Name: Michael Beaver

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| Course: | CS 355 | Assignment Number: | 8 |
| Semester: | Fall 2012 | Assignment Type: | Homework 6 |
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| Assignment Description: | You will create a template Hash Table | |  |
| Assignment Due Date: | Tuesday, October 23, 2012 (first half of class) | |  |
| To Be Included in Portfolio: | YES |  |  |
| Total Grade: Implementation (60), Test Cases (20), and Analysis (20) | | |  |
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| Write a template Hash Table. This hash table should have the following operations: | | |  |

1. Constructor: The constructor should take in as a parameter the number of keys to be stored in the hash table. You should dynamically create your array such that the size of the hash table is roughly twice the size of the parameter and is prime.
2. Dynamic Memory Methods: Copy constructor, Assignment Operator, and Destructor to handle dynamic array
3. Show Fill: Print a “picture” of the table to demonstrate how the table is filled. You may simply print X’s

where slots are taken as opposed to the actual data values. *void ShowFill()const;*

4. Print: Print the location values and data of slots taken. *void ShowContents()const;*

5. Insert: Insert a key by h(x) = x % tablesize; Return the number of slots hit before a slot is found. Should return 1 if hits actual hashed slot.

*int Insert(T key);*

6. Remove: Remove a key. Return the number of slots hit before finding the slot to remove. If not found, return 0 or the negative of the number of slots that had to be searched before removing.

*int Remove (T key);*

7. Search: Search for a key. Return the number of slots hit before finding the slot of the key. If not found, return 0 or the negative of the number of slots that had to be searched before removing.

*int Search(T key);*

8. Collision: Taking in the original hashed slot, and the number of times you have tried to find a slot, determine the next slot for the new key. Use linear probing for collision handling.

*int NewSlot(T HashVal, int trynumber)*

Write a driver that mimics the driver I gave you for the BST. Remove any items that no longer make sense. The Collision method will be tested through Insert and no extra call is needed in the driver. Add ‘Z’ to the menu for ShowFill. There can be a private method called IsPrime written for use in the constructor.

Test Case Requirements Met: Analysis Requirements Met:

\_\_\_\_ created at least one test case for each method \_\_\_\_ Clear and correct communication

\_\_\_\_ test cases showed methods were correct \_\_\_\_ Reasonable/correct answers and justifications

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Course: CS 355

Semester: Fall 2012

Assignment Number: 8

Assignment Type: Homework 6 – Test Cases

Assignment Description: Create Test cases for each of the methods. You should show enough test cases to demonstrate the method works. Be sure to think about special cases. Try to break your code.

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|  | Assignment Due Date: | Tuesday, October 23, 2012 (first half of class) | |  |  |
|  | To Be Included in Portfolio: | YES |  |  |  |
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|  | Test Case 1 |  |  |  |  |
|  |  |  |  |  |  |
|  | Date/Time: | Expected Result | Actual Result | Action needed (Yes/No) |  |
|  | Keys: 5 | 11 slots | 11 slots | No |  |
|  | Insert(20) | 9: 20 | 9: 20 | No |  |
|  | Insert(543) | 4: 543 | 4: 543 | No |  |
|  | Insert(4) | 5: 4 | 5: 4 | No |  |
|  | Insert(121) | 0: 121 | 0: 121 | No |  |
|  | Show Fill | 0: XXXX  1:  2:  3:  4: XXXX  5: XXXX  6:  7:  8:  9: XXXX  10: | 0: XXXX  1:  2:  3:  4: XXXX  5: XXXX  6:  7:  8:  9: XXXX  10: | No |  |

