To test the big-Theta of the algorithm, variable input size ranging from 0 to 100. The data was plotted in a graph and a table shown below:

|  |  |  |
| --- | --- | --- |
| **Input size** | **Number of basic operations** | |
| 0 | | 0 |
| 1 | | 4 |
| 2 | | 8 |
| 3 | | 15 |
| 4 | | 22 |
| 5 | | 32 |
| 6 | | 42 |
| 7 | | 55 |
| 8 | | 68 |
| 9 | | 75 |
| 10 | | 91 |
| 11 | | 110 |
| 12 | | 129 |
| 13 | | 151 |
| 14 | | 173 |
| 15 | | 198 |
| 16 | | 223 |
| 17 | | 251 |
| 18 | | 270 |
| 19 | | 301 |
| 20 | | 332 |

Hypothesis: As the input size (n) grows linearly, the number of basic operations performed by the algorithm grows quadratically, which is shown in the graph above.

Additional tests for the input size greater than 100 resulted in a similar pattern of result as shown in the graphs below.

|  |  |
| --- | --- |
| **n** | **number of basic operations** |
| 100 | 7651 |
| 110 | 9242 |
| 120 | 10983 |
| 130 | 12874 |
| 140 | 14915 |
| 150 | 17106 |
| 160 | 19447 |
| 170 | 21938 |
| 180 | 24570 |
| 190 | 27361 |
| 200 | 30302 |
| 210 | 33393 |
| 220 | 36634 |
| 230 | 40025 |
| 240 | 43566 |
| 250 | 47257 |
| 260 | 51098 |
| 270 | 55080 |
| 280 | 59221 |
| 290… | 63512… |

Additionally, to find the complexity class the algorithm falls into, we calculate the number of basic operations/nth power of the equation given by the curvature. From the figure we can assume that curve is quadratic. We can see that the constant opr/n2 is almost constant i.e o.76, which proves that it is an algorithm with quadratic complexity for big-Theta.

|  |  |  |
| --- | --- | --- |
| **n** | **number of basic operations(opr)** | **Comparison(opr/n2)** |
| 100 | 7651 | 0.7651 |
| 110 | 9242 | 0.763801653 |
| 120 | 10983 | 0.762708333 |
| 130 | 12874 | 0.761775148 |
| 140 | 14915 | 0.760969388 |
| 150 | 17106 | 0.760266667 |
| 160 | 19447 | 0.759648438 |
| 170 | 21938 | 0.759100346 |
| 180 | 24570 | 0.758333333 |
| 190 | 27361 | 0.757922438 |
| 200 | 30302 | 0.75755 |
| 210 | 33393 | 0.757210884 |
| 220 | 36634 | 0.756900826 |
| 230 | 40025 | 0.756616257 |
| 240 | 43566 | 0.756354167 |
| 250 | 47257 | 0.756112 |