Name: Jonathan Smoley

Assignment: 9

Complete & Correct:	42 / 48
Tests:	0 / 0
Format and Comments:	6 / 6
Writeup:	6 / 6
Total Score:	54 / 60

Comments:

1. (-6) mem issue as reported by valgrind, which I think is due to your erase (e.g., the use of prev looks unecessary, etc.)

Unit test output:

```
==708327== Memcheck, a memory error detector
==708327== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==708327== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==708327== Command: ./hw9_test
==708327==
[======] Running 21 tests from 1 test suite.
[-----] Global test environment set-up.
[-----] 21 tests from BasicAVLMapTests
[ RUN
                   ] BasicAVLMapTests.EmptyCheck
Ε
              OK ] BasicAVLMapTests.EmptyCheck (11 ms)
                   ] BasicAVLMapTests.InsertCheck
[ RUN
Γ
              OK ] BasicAVLMapTests.InsertCheck (4 ms)
[ RUN
                   ] BasicAVLMapTests.RValueAccessCheck
              OK ] BasicAVLMapTests.RValueAccessCheck (3 ms)
Γ
[ RUN
                   ] BasicAVLMapTests.LValueAccessCheck
              OK ] BasicAVLMapTests.LValueAccessCheck (3 ms)
[ RUN
                   ] BasicAVLMapTests.SimpleContainsCheck
              OK ] BasicAVLMapTests.SimpleContainsCheck (3 ms)
Γ
[ RUN
                   ] \begin{tabular}{l} Basic AVL Map Tests. More Involved Contains Check \\
              OK ] BasicAVLMapTests.MoreInvolvedContainsCheck (2 ms)
Γ
[ RUN
                   ] BasicAVLMapTests.EraseCheck
==708327== Invalid read of size 8
==708327==
                        at 0x1A2299: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:589)
                        by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
==708327==
                        by 0x18DB21: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:112)
                        \verb|by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing) | testing | test
==708327==
                        by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
                        by Ox1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2MC
==708327==
==708327==
                        by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                        by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
                        by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
==708327==
                        by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
                        by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327==
                        by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
                     Address 0x4df1df8 is 24 bytes inside a block of size 32 free'd
==708327==
                        at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
                        by Ox1A21DO: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
==708327==
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by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
             by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
==708327==
              by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
==708327==
             by 0x18DB21: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:112)
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             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
             by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327== Block was alloc'd at
==708327==
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
             by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
             by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
==708327==
             by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
==708327==
==708327==
              by 0x1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
             by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
==708327==
             by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
             by 0x18D9B1: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:106)
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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              at 0x1A2299: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:589)
==708327==
==708327==
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
             by Ox18DCFA: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:115)
==708327==
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              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
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             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
             by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
             by Ox1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
             by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327==
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
           Address 0x4df1d98 is 24 bytes inside a block of size 32 free'd
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memo
==708327==
             by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
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             by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
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             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327== Block was alloc'd at
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
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==708327==
             by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
             by Ox18D98F: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:105)
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
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             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
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by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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==708327==
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              by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
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              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
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              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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==708327==
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             by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
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             by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
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             by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
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              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
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             by 0x18EBC2: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:139)
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             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
             by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
             by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327==
             by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327==
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327== Address 0x4df1eb8 is 24 bytes inside a block of size 32 free'd
==708327==
             at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
             by Ox1A21DO: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
==708327==
             by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
             by Ox18EBC2: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:139)
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
              by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327== Block was alloc'd at
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
==708327==
             by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
==708327==
             by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
             by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
             by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
             by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
             by 0x18D9F5: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:108)
==708327==
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
             by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
==708327== Invalid read of size 8
==708327==
              at Ox1A22AB: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:593)
```

