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Time Complexity

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| --- | --- | --- | --- | --- | --- | --- |
|  | ResizableArrayBag | | | LinkedBag | | |
| union | intersection | difference | union | intersection | difference |
| Time complexity in the Best Case | O(1) | O(1) | O(1) | O(1) | O(1) | O(1) |
| Time complexity in the Worst Case | O(N) | O(N^2) | O(N^2) | O(N) | O(N) | O(N) |

ResizableArrayBag Time Complexity

**Union**:

-Worst Case Scenario: In this given instance, the line of code :

for (T elem : mine)

dominates the previous time complexities of 1. In the code above, the for loop can be considered O(n) because it searches through the array n amount of times.

-Best Case Scenario: The best case scenario would be O(1) if all of the variables are assigned an actual integer value. If we had a set amount of items in an array, it would be ran that amount of times. An example would be an array of 5. This means the computer would search through the array a total of 5 times.

**Intersection**:

-Worst Case Scenario: In this given instance, the line of code :

for (int i=0; i<mine.length;i++)

dominates the previous time complexities of 1 and n. In the code above, int i=0 is n, i<mine.length is n, and the i++ is 1. So together that makes n\*n\*1 which can be simplified to n^2.

-Best Case Scenario: The best case scenario would be O(1) because if we know the length of the array, it would only execute one less than the length of that array. In this instance, if the length of the array is 7, the part of the for loop that is i<mine.length would make the loop only run until i<7 so it would run 6 times.

**Difference**:

-Worst Case Scenario: In this given instance, the line of code :

for (int i=0; i<mine.length;i++)

dominates the previous time complexities of 1 and n. In the code above, int i=0 is n, i<mine.length is n, and the i++ is 1. So together that makes n\*n\*1 which can be simplified to n^2.

-Best Case Scenario: The best case scenario would be O(1) because if we know the length of the array, it would only execute one less than the length of that array. In this instance, if the length of the array is 9, the part of the for loop that is i<mine.length would make the loop only run until i<9 so it would run 8 times.

LinkedBag Time Complexity

**Union**:

-Worst Case Scenario: In this given instance, the line of code :

for (T elem : mine)

dominates the previous time complexities of 1. In the code above, the for loop can be considered O(n) because it searches through the array n amount of times.

-Best Case Scenario: The best case scenario would be O(1) if all of the variables are assigned an actual integer value. If we had a set amount of items in an array, it would be ran that amount of times. An example would be an array of 6. This means the computer would search through the array a total of 6 times.

**Intersection**:

-Worst Case Scenario: In this given instance, the line of code :

for (T elem : others)

dominates the previous time complexities of 1. In the code above, the for loop can be considered O(n) because it searches through the array n amount of times.

-Best Case Scenario: The best case scenario would be O(1) if all of the variables are assigned an actual integer value. If we had a set amount of items in an array, it would be ran that amount of times. An example would be an array of 7. This means the computer would search through the array a total of 7 times.

**Difference**:

-Worst Case Scenario: In this given instance, the line of code :

for (T elem : others)

dominates the previous time complexities of 1. In the code above, the for loop can be considered O(n) because it searches through the array n amount of times.

-Best Case Scenario: The best case scenario would be O(1) if all of the variables are assigned an actual integer value. If we had a set amount of items in an array, it would be ran that amount of times. An example would be an array of 8. This means the computer would search through the array a total of 8 times.