Conclusion

The value of k where Algorithm 2 started to run faster than Algorithm 1 was 36 and greater. The reason for this is that since Algorithm 1 was using a sequential search it has to scan every element one by one until the element asked to get found, and the more increases the number of elements to look for the more time it takes to find them all, therefore time takes to search the elements is proportional to the number of elements on the Array. On the other hand, since Algorithm 2 was using Binary Search which is based on a divide and conquer method the bigger the data set the faster Algorithm 2 will get compared to Algorithm 1

Chart, line chart

Description automatically generated

|  |  |  |
| --- | --- | --- |
| **k** | **Algorithm 1** | **Algorithm 2** |
| **1** | 0.0370295 | 0.062115125 |
| **2** | 0.042111583 | 0.063594458 |
| **3** | 0.041372 | 0.152996667 |
| **4** | 0.0469245 | 0.120362875 |
| **5** | 0.052337166 | 0.129379083 |
| **6** | 0.05824025 | 0.167633458 |
| **7** | 0.064142333 | 0.158638208 |
| **8** | 0.069845833 | 0.18362125 |
| **9** | 0.0756535 | 0.187633667 |
| **10** | 0.081612792 | 0.196942791 |
| **11** | 0.086131917 | 0.221162 |
| **12** | 0.093953584 | 0.199863875 |
| **13** | 0.101168708 | 0.224879792 |
| **14** | 0.112181167 | 0.221275042 |
| **15** | 0.111781167 | 0.23765875 |
| **16** | 0.119213875 | 0.228719125 |
| **17** | 0.126885209 | 0.224766584 |
| **18** | 0.136298625 | 0.227163 |
| **19** | 0.138565416 | 0.226888209 |
| **20** | 0.15067675 | 0.238988958 |
| **21** | 0.155863416 | 0.249077459 |
| **22** | 0.165000125 | 0.246391625 |
| **23** | 0.170205041 | 0.2513455 |
| **24** | 0.187467334 | 0.252211416 |
| **25** | 0.185774083 | 0.252171042 |
| **26** | 0.198117542 | 0.276642958 |
| **27** | 0.205977958 | 0.283024333 |
| **28** | 0.213275167 | 0.274153166 |
| **29** | 0.220730583 | 0.251630667 |
| **30** | 0.225559542 | 0.265414167 |
| **31** | 0.240955375 | 0.292964375 |
| **32** | 0.239457208 | 0.285098291 |
| **33** | 0.250519625 | 0.28312525 |
| **34** | 0.259830292 | 0.277404917 |
| **35** | 0.27872875 | 0.291359209 |
| **36** | 0.337822916 | 0.287124584 |
| **37** | 0.282378542 | 0.285983292 |
| **38** | 0.29831975 | 0.285224459 |
| **39** | 0.300681292 | 0.281482666 |
| **40** | 0.312748 | 0.287573333 |
| **41** | 0.318394417 | 0.286190208 |
| **42** | 0.386748875 | 0.296765 |
| **43** | 0.337566208 | 0.28930125 |
| **44** | 0.348085583 | 0.30258125 |
| **45** | 0.358416833 | 0.299262667 |
| **46** | 0.3530655 | 0.292620083 |
| **47** | 0.376511625 | 0.294905542 |
| **48** | 0.47159275 | 0.301528542 |
| **49** | 0.39579725 | 0.3059185 |
| **50** | 0.397214375 | 0.311674417 |
| **1** | 0.0370295 | 0.062115125 |
| **2** | 0.042111583 | 0.063594458 |
| **3** | 0.041372 | 0.152996667 |
| **4** | 0.0469245 | 0.120362875 |
| **5** | 0.052337166 | 0.129379083 |
| **6** | 0.05824025 | 0.167633458 |
| **7** | 0.064142333 | 0.158638208 |
| **8** | 0.069845833 | 0.18362125 |
| **9** | 0.0756535 | 0.187633667 |
| **10** | 0.081612792 | 0.196942791 |
| **11** | 0.086131917 | 0.221162 |
| **12** | 0.093953584 | 0.199863875 |
| **13** | 0.101168708 | 0.224879792 |
| **14** | 0.112181167 | 0.221275042 |
| **15** | 0.111781167 | 0.23765875 |
| **16** | 0.119213875 | 0.228719125 |
| **17** | 0.126885209 | 0.224766584 |
| **18** | 0.136298625 | 0.227163 |
| **19** | 0.138565416 | 0.226888209 |
| **20** | 0.15067675 | 0.238988958 |
| **21** | 0.155863416 | 0.249077459 |
| **22** | 0.165000125 | 0.246391625 |
| **23** | 0.170205041 | 0.2513455 |
| **24** | 0.187467334 | 0.252211416 |
| **25** | 0.185774083 | 0.252171042 |
| **26** | 0.198117542 | 0.276642958 |
| **27** | 0.205977958 | 0.283024333 |
| **28** | 0.213275167 | 0.274153166 |
| **29** | 0.220730583 | 0.251630667 |
| **30** | 0.225559542 | 0.265414167 |
| **31** | 0.240955375 | 0.292964375 |
| **32** | 0.239457208 | 0.285098291 |
| **33** | 0.250519625 | 0.28312525 |
| **34** | 0.259830292 | 0.277404917 |
| **35** | 0.27872875 | 0.291359209 |
| **36** | 0.337822916 | 0.287124584 |
| **37** | 0.282378542 | 0.285983292 |
| **38** | 0.29831975 | 0.285224459 |
| **39** | 0.300681292 | 0.281482666 |
| **40** | 0.312748 | 0.287573333 |
| **41** | 0.318394417 | 0.286190208 |
| **42** | 0.386748875 | 0.296765 |
| **43** | 0.337566208 | 0.28930125 |
| **44** | 0.348085583 | 0.30258125 |
| **45** | 0.358416833 | 0.299262667 |
| **46** | 0.3530655 | 0.292620083 |
| **47** | 0.376511625 | 0.294905542 |
| **48** | 0.47159275 | 0.301528542 |
| **49** | 0.39579725 | 0.3059185 |
| **50** | 0.397214375 | 0.311674417 |