

Codebeispiele

C++

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1 Drill questions

namespace	headerfile	variable	function	type	description
std::cin	istream	x			Represent standard input stream
std::endl	ostream		x		Inserts a newline character into the output sequence os and flushes it as if by calling.
std::tolower	cctype		x		Converts given character to lowercase (A -> a).
std::string	string			x	Stores and manipulates sequences of char-like objects.
std::distance	iterator		x		Returns the number of hops from first to last.
std::istream_iterator	iterator			x	Read successive objects of type T from the basic_istream.
std::size_t	cstdint			x	Unsigned integer type of the result of the sizeof operator.
std::vector	vector			x	Sequence container that encapsulates dynamic size arrays.

1.1 Element Iteration

	const: • element cannot be changed	non-const: • element can be changed
reference: • element in vector is accessed	<pre>for (auto const & cref : v) { std::cout << cref << '\n'; }</pre>	<pre>for (auto & ref : v) { ref *= 2; }</pre>
copy: • loop has own copy of the element	<pre>for (auto const ccopy : v) { std::cout << ccopy << '\n'; }</pre>	<pre>for (auto copy : v) { copy *= 2; std::cout << copy << '\n'; }</pre>

2 Stack and Queue

```
1 #include <stack>
2 #include <queue>
3 #include <iostream>
4 #include <string>
5
6 int main() {
7     std::stack<std::string> lifo{};
8     std::queue<std::string> fifo{};
9     for (std::string s : { "Fall", "leaves", "after", "leaves", "fall" }) {
10         lifo.push(s);
11         fifo.push(s);
12     }
13     while (!lifo.empty()) { // fall leaves after leaves Fall
14         std::cout << lifo.top() << ' ';
15         lifo.pop(); } std::cout << '\n';
16     while (!fifo.empty()) { // Fall leaves after leaves fall
17         std::cout << fifo.front() << ' ';
18         fifo.pop();
19     }
20 }
21 }
```

3 MAP

3.1 counting word

```
1 #include <map>
2 #include <iostream>
3 #include <string>
4
5 int main(){
6     std::map<std::string, size_t> words{};
7     std::string s{};
8
9     while (std::cin >> s) {
10         ++words[s];
11     }
12     for(auto const & p : words) {
13         std::cout << p.first << " = " << p.second << '\n';
14     }
15 }
```

4 Istream and Ostream

4.1 robust reading of an int value

```

1 int inputAge(std::istream & in) {
2     while (in.good()) {
3         std::string line{};
4         getline(in, line);
5         std::istringstream is{line};
6         int age{-1};
7         if (is >> age) {
8             return age;
9         }
10    }
11    return -1;
12 }

```

4.2 Implementing Read

```

1 class Date {
2     int year, month, day;
3 public:
4     std::istream & read(std::istream & is) {
5         int year{-1}, month{-1}, day{-1};
6         char sep1, sep2;
7         //read values
8         is >> year >> sep1 >> month >> sep2 >> day;
9         try {
10            Date input{year, month, day};
11            //overwrite content of this object (copy-ctor)
12            (*this) = input;
13            //clear stream if read was ok
14            is.clear();
15        } catch (std::out_of_range const & e) {
16            //set failbit
17            is.setstate(std::ios::failbit);
18        }
19        return is;
20    }
21 };

```

4.3 Implementing Print

Date.h

```

1 #include <ostream>
2
3 class Date {
4     int year, month, day;
5 public:
6     std::ostream & print(std::ostream & os) const {
7         os << year << "/" << month << "/" << day;
8         return os;
9     }
10 };
11 inline std::ostream & operator<<(std::ostream & os, Date const & date) {
12     return date.print(os);
13 }

```

13 }

Any.cpp

```
1 #include "Date.h"
2 #include <iostream>
3
4 void foo() {
5     std::cout << Date::myBirthday;
6 }
```

5 Count

5.1 non-whitespace Chars

char.h

```
1 #include <iosfwd>
2 int charcount(std::istream &in);
```

char.cpp

```
1 int charcount(std::istream &in){
2     std::string line{};
3     std::getline(input, line);
4     line.erase(remove(line.begin(), line.end(), ' '), line.end());
5     return line.size();
6 }
```

main.cpp

```
1 #include <charc.h>
2 #include <iostream>
3 int main(){
4     std::cout << charc(std::cin) << '\n';
5 }
```

without loop char.cpp

```
1 int charcount(std::istream &in){
2     using initer = std::istream_iterator<char>;
3     return std::vector<char>{initer{in}, initer{}}.size();
4 }
```