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|  | Test Case 2 |  |  |  |  |
|  |  |  |  |  |  |
|  | Date/Time: | Expected Result | Actual Result | Action needed (Yes/No) |  |
|  | Keys: 3 | 7 slots | 7 slots | No |  |
|  | Insert (3) | 3: 3 | 3: 3 | No |  |
|  | Insert (31) | 4: 31 | 4: 31 | No |  |
|  | Insert (7000) | 0: 7000 | 0: 7000 | No |  |
|  | Insert (28) | 1: 28 | 1: 28 | No |  |
|  | Insert (5) | 5: 5 | 5: 5 | No |  |
|  | Insert (33) | 6: 33 | 6: 33 | No |  |
|  | Insert (6) | 2: 6 | 2: 6 | No |  |
|  | Show Fill | 0: XXXX  1: XXXX  2: XXXX  3: XXXX  4: XXXX  5: XXXX  6: XXXX | 0: XXXX  1: XXXX  2: XXXX  3: XXXX  4: XXXX  5: XXXX  6: XXXX | No |  |
|  | Search (6) | 4 slots | 4 slots | No |  |
|  | Search (7000) | 1 slot | 1 slot | No |  |
|  | Search (12345) | 0 slots | 0 slots | No |  |
|  | Remove (6) | 4 slots | 4 slots | No |  |
|  | Remove (1234) | 0 slots | 0 slots | No |  |
|  | Show Contents | 0: 7000  1: 28  2:  3: 3  4: 31  5: 5  6: 33 | 0: 7000  1: 28  2:  3: 3  4: 31  5: 5  6: 33 | No |  |

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|  | Test Case 3 |  |  |  |  |
|  |  |  |  |  |  |
|  | Date/Time: | Expected Result | Actual Result | Action needed (Yes/No) |  |
|  | Keys: 2 | 5 slots | 5 slots | No |  |
|  | Insert (20) | 0: 20 | 0: 20 | No |  |
|  | Insert (39) | 4: 39 | 4: 39 | No |  |
|  | Insert (4) | 1: 4 | 1: 4 | No |  |
|  | Insert (25) | 2: 25 | 2: 25 | No |  |
|  | Insert (54) | 3: 54 | 3: 54 | No |  |
|  | Search (12) | 0 slots | 0 slots | No |  |
|  | Search (54) | 5 slots | 5 slots | No |  |
|  | Remove (54) | 5 slots | 5 slots | No |  |
|  | Show Contents | 0: 20  1: 4  2: 25  3:  4: 39 | 0: 20  1: 4  2: 25  3:  4: 39 | No |  |
|  | Insert(0) | 3: 0 | 3: 0 | No |  |
|  | Search (4) | 3 slots | 3 slots | No |  |
|  | Remove (4) | 3 slots | 3 slots | No |  |
|  | Remove (25) | 3 slots | 3 slots | No |  |
|  | Remove (20) | 1 slot | 1 slot | No |  |
|  | Remove (39) | 1 slot | 1 slot | No |  |
|  | Show Contents | 0:  1:  2:  3: 0  4: | 0:  1:  2:  3: 0  4: | No |  |
|  | Show Fill | 0:  1:  2:  3: XXXX  4: | 0:  1:  2:  3: XXXX  4: | No |  |

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|  | Test Case 4 |  |  |  |  |
|  |  |  |  |  |  |
|  | Date/Time: | Expected Result | Actual Result | Action needed (Yes/No) |  |
|  | Keys: 2 | 5 slots | 5 slots | No |  |
|  | Insert (3) | 3: 3 | 3: 3 | No |  |
|  | Insert (50) | 0: 50 | 0: 50 | No |  |
|  | Copy Constructor | Result: Print New Copy  0 : 50  1 :  2 :  3 : 3  4 :  Result: Print Modified Copy  0 : 50  1 : 10000  2 :  3 : 3  4 :  Result: Print Original Test List  0 : 50  1 :  2 :  3 : 3  4 : | Result: Print New Copy  0 : 50  1 :  2 :  3 : 3  4 :  Result: Print Modified Copy  0 : 50  1 : 10000  2 :  3 : 3  4 :  Result: Print Original Test List  0 : 50  1 :  2 :  3 : 3  4 : | No |  |
|  | Insert (1) | 1: 1 | 1: 1 | No |  |
|  | Insert (2) | 2: 2 | 2: 2 | No |  |
|  | Insert (4) | 4: 4 | 4: 4 | No |  |
|  | Copy Constructor | Result: Print New Copy  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Result: Print Modified Copy  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Result: Print Original Test List  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4 | Result: Print New Copy  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Result: Print Modified Copy  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Result: Print Original Test List  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4 | No |  |

