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3 // C/C++ Programming IV : Advanced Programming with Objects
4 // 152488 Raymond L. Mitchell III
5 // hw1.cpp
6 // Win10
7 // Visual C++ 19.0
8 //
9
10 #include <iostream>
11 #include <algorithm>
12 #include <deque>
13 #include <string>
14 #include <vector>
15 #include <exception>
16 #include <iterator>           // contains back_inserter
17 #include <numeric>           // contains accumulate
18 #include <sstream>           // contains ostringstream
19
20 using namespace std;
21
22 // class generators:
23 struct UniqueNumbers {
24     int current;
25     UniqueNumbers() { current = 0; }
26     int operator()() { return ++current; }
27 } uniqueNumber;
28
29 struct LowerCharUnique {
30     char current;
31     LowerCharUnique() { current = 'a'; }
32     char operator()() { return current++; }
33 } uniqueLowerLetter;
34
35 // Parser Function:
36 bool isEven(int i) { return (i % 2) == 0; }
37
38 // Unit Tests:
39 void testDeque()
40 {
41     const size_t NUM_VALUES = 10;
42     const int VALID_VALUE = 55;
43     deque<int> tempDeque;
44
45     // 1a) populate the testDeque with sequential values 1 to 10
46     generate_n(back_inserter(tempDeque), NUM_VALUES, uniqueNumber);
47
48     // 1b) add all values within the testDeque (initial value is 0)
49     int testValue = accumulate(tempDeque.begin(), tempDeque.end(), 0);
50
51     // 1c) Check if expected value is calculated
52     if (testValue == VALID_VALUE)
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53     clog << "testDeque PASSED\n";
54     else
55         clog << "testDeque FAILED : Expected accumulation "
56             << VALID_VALUE << " instead saw " << testValue << "\n";
57 }
58
59 void testString()
60 {
61     const size_t NUM_VALUES = 26;
62     string tempString;
63     const string VALID_VALUE = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";
64
65     // 2a) populate tempString with lowercase letters ascending order
66     generate_n(back_inserter(tempString), NUM_VALUES, uniqueLowerLetter);
67
68     // 2b) use transform to convert string to uppercase
69     transform(tempString.begin(), tempString.end(), tempString.begin(), toupper);
70
71     // 2c) Check if expected value is calculated (if true output = 0)
72     if (tempString.compare(VALID_VALUE) == 0)
73         clog << "testString PASSED\n";
74     else
75         clog << "testString FAILED : Expected string "
76             << VALID_VALUE << " instead saw " << tempString << "\n";
77 }
78
79 void testVector()
80 {
81     vector<int>::iterator divider;
82     const string VALID_VALUE = "24681013579";
83     ostringstream tempOStream;
84     std::ostream_iterator<int> out_it(tempOStream);
85
86     //3a) create an array literal containing the values 10 to 1
87     const int INIT_ARRAY[] = {10,9,8,7,6,5,4,3,2,1};
88
89     //3b) initialize vector to initArray using iterator range constructor
90     vector<int> tempVector(INIT_ARRAY, INIT_ARRAY + sizeof(INIT_ARRAY) / sizeof
91         (int));
92
93     //3c) rearrange values to place even numbers in lower half of vector
94     divider = partition(tempVector.begin(), tempVector.end(), isEven);
95
96     //3d) sort on each partition
97     // sort even partition
98     sort(tempVector.begin(), divider);
99     // sort odd partition
100     sort(divider, tempVector.end());
101
102     // 3e) Copy vector to an ostring_stream
103     copy(tempVector.begin(), tempVector.end(), out_it);
```

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104 // 3f) Verify ostream_stream contents
105 if (tempOStream.str().compare(VALID_VALUE) == 0)
106     clog << "testVector PASSED\n";
107 else
108     clog << "testVector FAILED : Expected output "
109         << VALID_VALUE << " instead saw " << tempOStream.str() << "\n";
110 }
111
112 int main(void)
113 {
114     //unit test demonstrating deque & algorithm functionality
115     testDeque();
116
117     //unit test demonstrating string & algorithm functionality
118     testString();
119
120     // unit test demonstrating vector & algorithm functionality
121     testVector();
122 }
123
```