5.2 all Chars

header

```
1 int allcharcount(std::istream &in){
2 }
```

cpp

```
1 void allcharc(std::istream & in, std::ostream & out) {
2     char c { };
3     int counter { 0 };
4     while (in.get() >> c && in.eof() == false) {
5         counter++;
6     }
7     out << counter;
8 }
```

without loop cpp

```
1 int allcharcount(std::istream &in){
2 }
3 void allcharc(std::istream & in, std::ostream & out) {
4     std::noskipws (in);
5     std::istream_iterator<char> input {in};
6     std::istream_iterator<char> eos{};
7     out << std::distance(input, eos);
8 }
```


5.3 Words

header

```
1 int wordcount(std::istream &in){  
2 }
```

cpp

```
1 void wc(std::istream & in, std::ostream & out) {  
2     std::string word{};  
3     int counter{0};  
4     while (in >> word) {  
5         counter++;  
6     }  
7     out << counter;  
8 }
```

5.4 Lines

header

```
1 int linecount(std::istream &in){  
2 }
```

cpp

```
1 void lc(std::istream & in, std::ostream & out) {  
2     std::string line{};  
3     int counter{0};  
4     while (!in.eof()) {  
5         std::getline(in, line);  
6         counter++;  
7     }  
8     out << counter;  
9 }
```

6 Testat 1

6.1 calc.cpp

```
1 #include "calc.h"
2 #include <exception>
3 #include <istream>
4 int calc(int lhs, int rhs, char op) {
5     switch(op) {
6         case '+': return lhs + rhs;
7         case '-': return lhs - rhs;
8         case '*': return lhs * rhs;
9         case '/':
10            case '%':
11                if(rhs == 0)
12                {
13                    throw std::invalid_argument{"Modulo by zero"};
14                }
15                else
16                {
17                    if(op == '/')
18                    {
19                        return lhs / rhs;
20                    }
21                    else
22                    {
23                        return lhs % rhs;
24                    }
25                }
26            default: throw std::invalid_argument{"Invalid Argument"};
27        }
28    }
29    int calc(std::istream& in)
30    {
31        int lhs{}, rhs{};
32        char op{};
33        if(in >> lhs >> op >> rhs)
34        {
35            return calc(lhs, rhs, op);
36        }
37
38        throw std::invalid_argument{"Invalid Argument!"};
39    }
```

6.2 calc.h

```
1 #ifndef CALC_H_
2 #define CALC_H_
3 #include <iosfwd>
4
5 int calc(int lhs, int rhs, char op);
6 int calc(std::istream& in);
7
8 #endif /* CALC_H_ */
```

6.3 pocketcalculator.cpp

```

1  #include "pocketcalculator.h"
2  #include "calc.h"
3  #include "sevensegment.h"
4  #include <iostream>
5  #include <exception>
6  #include <string>
7  #include <sstream>
8
9  const unsigned MAXDIGITLENGTH{8};
10
11 void startCalculator(std::ostream &out, std::istream &in)
12 {
13     std::string line{};
14     while(getline(in, line))
15     {
16         std::istringstream argument{line};
17         try {
18             int result = calc(argument);
19             std::string digits = std::to_string(result);
20             if(digits.length() <= MAXDIGITLENGTH)
21             {
22                 printLargeNumber(result, out);
23             }
24             else
25             {
26                 throw std::length_error{"Too many digits"};
27             }
28         } catch (...) {
29             printErrorMessage(out);
30         }
31     }
32 }

```

6.4 pocketcalculator.h

```

1  #ifndef POCKETCALCULATOR_H_
2  #define POCKETCALCULATOR_H_
3  #include <iosfwd>
4
5  void startCalculator(std::ostream &out, std::istream &in);
6
7  #endif /* POCKETCALCULATOR_H_ */