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==708327==
              by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
==708327==
              by 0x18ED9B: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:142)
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
==708327==
             by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
             by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
              by 0x1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327== Address 0x4df1cd8 is 24 bytes inside a block of size 32 free'd
==708327==
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
             by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
==708327==
             by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
==708327==
              by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
==708327==
             by 0x18ED9B: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:142)
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327== Block was alloc'd at
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
             by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
==708327==
             by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
==708327==
             by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
             by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
==708327==
             by 0x1A0C8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
             by Ox18D94B: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:103)
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327== Invalid read of size 8
              at 0x1A22AB: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:593)
==708327==
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
==708327==
             by 0x18EF74: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:145)
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
==708327==
             by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
             by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
           Address 0x4df1f78 is 24 bytes inside a block of size 32 free'd
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memo
==708327==
             by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
==708327==
==708327==
             by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
             by Ox18EF74: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:145)
==708327==
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
```

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by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
                  by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327== Block was alloc'd at
                   at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
==708327==
                  by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
                  by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
                  by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
                  by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
==708327==
                  by 0x1A0C8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
                  by 0x18DA39: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:110)
==708327==
                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
                  by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
                  by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
                   by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
           OK ] BasicAVLMapTests.EraseCheck (20 ms)
[ RUN
               ] BasicAVLMapTests.KeyRangeCheck
           OK ] BasicAVLMapTests.KeyRangeCheck (11 ms)
Γ
[ RUN
               ] BasicAVLMapTests.SortedKeyCheck
           OK ] BasicAVLMapTests.SortedKeyCheck (5 ms)
[ RUN
               ] BasicAVLMapTests.InvalidKeyCheck
           OK ] BasicAVLMapTests.InvalidKeyCheck (30 ms)
Γ
[ RUN
               ] BasicAVLMapTests.NextKeyCheck
Γ
           OK ] BasicAVLMapTests.NextKeyCheck (7 ms)
[ RUN
               ] BasicAVLMapTests.PrevKeyCheck
Γ
           OK ] BasicAVLMapTests.PrevKeyCheck (7 ms)
[ RUN
               BasicAVLMapTests.DestructorCheck
OK ] BasicAVLMapTests.DestructorCheck (3 ms)
              ] BasicAVLMapTests.CopyConstructorCheck
[ RUN
==708327== Invalid read of size 8
==708327==
                   at 0x1A22AB: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:593)
==708327==
                  by 0x1A0E39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
                  by 0x1960E9: BasicAVLMapTests_CopyConstructorCheck_Test::TestBody() (hw9_test.cpp:329)
==708327==
                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
                  by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
                  by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
                  by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
                   \verb|by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported < testing::internal::UnitTestInternal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Intern
==708327==
==708327==
                  by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
                   by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
                Address 0x4df6008 is 24 bytes inside a block of size 32 free'd
==708327==
                   at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
                  by Ox1A21DO: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
                  by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
==708327==
                  by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
                  by 0x1960E9: BasicAVLMapTests_CopyConstructorCheck_Test::TestBody() (hw9_test.cpp:329)
                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
==708327==
                  by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
                  by Ox1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2MC
==708327==
                  by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                  by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
                   by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327== Block was alloc'd at
==708327==
                   at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
                  by Ox1A26D1: AVLMap<char, int>::copy(AVLMap<char, int>::Node const*) const (avlmap.h:493)
==708327==
==708327==
                  by Ox1A2734: AVLMap<char, int>::copy(AVLMap<char, int>::Node const*) const (avlmap.h:498)
                  by Ox1A1636: AVLMap<char, int>::AVLMap(AVLMap<char, int> const&) (avlmap.h:171)
==708327==
==708327==
                  by 0x195FDB: BasicAVLMapTests_CopyConstructorCheck_Test::TestBody() (hw9_test.cpp:326)
```