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|  | Test Case 5 |  |  |  |  |
|  |  |  |  |  |  |
|  | Date/Time: | Expected Result | Actual Result | Action needed (Yes/No) |  |
|  | Keys: 2 | 5 slots | 5 slots | No |  |
|  | Insert (3) | 3: 3 | 3: 3 | No |  |
|  | Insert (50) | 0: 50 | 0: 50 | No |  |
|  | Assignment Operator | Modify New List  0 : 50  1 : 100000  2 :  3 : 3  4 :  Old List should not be affected  0 : 50  1 :  2 :  3 : 3  4 :  Destroy New List  Old List should not be affected  0 : 50  1 :  2 :  3 : 3  4 : | Modify New List  0 : 50  1 : 100000  2 :  3 : 3  4 :  Old List should not be affected  0 : 50  1 :  2 :  3 : 3  4 :  Destroy New List  Old List should not be affected  0 : 50  1 :  2 :  3 : 3  4 : | No |  |
|  | Insert (1) | 1: 1 | 1: 1 | No |  |
|  | Insert (2) | 2: 2 | 2: 2 | No |  |
|  | Insert (4) | 4: 4 | 4: 4 | No |  |
|  | Assignment Operator | Modify New List  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Old List should not be affected  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Destroy New List  Old List should not be affected  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4 | Modify New List  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Old List should not be affected  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4  Destroy New List  Old List should not be affected  0 : 50  1 : 1  2 : 2  3 : 3  4 : 4 | No |  |

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|  | Test Case 6 |  |  |  |  |
|  |  |  |  |  |  |
|  | Date/Time: | Expected Result | Actual Result | Action needed (Yes/No) |  |
|  | Keys: 2 | 5 slots | 5 slots | No |  |
|  | Insert (3) | 3: 3 | 3: 3 | No |  |
|  | Insert (31) | 1: 31 | 1: 31 | No |  |
|  | Insert (7000) | 0: 7000 | 0: 7000 | No |  |
|  | Insert (28) | 4: 28 | 4: 28 | No |  |
|  | Insert (5) | 3: 5 | 3: 5 | No |  |
|  | Insert (33) | 5 slots (no insert) | 5 slots (no insert) | No |  |
|  | Insert (6) | 0 slots | 0 slots | No |  |
|  | Remove (6) | 0 slots | 0 slots | No |  |
|  | Search (6) | 0 slots | 0 slots | No |  |
|  | Remove (5) | 3 slots | 3 slots | No |  |
|  | Copy Constructor | Result: Print New Copy  0 : 7000  1 : 31  2 :  3 : 3  4 : 28  Result: Print Modified Copy  0 : 7000  1 : 31  2 : 10000  3 : 3  4 : 28  Result: Print Original Test List  0 : 7000  1 : 31  2 :  3 : 3  4 : 28 | Result: Print New Copy  0 : 7000  1 : 31  2 :  3 : 3  4 : 28  Result: Print Modified Copy  0 : 7000  1 : 31  2 : 10000  3 : 3  4 : 28  Result: Print Original Test List  0 : 7000  1 : 31  2 :  3 : 3  4 : 28 | No |  |
|  | Assignment Operator | Modify New List  0 : 7000  1 : 31  2 : 100000  3 : 3  4 : 28  Old List should not be affected  0 : 7000  1 : 31  2 :  3 : 3  4 : 28  Destroy New List  Old List should not be affected  0 : 7000  1 : 31  2 :  3 : 3  4 : 28 | Modify New List  0 : 7000  1 : 31  2 : 100000  3 : 3  4 : 28  Old List should not be affected  0 : 7000  1 : 31  2 :  3 : 3  4 : 28  Destroy New List  Old List should not be affected  0 : 7000  1 : 31  2 :  3 : 3  4 : 28 | No |  |
|  | Empty? | Slot available at: 2 | Slot available at: 2 | No |  |
|  | Show Fill | 0 : XXXX  1 : XXXX  2 :  3 : XXXX  4 : XXXX | 0 : XXXX  1 : XXXX  2 :  3 : XXXX  4 : XXXX | No |  |
|  | Show Contents | 0 : 7000  1 : 31  2 :  3 : 3  4 : 28 | 0 : 7000  1 : 31  2 :  3 : 3  4 : 28 | No |  |
|  | Clear Table | 0 :  1 :  2 :  3 :  4 : | 0 :  1 :  2 :  3 :  4 : | No |  |