```

6.5 sevensegment.cpp

```

1  #include "sevensegment.h"
2  #include <ostream>
3  #include <algorithm>
4  #include <vector>
5  #include <string>
6  void printLargeNumber(int i, std::ostream &out)
7  {
8      std::string number = std::to_string(i);
9      if(i > 0)
10     {
11         for(int line = 0; line < 5; line++)
12         {

```

```

13         std::for_each(number.begin(), number.end(), [&out, line](auto digit){
14             digit = digit - '0';
15             out << digitsvector.at(digit).at(line);
16         });
17         out << '\n';
18     }
19 }
20 else
21 {
22     for(int line = 0; line < 5; line++)
23     {
24
25         std::for_each(number.begin(), number.end(), [&out, line](auto symbol){
26             if(symbol == '-')
27             {
28                 out << minusvector.at(line);
29             }
30             else
31             {
32                 symbol = symbol - '0';
33                 out << digitsvector.at(symbol).at(line);
34             }
35
36         });
37         out << '\n';
38     }
39 }
40
41 }
42 void printErrorMessage(std::ostream &out)
43 {
44     std::for_each(errorvector.begin(), errorvector.end(), [&out](auto line)
45     {
46         out << line << '\n';
47     });
48 }
49 void printLargeDigit(int i, std::ostream &out)
50 {
51     std::vector<std::string> number = digitsvector.at(i);
52
53     std::for_each(std::begin(number), std::end(number), [&out](auto line) {
54         out << line << '\n';
55     });
56 }

```

6.6 sevensegment.h

```

1 #ifndef SEVENSEGMENT_H_
2 #define SEVENSEGMENT_H_
3 #include <iosfwd>
4 #include <vector>
5 #include <string>
6
7 const std::vector<std::vector<std::string>> digitsvector{
8     std::vector<std::string>{" - ", " | ", " ", " | ", " - "},
9     std::vector<std::string>{" ", " | ", " ", " | ", " "},
10    std::vector<std::string>{" - ", " | ", " - ", " | ", " - "},
11    std::vector<std::string>{" - ", " | ", " - ", " | ", " - "},
12    std::vector<std::string>{" ", " | ", " - ", " | ", " "},
13    std::vector<std::string>{" - ", " | ", " - ", " | ", " - "},

```

```

14     std::vector<std::string>{" - ", "| ", " - ", "| |", " - "},
15     std::vector<std::string>{" - ", "| ", " ", "| ", " "},
16     std::vector<std::string>{" - ", "| |", " - ", "| |", " - "},
17     std::vector<std::string>{" - ", "| |", " - ", " |", " - "}
18 };
19
20 const std::vector<std::string> errorvector
21 {
22
23     {" - "},
24     {"| "},
25     {" - - - - "},
26     {"| | | | |"},
27     {" - - "}}
28 };
29
30 const std::vector<std::string> minusvector
31 {
32     {" "},
33     {" "},
34     {"-"},
35     {" "},
36     {" "}}
37 };
38
39 void printLargeDigit(int i, std::ostream &out);
40 void printLargeNumber(int i, std::ostream &out);
41 void printErrorMessage(std::ostream &out);
42
43 #endif /* SEVENSEGMENT_H_ */

```

7 Testat 2

7.1 word.h

```

1  #ifndef WORD_H_
2  #define WORD_H_
3
4  #include <algorithm>
5  #include <iosfwd>
6  #include <string>
7  #include <cctype>
8  #include <vector>
9
10 namespace word {
11     class Word {
12     public:
13         Word() noexcept = default;
14         explicit Word(std::string const &s);
15         std::istream & read(std::istream & is);
16         std::ostream & print(std::ostream & os) const;
17         bool operator==(Word const & rhs) const;
18         bool operator<(Word const & rhs) const;
19     private:
20         bool static isValidWord(std::string s);
21     };
22
23     std::istream & operator>>(std::istream & is, Word & word);
24     std::ostream & operator<<(std::ostream & os, Word const & word);
25     std::ostream & operator<<(std::ostream & os, std::vector<Word> const & l);
26
27     inline bool operator>(Word const & lhs, Word const & rhs) {
28         return rhs < lhs;
29     }
30     inline bool operator>=(Word const & lhs, Word const & rhs) {
31         return !(lhs < rhs);
32     }
33     inline bool operator<=(Word const & lhs, Word const & rhs) {
34         return !(rhs < lhs);
35     }
36     inline bool operator!=(Word const & lhs, Word const & rhs) {
37         return !(rhs == lhs);
38     }
39 }
40
41 #endif /* WORD_H_ */