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==708327==
                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
                  by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
                  by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
==708327==
                  by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
                  by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327==
Γ
          OK ] BasicAVLMapTests.CopyConstructorCheck (5 ms)
[ RUN
              ] BasicAVLMapTests.CopyAssignmentCheck
Γ
          OK ] BasicAVLMapTests.CopyAssignmentCheck (8 ms)
[ RUN
               ] BasicAVLMapTests.MoveConstructorCheck
          OK ] BasicAVLMapTests.MoveConstructorCheck (5 ms)
Γ
[ RUN
               ] BasicAVLMapTests.MoveAssignmentCheck
OK ] BasicAVLMapTests.MoveAssignmentCheck (7 ms)
[ RUN
               ] BasicAVLMapTests.HeightEmptyCheck
Γ
          OK ] BasicAVLMapTests.HeightEmptyCheck (1 ms)
[ RUN
               ] BasicAVLMapTests.SimpleHeightCheck
Γ
          OK ] BasicAVLMapTests.SimpleHeightCheck (4 ms)
[ RUN
               ] BasicAVLMapTests.InsertRebalanceCheck
Γ
          OK ] BasicAVLMapTests.InsertRebalanceCheck (22 ms)
[ RUN
              ] BasicAVLMapTests.EraseRebalanceCheck
==708327== Invalid read of size 8
==708327==
                  at 0x1A2EAF: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int;
==708327==
                  by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
                  by 0x19CB80: BasicAVLMapTests_EraseRebalanceCheck_Test::TestBody() (hw9_test.cpp:524)
==708327==
                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
                  by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
                  by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
                  by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
                   \verb|by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported < testing::internal::UnitTestInternal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Intern
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                  by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327==
                  by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                Address 0x4df9420 is 48 bytes inside a block of size 56 free'd
==708327==
                  at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
                  by Ox1A2DC6: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
                  by Ox1A2E86: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
                  by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
==708327==
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                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
                  by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
                  by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
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                  by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
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==708327==
                  at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
                  by Ox1A2AC9: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int
                  by 0x1A2B7D: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int;
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                  by Ox1A1AB5: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
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                  by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
                  by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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==708327==
==708327==
                  by Ox1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
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==708327== Invalid read of size 8
             at 0x1A2E9D: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
==708327==
             by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>, int>
             by 0x19D842: BasicAVLMapTests_EraseRebalanceCheck_Test::TestBody() (hw9_test.cpp:552)
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             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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             by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327==
             by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327== Address 0x4df9b20 is 48 bytes inside a block of size 56 free'd
             at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
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==708327==
             by Ox1A2DC6: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
             by Ox1A2D1C: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>, int>
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==708327==
             by 0x1A2E86: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
             by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
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==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327== Block was alloc'd at
             at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
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==708327==
             by Ox1A2AC9: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
             by 0x1A2B57: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>, int>
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==708327==
             by 0x1A2B7D: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
             by Ox1A1AB5: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
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             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
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             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by Ox1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
       OK ] BasicAVLMapTests.EraseRebalanceCheck (15 ms)
[-----] 21 tests from BasicAVLMapTests (199 ms total)
[-----] Global test environment tear-down
[=======] 21 tests from 1 test suite ran. (238 ms total)
[ PASSED ] 21 tests.
==708327==
==708327== HEAP SUMMARY:
==708327==
               in use at exit: 6,968 bytes in 181 blocks
==708327==
            total heap usage: 824 allocs, 643 frees, 155,719 bytes allocated
==708327==
==708327== LEAK SUMMARY:
==708327==
             definitely lost: 1,384 bytes in 35 blocks
             indirectly lost: 5,584 bytes in 146 blocks
==708327==
==708327==
               possibly lost: 0 bytes in 0 blocks
             still reachable: 0 bytes in 0 blocks
==708327==
==708327==
                   suppressed: 0 bytes in 0 blocks
==708327== Rerun with --leak-check=full to see details of leaked memory
==708327==
==708327== ERROR SUMMARY: 10 errors from 10 contexts (suppressed: 0 from 0)
==708327==
==708327== 1 errors in context 1 of 10:
```

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==708327== Invalid read of size 8
             at 0x1A2E9D: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
==708327==
              by 0x1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>, int;
              by 0x19D842: BasicAVLMapTests_EraseRebalanceCheck_Test::TestBody() (hw9_test.cpp:552)
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==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
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             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
             by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
             by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
==708327==
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
           Address 0x4df9b20 is 48 bytes inside a block of size 56 free'd
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
==708327==
              by 0x1A2DC6: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
              by 0x1A2D1C: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>, int
==708327==
==708327==
             by 0x1A2E86: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
             by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
             by 0x19D842: BasicAVLMapTests_EraseRebalanceCheck_Test::TestBody() (hw9_test.cpp:552)
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             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
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==708327==
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327== Block was alloc'd at
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
==708327==
             by Ox1A2AC9: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
             by 0x1A2B57: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>, int>
==708327==
==708327==
             by Ox1A2B7D: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
             by Ox1A1AB5: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
             by 0x19D678: BasicAVLMapTests_EraseRebalanceCheck_Test::TestBody() (hw9_test.cpp:549)
==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
             by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
             by Ox1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
==708327==
==708327==
==708327== 1 errors in context 2 of 10:
==708327== Invalid read of size 8
              at 0x1A2EAF: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int
==708327==
==708327==
             by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
==708327==
             by 0x19CB80: BasicAVLMapTests_EraseRebalanceCheck_Test::TestBody() (hw9_test.cpp:524)
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             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
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             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
             by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
             by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
             by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
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==708327==
             by Ox1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
             by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
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              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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             by Ox1A1B53: AVLMap<std::_cxx11::basic_string<char, std::char_traits<char>, std::allocator<char> >, int>
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==708327==
             by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
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==708327==
                  by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
                  by Ox1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2MC
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==708327==
                  by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
                  by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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==708327==
                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
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                  by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
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==708327==
==708327==
==708327== 1 errors in context 3 of 10:
==708327== Invalid read of size 8
==708327==
                  at 0x1A22AB: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:593)
==708327==
                  by 0x1A0E39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
                  by 0x1960E9: BasicAVLMapTests_CopyConstructorCheck_Test::TestBody() (hw9_test.cpp:329)
==708327==
                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
                  by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
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                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
                  by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
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                  by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
                   \verb|by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported < testing::internal::UnitTestInternal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Internal::Intern
==708327==
                  by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
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                  by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
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                  at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
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                  by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
                  by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
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==708327==
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                  by 0x1960E9: BasicAVLMapTests_CopyConstructorCheck_Test::TestBody() (hw9_test.cpp:329)
==708327==
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                  by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
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                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
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                  by Ox1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
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                  at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
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                  by Ox1A26D1: AVLMap<char, int>::copy(AVLMap<char, int>::Node const*) const (avlmap.h:493)
                  by Ox1A2734: AVLMap<char, int>::copy(AVLMap<char, int>::Node const*) const (avlmap.h:498)
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                  by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
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                  by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
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             at 0x1A22AB: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:593)
==708327==
==708327==
             by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
             by Ox18EF74: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:145)
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==708327==
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             by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
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             by 0x18EF74: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:145)
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             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
             by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
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             at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
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             by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
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             by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
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by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
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             by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
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              by 0x18D94B: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:103)
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             by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
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              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
==708327==
              by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
              by 0x1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327== Address 0x4df1f18 is 24 bytes inside a block of size 32 free'd
==708327==
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
              by Ox1A21DO: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
              by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
==708327==
              by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
              by 0x18E9E9: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:136)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
              by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
              by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
==708327== Block was alloc'd at
==708327==
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
              by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
==708327==
              by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
==708327==
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
              by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
              by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
              by Ox18DA17: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:109)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
==708327==
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
==708327==
==708327== 1 errors in context 8 of 10:
==708327== Invalid read of size 8
              at Ox1A2299: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:589)
==708327==
==708327==
              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
              by Ox18EOAC: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:121)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
==708327==
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
              by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
              by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327==
              by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
              by Ox1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
==708327== Address 0x4df1d38 is 24 bytes inside a block of size 32 free'd
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
==708327==
              by Ox1A21DO: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
```

```
by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
              by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
==708327==
              by 0x1A0E39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
              by Ox18EOAC: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:121)
==708327==
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327== Block was alloc'd at
==708327==
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
              by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
              by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
==708327==
              by 0x1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
              by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
==708327==
              by 0x18D96D: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:104)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
==708327== 1 errors in context 9 of 10:
==708327== Invalid read of size 8
              at Ox1A2299: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:589)
==708327==
==708327==
              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
              by Ox18DCFA: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:115)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
==708327==
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
              by Ox1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2MC
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
              by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
              by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
              by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
            Address 0x4df1d98 is 24 bytes inside a block of size 32 free'd
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
              by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
==708327==
==708327==
              by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
              by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
              by 0x1A0E39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
              by Ox18DCFA: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:115)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
==708327==
==708327==
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
==708327==
              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
==708327==
==708327==
           Block was alloc'd at
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
==708327==
              by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
==708327==
              by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
==708327==
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
              by Ox1A2O44: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
              by Ox1AOC8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
==708327==
              by Ox18D98F: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:105)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
```

