**Project One Runtime Analysis**

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**Runtime Analysis Chart**

**Vector:**

| **Operation** | **Cost Per Line** | **Executions** | **Big O** |
| --- | --- | --- | --- |
| Opening/reading file | 1 | O(N) | O(N) |
| Parsing lines/Creating Course Objects | 1 | O(N) | O(N) |

**Hash Table:**

| **Operation** | **Cost Per Line** | **Executions** | **Big O** |
| --- | --- | --- | --- |
| Opening/reading file | 1 | O(N) | O(N) |
| Parsing lines/Creating Course Objects | O(1) | O(N) | O(N) |

**Binary Search Tree**

| **Operation** | **Cost Per Line** | **Executions** | **Big O** |
| --- | --- | --- | --- |
| Opening/reading file | 1 | O(N) | O(N) |
| Parsing lines/Creating Course Objects | O(log N) | O(N) | O(N log N) |

**Advantages and Disadvantages:**

Vectors are simple and perfect for small data sets, but inefficient in searching in comparison to Hash Tables and BSTs. Hash tables are efficient in searching with a best case of O(1) lookup time, but are more difficult to implement and require larger amounts of storage. Binary search trees sort data efficiently and also have fast look up times. However, they require higher memory usage due to the structure. It is recommended that hash tables are used because of the fast look up times. This provides fast access to course information.