```

7.2 word.cpp

```

1  #include "word.h"
2
3  #include <algorithm>
4
5  #include <cctype>
6  #include <iosfwd>
7  #include <stdexcept>
8  #include <string>
9  #include <iterator>
10

```

```

11 namespace word {
12 Word::Word(std::string const &s) {
13     if (s.empty()) {
14         throw std::invalid_argument("Word cannot be initialized with an empty string!");
15     }
16     if (!isValidWord(s)) {
17         throw std::invalid_argument("Word must contain only alphanumeric chars!");
18     }
19     word = s;
20 }
21
22 bool Word::isValidWord(std::string s) {
23     return std::all_of(s.begin(), s.end(), [](char c) {return std::isalpha(c);});
24 }
25
26 std::istream & Word::read(std::istream & is) {
27     while (!isalpha(is.peek()) && !is.eof()) {
28         is.ignore();
29     }
30     std::string temp { };
31     while (isalpha(is.peek()) && !is.eof()) {
32         temp += is.get();
33     }
34     if (!temp.empty()) {
35         if (isValidWord(temp)) {
36             word.clear();
37             word = temp;
38             is.clear();
39         } else {
40             is.setstate(std::ios::failbit);
41         }
42     }
43     return is;
44 }
45 bool Word::operator==(Word const & rhs) const {
46     return std::equal(word.begin(), word.end(), rhs.word.begin(), rhs.word.end(),
47         [](auto left, auto right)
48         {
49             return tolower(left) == tolower(right);
50         });
51 }
52 bool Word::operator<(Word const & rhs) const {
53     return std::lexicographical_compare(word.begin(), word.end(), rhs.word.begin(),
54         rhs.word.end(), [](char a, char b) {
55             return tolower(a) < tolower(b);
56         });
57 }
58 std::ostream & Word::print(std::ostream & os) const {
59     os << word;
60     return os;
61 }
62
63 std::istream & operator>>(std::istream & is, Word & word) {
64     return word.read(is);
65 }
66
67 std::ostream & operator<<(std::ostream & os, Word const & word) {
68     return word.print(os);
69 }
70 }

```

7.3 kwic.cpp

```

1  #include "kwic.h"
2  #include "word.h"
3  #include <iosfwd>
4  #include <iterator>
5  #include <ostream>
6  #include <sstream>
7  #include <string>
8  #include <vector>
9  #include <algorithm>
10
11 using namespace word;
12
13 namespace word {
14     std::ostream & operator<<(std::ostream & os, std::vector<Word> const & l) {
15         std::copy(std::begin(l), std::end(l), std::ostream_iterator<Word>(os, " "));
16         return os;
17     }
18 }
19
20 namespace kwic {
21     std::vector<std::vector<Word>> rotate(std::vector<std::vector<Word>> const &
22         input) {
23         std::vector<std::vector<Word>> rotated {};
24         std::for_each(begin(input), end(input), [&](std::vector<Word> toRotate) {
25             for (auto it = begin(toRotate); it != end(toRotate); it++) {
26                 std::vector<Word> rotatedLine { toRotate.size() };
27                 std::rotate_copy(
28                     std::begin(toRotate), it, std::end(toRotate),
29                     std::begin(rotatedLine));
30                 rotated.push_back(rotatedLine);
31             }
32         });
33         std::sort(rotated.begin(), rotated.end());
34         return rotated;
35     }
36
37     void kwic(std::istream & in, std::ostream & out) {
38         std::vector<std::vector<Word>> lines {};
39         std::string inputLine {};
40         while(std::getline(in, inputLine)) {
41             std::istringstream lineStream { inputLine };
42             std::istream_iterator<Word> wordIterator { lineStream }, eof {};
43             lines.push_back(std::vector<Word> { wordIterator, eof });
44         }
45         std::vector<std::vector<Word>> rotatedLines = rotate(lines);
46
47         std::copy(
48             std::begin(rotatedLines),
49             std::end(rotatedLines),
50             std::ostream_iterator<std::vector<Word>>(out, "\n"));
51
52         // std::for_each(begin(rotatedLines), end(rotatedLines), [&out](std::vector<Word>
53         //     line) {
54         //         //out << line << '\n';
55         //     });
56     }
57 }