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==708327==
              by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
==708327== 1 errors in context 10 of 10:
==708327== Invalid read of size 8
              at 0x1A2299: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:589)
==708327==
==708327==
              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
              by 0x18DB21: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:112)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
              by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
              by 0x1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-x
              by 0x1B3DE0: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327==
              by 0x1C3960: testing::internal::UnitTestImpl::RunAllTests() (in /home/bowers/svn/bowers/teaching/cpsc223-
              by 0x1E78A9: bool testing::internal::HandleSehExceptionsInMethodIfSupported<testing::internal::UnitTestIn
==708327==
==708327==
              by Ox1DF42E: bool testing::internal::HandleExceptionsInMethodIfSupported<testing::internal::UnitTestImpl
              by 0x1C209F: testing::UnitTest::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327== Address 0x4df1df8 is 24 bytes inside a block of size 32 free'd
              at 0x483D1CF: operator delete(void*, unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memory
==708327==
==708327==
              by Ox1A21D0: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:563)
==708327==
              by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
              by Ox1A2138: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:549)
==708327==
              by Ox1A2282: AVLMap<char, int>::erase(char const&, AVLMap<char, int>::Node*) (avlmap.h:586)
==708327==
              by Ox1AOE39: AVLMap<char, int>::erase(char const&) (avlmap.h:297)
==708327==
              by 0x18DB21: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:112)
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
==708327==
              by Ox1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Test)
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
==708327==
              by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
              by Ox1B3DEO: testing::TestSuite::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327== Block was alloc'd at
==708327==
              at 0x483BE63: operator new(unsigned long) (in /usr/lib/x86_64-linux-gnu/valgrind/vgpreload_memcheck-amd64
==708327==
              by Ox1A1FA6: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:508)
==708327==
              by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
==708327==
              by Ox1A201E: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:520)
==708327==
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
              by Ox1A2044: AVLMap<char, int>::insert(char const&, int const&, AVLMap<char, int>::Node*) (avlmap.h:524)
==708327==
==708327==
              by 0x1A0C8B: AVLMap<char, int>::insert(char const&, int const&) (avlmap.h:284)
              by Ox18D9B1: BasicAVLMapTests_EraseCheck_Test::TestBody() (hw9_test.cpp:106)
==708327==
==708327==
              by 0x1E637B: void testing::internal::HandleSehExceptionsInMethodIfSupported<testing::Test, void>(testing
              by 0x1DE1F0: void testing::internal::HandleExceptionsInMethodIfSupported<testing::Test, void>(testing::Te
==708327==
==708327==
              by 0x1B2A37: testing::Test::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-JT2M0
==708327==
              by Ox1B34AB: testing::TestInfo::Run() (in /home/bowers/svn/bowers/teaching/cpsc223-s22/grading/HW-9/hw9-
==708327==
==708327== ERROR SUMMARY: 10 errors from 10 contexts (suppressed: 0 from 0)
```

Performance test output:

```
# All times in milliseconds (msec)
# Column 1 = input data size
# Column 2 = binsearch map insert
# Column 3 = hash map insert
# Column 4 = bst map insert
# Column 5 = avl map insert
# Column 6 = binsearch map erase
# Column 7 = hash map erase
# Column 8 = bst map erase
# Column 9 = avl map erase
# Column 10 = binsearch map contains
```

```
# Column 11 = hash map contains
# Column 12 = bst map contains
# Column 13 = avl map contains
# Column 14 = binsearch map find range
# Column 15 = hash map find range
# Column 16 = bst map find range
# Column 17 = avl map find range
# Column 18 = binsearch map next key
# Column 19 = hash map next key
# Column 20 = bst map next key
# Column 21 = avl map next key
# Column 22 = binsearch map sorted keys
# Column 23 = hash map sorted keys
# Column 24 = bst map sorted keys
# Column 25 = avl map sorted keys
# Column 26 = bst map height
# Column 27 = avl map height
# Column 28 = log base 2 of input size
50000 0.27 0.00 0.01 0.00 0.28 0.00 0.08 0.00 0.00 0.00 0.11 0.00 2.25 2.65 0.06 0.03 0.00 0.43 0.02 0.00 0.74 3.24 1.4
60000\ 0.17\ 0.00\ 0.02\ 0.00\ 0.17\ 0.00\ 0.05\ 0.00\ 0.00\ 0.00\ 0.01\ 0.00\ 0.09\ 0.60\ 0.05\ 0.01\ 0.00\ 0.51\ 0.02\ 0.00\ 0.84\ 4.49\ 1.50\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 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\ 0.0
80000\ 0.34\ 0.00\ 0.04\ 0.00\ 0.34\ 0.00\ 0.07\ 0.00\ 0.00\ 0.00\ 0.02\ 0.00\ 5.00\ 5.54\ 0.09\ 0.04\ 0.00\ 0.68\ 0.03\ 0.00\ 1.92\ 11.56\ 3
100000 0.36 0.00 0.04 0.00 0.38 0.00 0.07 0.00 0.00 0.00 0.08 0.00 16.43 17.98 0.16 0.08 0.00 1.39 0.05 0.00 2.03 12.84
69.39user 0.03system 1:09.44elapsed 99%CPU (Oavgtext+Oavgdata 69128maxresident)k
Oinputs+72outputs (Omajor+17600minor)pagefaults Oswaps
```