

Name: *Samuel Sovi*

Assignment: 8

Complete & Correct:	48 / 48
Tests:	0 / 0
Format and Comments:	6 / 6
Writeup:	6 / 6

Total Score:	60 / 60
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Comments:

1. looks good
2. be sure to remove commented out code

Unit test output:

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==660349== Memcheck, a memory error detector
==660349== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==660349== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==660349== Command: ./hw8_test
==660349==
[=====] Running 21 tests from 1 test suite.
[-----] Global test environment set-up.
[-----] 21 tests from BasicBSTMapTests
[ RUN      ] BasicBSTMapTests.EmptyCheck
[      OK  ] BasicBSTMapTests.EmptyCheck (11 ms)
[ RUN      ] BasicBSTMapTests.InsertCheck
[      OK  ] BasicBSTMapTests.InsertCheck (2 ms)
[ RUN      ] BasicBSTMapTests.RValueAccessCheck
[      OK  ] BasicBSTMapTests.RValueAccessCheck (3 ms)
[ RUN      ] BasicBSTMapTests.LValueAccessCheck
[      OK  ] BasicBSTMapTests.LValueAccessCheck (3 ms)
[ RUN      ] BasicBSTMapTests.SimpleContainsCheck
[      OK  ] BasicBSTMapTests.SimpleContainsCheck (3 ms)
[ RUN      ] BasicBSTMapTests.MoreInvolvedContainsCheck
[      OK  ] BasicBSTMapTests.MoreInvolvedContainsCheck (1 ms)
[ RUN      ] BasicBSTMapTests.EraseCheck
[      OK  ] BasicBSTMapTests.EraseCheck (16 ms)
[ RUN      ] BasicBSTMapTests.KeyRangeCheck
[      OK  ] BasicBSTMapTests.KeyRangeCheck (12 ms)
[ RUN      ] BasicBSTMapTests.SortedKeyCheck
[      OK  ] BasicBSTMapTests.SortedKeyCheck (5 ms)
[ RUN      ] BasicBSTMapTests.InvalidKeyCheck
[      OK  ] BasicBSTMapTests.InvalidKeyCheck (30 ms)
[ RUN      ] BasicBSTMapTests.NextKeyCheck
[      OK  ] BasicBSTMapTests.NextKeyCheck (7 ms)
[ RUN      ] BasicBSTMapTests.PrevKeyCheck
[      OK  ] BasicBSTMapTests.PrevKeyCheck (7 ms)
[ RUN      ] BasicBSTMapTests.DestructorCheck
[      OK  ] BasicBSTMapTests.DestructorCheck (3 ms)
[ RUN      ] BasicBSTMapTests.CopyConstructorCheck
[      OK  ] BasicBSTMapTests.CopyConstructorCheck (5 ms)
[ RUN      ] BasicBSTMapTests.CopyAssignmentCheck

```

```

[      OK ] BasicBSTMapTests.CopyAssignmentCheck (8 ms)
[ RUN      ] BasicBSTMapTests.MoveConstructorCheck
[      OK ] BasicBSTMapTests.MoveConstructorCheck (5 ms)
[ RUN      ] BasicBSTMapTests.MoveAssignmentCheck
[      OK ] BasicBSTMapTests.MoveAssignmentCheck (7 ms)
[ RUN      ] BasicBSTMapTests.HeightEmptyCheck
[      OK ] BasicBSTMapTests.HeightEmptyCheck (2 ms)
[ RUN      ] BasicBSTMapTests.NormalHeightCheck
[      OK ] BasicBSTMapTests.NormalHeightCheck (4 ms)
[ RUN      ] BasicBSTMapTests.StatsLinkedListCheck
[      OK ] BasicBSTMapTests.StatsLinkedListCheck (1 ms)
[ RUN      ] BasicBSTMapTests.StatsLeftLeaningCheck
[      OK ] BasicBSTMapTests.StatsLeftLeaningCheck (2 ms)
[-----] 21 tests from BasicBSTMapTests (158 ms total)