```

7.4 kwic.h

```
1 #ifndef KWIC_H_
2 #define KWIC_H_
3 #include <iosfwd>
4
5 namespace kwic {
6     void kwic(std::istream & in, std::ostream & out);
7 }
8
9 #endif /* KWIC_H_ */
```

8 Testat 3

8.1 indexableSet.h

```

1  #ifndef SRC_INDEXABLESET_H_
2  #define SRC_INDEXABLESET_H_
3
4  #include <functional>
5  #include <set>
6  #include <iterator>
7  #include <stdexcept>
8
9  template<typename T, typename COMPARE = std::less<T>>
10 struct indexableSet: std::set<T, COMPARE> {
11     using container = std::set<T, COMPARE>;
12     using container::container;
13     using const_reference = typename container::const_reference;
14
15 public:
16     const_reference at(int index) const {
17         if (index < 0) {
18             index += this->size();
19         }
20         if (static_cast<unsigned>(index) >= this->size()) {
21             throw std::out_of_range { "index out of range!" };
22         }
23
24         return *std::next(this->begin(), index);
25     }
26
27     const_reference operator[](int index) const {
28         return at(index);
29     }
30
31     const_reference front() const {
32         return at(0);
33     }
34
35     const_reference back() const {
36         return at(-1);
37     }
38 };
39 #endif /* SRC_INDEXABLESET_H_ */

```

8.2 Test.cpp

```

1  #include "cute.h"
2  #include "ide_listener.h"
3  #include "xml_listener.h"
4  #include "cute_runner.h"
5  #include "indexableSet.h"
6
7  #include <functional>
8  #include <iterator>
9  #include <string>
10 #include <vector>
11 #include <algorithm>
12 #include <cctype>
13

```

```

14 void emptyContainerTest() {
15     indexableSet<int, std::less<int>> empty { };
16     ASSERT_EQUAL(0, empty.size());
17 }
18
19 void resultingSizeTest() {
20     std::vector<std::string> input { "Banana", "Apple", "Strawberry", "Ananas" };
21     indexableSet<std::string> const fruits { std::begin(input), std::end(input) };
22     ASSERT_EQUAL(4, fruits.size());
23 }
24
25 void ascendingOrderRangeConstructorTest() {
26     indexableSet<std::string> fruits { "Banana", "Apple", "Strawberry", "Ananas" };
27     std::vector<std::string> expected { "Ananas", "Apple", "Banana", "Strawberry" };
28     std::vector<std::string> actual { std::begin(fruits), std::end(fruits) };
29     ASSERT_EQUAL(expected, actual);
30 }
31
32 void descendingOrderRangeConstructorTest() {
33     indexableSet<std::string> fruits { "Banana", "Apple", "Strawberry", "Ananas" };
34     std::vector<std::string> expected { "Strawberry", "Banana", "Apple", "Ananas" };
35     std::vector<std::string> actual { std::rbegin(fruits), std::rend(fruits) };
36     ASSERT_EQUAL(expected, actual);
37 }
38
39 void copyConstructorTest() {
40     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
41     };
42     indexableSet<std::string> const copy { fruits };
43     ASSERT_EQUAL(4, copy.size());
44 }
45
46 void atTooLargeIndex() {
47     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
48     };
49     ASSERT_THROWS(fruits.at(4), std::out_of_range);
50 }
51
52 void atTooSmallIndex() {
53     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
54     };
55     ASSERT_THROWS(fruits.at(-8), std::out_of_range);
56 }
57
58 void initializerConstructorTest() {
59     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
60     };
61     ASSERT_EQUAL(4, fruits.size());
62 }
63
64 void atPositiveIndicesTest() {
65     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
66     };
67     ASSERT_EQUAL("Strawberry", fruits.at(3));
68 }
69
70 void atNegativeIndicesTest() {
71     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
72     };
73     ASSERT_EQUAL("Banana", fruits.at(-2));
74 }

