the time it takes to solve a problem. Reducing the complexity of a given algorithm greatly improves it performance.