[-----] Global test environment tear-down
[=====] 21 tests from 1 test suite ran. (197 ms total)
[ PASSED ] 21 tests.
==660349==
==660349== HEAP SUMMARY:
==660349==    in use at exit: 0 bytes in 0 blocks
==660349== total heap usage: 804 allocs, 804 frees, 152,229 bytes allocated
==660349==
==660349== All heap blocks were freed -- no leaks are possible
==660349==
==660349== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)

```

Performance test output:

```

# All times in milliseconds (msec)
# Column 1 = input data size
# Column 2 = array map insert
# Column 3 = binsearch map insert
# Column 4 = hash map insert
# Column 5 = bst map insert
# Column 6 = array map erase
# Column 7 = binsearch map erase
# Column 8 = hash map erase
# Column 9 = bst map erase
# Column 10 = array map contains
# Column 11 = binsearch map contains
# Column 12 = hash map contains
# Column 13 = bst map contains
# Column 14 = array map find range
# Column 15 = binsearch map find range
# Column 16 = hash map find range
# Column 17 = bst map find range
# Column 18 = array map next key
# Column 19 = binsearch map next key
# Column 20 = hash map next key
# Column 21 = bst map next key
# Column 22 = array map sorted keys
# Column 23 = binsearch map sorted keys
# Column 24 = hash map sorted keys
# Column 25 = bst map sorted keys
# Column 26 = bst map height shuffled
# Column 27 = log base 2 of input size
0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
10000 0.04 0.00 0.00 0.00 0.04 0.06 0.00 0.01 0.00 0.06 0.00 0.00 0.00 0.10 0.06 0.00 0.00 0.07 0.06 0.00 0.18 1.30 1.00 0.00 0.00
20000 0.07 0.00 0.00 0.01 0.07 0.12 0.00 0.01 0.00 0.11 0.00 0.01 0.00 0.20 0.14 0.01 0.00 0.16 0.13 0.00 0.38 2.79 2.10 0.00 0.00
30000 0.10 0.00 0.00 0.01 0.10 0.18 0.00 0.02 0.00 0.17 0.00 0.01 0.00 0.31 0.22 0.02 0.00 0.24 0.20 0.01 0.50 4.22 3.40 0.00 0.00

```

40000	0.12	0.00	0.00	0.01	0.13	0.25	0.00	0.03	0.00	0.23	0.00	0.03	0.00	0.40	0.45	0.02	0.00	0.35	0.32	0.01	0.75	5.92	4.8
50000	0.15	0.00	0.00	0.01	0.15	0.30	0.00	0.03	0.00	0.27	0.00	0.02	0.03	0.52	0.40	0.05	0.00	0.43	0.32	0.02	0.87	7.20	6.2
60000	0.16	0.00	0.00	0.03	0.17	0.37	0.00	0.05	0.00	0.35	0.00	0.01	0.01	0.58	0.47	0.03	0.00	0.54	0.39	0.02	0.98	8.69	7.7
70000	0.32	0.00	0.00	0.01	0.34	0.42	0.00	0.01	0.00	0.39	0.00	0.02	0.04	0.68	0.78	0.07	0.00	0.65	0.55	0.01	1.86	16.14	14
80000	0.34	0.00	0.00	0.04	0.35	0.50	0.00	0.07	0.00	0.45	0.00	0.03	0.04	0.76	1.07	0.10	0.00	0.81	0.60	0.03	1.98	18.27	16
90000	0.20	0.00	0.00	0.03	0.20	0.55	0.00	0.02	0.00	0.52	0.00	0.08	0.04	0.83	0.99	0.09	0.00	0.89	0.67	0.01	1.67	13.30	13
100000	0.35	0.00	0.00	0.04	0.37	0.61	0.00	0.07	0.00	0.54	0.00	0.06	0.07	0.90	1.57	0.14	0.00	1.05	0.83	0.04	2.32	22.42	2

63.55user 0.01system 1:03.57elapsed 99%CPU (0avgtext+0avgdata 14776maxresident)k
0inputs+72outputs (0major+5139minor)pagefaults 0swaps