```

```

70 void frontEmptyExceptionTest() {
71     indexableSet<std::string> const empty { };
72     ASSERT_THROWS(empty.front(), std::out_of_range);
73 }
74
75 void frontNotEmptyTest() {
76     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
77     };
78     ASSERT_EQUAL("Ananas", fruits.front());
79 }
80
81 void backEmptyExceptionTest() {
82     indexableSet<std::string> const empty { };
83     ASSERT_THROWS(empty.back(), std::out_of_range);
84 }
85
86 void backNotEmptyTest() {
87     indexableSet<std::string> const fruits { "Banana", "Apple", "Strawberry", "Ananas"
88     };
89     ASSERT_EQUAL("Strawberry", fruits.back());
90 }
91
92 void iteratorOrderTest() {
93     indexableSet<std::string, std::greater<>> fruits { "Banana", "Apple",
94     "Strawberry", "Ananas" };
95     std::vector<std::string> expected { "Strawberry", "Banana", "Apple", "Ananas" };
96     ASSERT_EQUAL_RANGES(std::begin(expected), std::end(expected), std::begin(fruits),
97     std::end(fruits));
98 }
99
100 void returningByIndexAndValueTest() {
101     indexableSet<int> const values { 15 };
102     ASSERT_EQUAL(&values.at(0), &values[0]);
103 }
104
105 void FrontBackReferenceTest() {
106     indexableSet<int> const values { 15 };
107     ASSERT_EQUAL(&values.front(), &values.back());
108 }
109
110 struct caselessCompare {
111     bool operator()(std::string const &left, std::string const &right) const {
112         return std::lexicographical_compare(left.begin(), left.end(), right.begin(),
113         right.end(), [](char c1, char c2)
114         {
115             return std::tolower(c1) < std::tolower(c2);
116         });
117     }
118 };
119
120 void caselessComparatorTest1() {
121     indexableSet<std::string, caselessCompare> set { "a", "B", "c" };
122     ASSERT_EQUAL("a", set[0]);
123 }
124
125 void caselessComparatorTest2() {
126     indexableSet<std::string, caselessCompare> set { "A", "B", "c" };
127     ASSERT_EQUAL("B", set[1]);
128 }
129
130 void caselessComparatorTest3() {
131     indexableSet<std::string, caselessCompare> set { "A", "B", "c" };

```

```
127     ASSERT_EQUAL("c", set[2]);
128 }
129
130 void caselessComparatorTest4() {
131     indexableSet<std::string, caselessCompare> set {"A", "a"};
132     ASSERT_EQUAL(1, set.size());
133 }
134
135 bool runAllTests(int argc, char const *argv[]) {
136     cute::suite s { };
137     //TODO add your test here
138     s.push_back(CUTE(emptyContainerTest));
139     s.push_back(CUTE(copyConstructorTest));
140     s.push_back(CUTE(resultingSizeTest));
141     s.push_back(CUTE(ascendingOrderRangeConstructorTest));
142     s.push_back(CUTE(atTooLargeIndex));
143     s.push_back(CUTE(atTooSmallIndex));
144     s.push_back(CUTE(initializerConstructorTest));
145     s.push_back(CUTE(descendingOrderRangeConstructorTest));
146     s.push_back(CUTE(frontNotEmptyTest));
147     s.push_back(CUTE(frontEmptyExceptionTest));
148     s.push_back(CUTE(backEmptyExceptionTest));
149     s.push_back(CUTE(backNotEmptyTest));
150     s.push_back(CUTE(atPositiveIndicesTest));
151     s.push_back(CUTE(atNegativeIndicesTest));
152     s.push_back(CUTE(iteratorOrderTest));
153     s.push_back(CUTE(returningByIndexAndValueTest));
154     s.push_back(CUTE(FrontBackReferenceTest));
155     s.push_back(CUTE(caselessComparatorTest1));
156     s.push_back(CUTE(caselessComparatorTest2));
157     s.push_back(CUTE(caselessComparatorTest3));
158     s.push_back(CUTE(caselessComparatorTest4));
159
160     cute::xml_file_opener xmlfile(argc, argv);
161     cute::xml_listener<cute::ide_listener<>> lis(xmlfile.out);
162     auto runner = cute::makeRunner(lis, argc, argv);
163     bool success = runner(s, "AllTests");
164     return success;
165 }
166
167 int main(int argc, char const *argv[]) {
168     return runAllTests(argc, argv) ? EXIT_SUCCESS : EXIT_FAILURE;
169 }
```
