

Source File: ~/4301/03/lab03.(C|CPP|cpp|c++|cc|cxx|cp)
Input: Under control of main function
Output: Under control of main function
Value: 2

For $\Sigma = \{a, b\}$, construct a boolean C++ function to implement a finite state automata that accepts a string of unknown length as its argument and determines if the string is a member of the set consisting of

$\{x \mid x \in \{a, b\}^* \text{ and that contain an odd number of occurrences of the substring } aa\}$

Note that *aaa* has two occurrences of *aa*. Valid strings include *aab*, *baa*, *aabbb*, *bbbaa*, *aabbbb*, *bbbbbbbaa*, *aa*, *baa*, *bbaaaabaaa*, and *bababaabababa*, but not ϵ , *babab*, *abbba*, *bbbabbabbb*, *a*, *b*, *ab*, *ba*, *bb*, *aaa*, *aba*, *bbb*, *abba*, *baba*, *babba*, *abbbba*, *bbabababa*, *babaaabaaa*, or *abaaaaaaaaaaa*.

A sample main function for testing your function is shown in Figure 1, and a sample execution sequence is shown in Figure 2. To use the Makefile as distributed in class, add a target of *lab03* to *targets2srcfiles*.

```

1  #include <iostream>
2  #include <cstdlib>
3  #include <string>
4
5  using namespace std;
6
7  bool isValid(string);
8
9  int main()
10 {
11     string s;
12
13     while (getline(cin, s))
14         cout << s << " is " << (isValid(s) ? "valid" : "invalid") << endl;
15
16     return EXIT_SUCCESS;
17 }
```

Figure 1. /usr/local/4301/src/lab03main.C

```

1  newuser@csunix ~> cd 4301
2  newuser@csunix ~/4301> ./getlab.ksh 03
3  * Checking to see if a folder exists for Lab 03. . .No
4  * Creating a folder for Lab 03
5  * Checking to see if Lab 03 has sample input and output files. . .Yes
6  * Copying input and output files for Lab 03
7  from folder /usr/local/4301/data/03 to folder ./03
8  * Checking to see if /usr/local/4301/src/lab03main.C exists. . .Yes
9  * Copying file /usr/local/4301/src/lab03main.C to folder ./03
10 * Checking to see if /usr/local/4301/include/lab03.h exists. . .No
11 * Copying file /usr/local/4301/src/Makefile to folder ./03
```

Figure 2. Commands to Compile, Link, & Run Lab 03 (Part 1 of 3)

```
12  * Adding a target of lab03 to targets2srcfiles
13  * Touching file ./03/lab03.cpp
14  * Edit file ./03/lab03.cpp in Notepad++
15  newuser@csunix ~/4301> cd 03
16  newuser@csunix ~/4301/03> ls
17  00.dat      00.out      Makefile    lab03.cpp   lab03main.C
18  newuser@csunix ~/4301/03> make lab03
19  g++ -g -Wall -std=c++11 -c lab03main.C -I/usr/local/4301/include -I.
20  g++ -g -Wall -std=c++11 -c lab03.cpp -I/usr/local/4301/include -I.
21  g++ -o lab03 lab03main.o lab03.o -L/usr/local/4301/lib -lm
22  newuser@csunix ~/4301/03> cat 00.dat
23  aab
24  aba
25  baa
26  babab
27  aabbb
28  bbbaa
29  abbba
30  aabbbbb
31  bbbbbbbbaa
32  bbbabbbabbb
33
34  a
35  b
36  aa
37  ab
38  ba
39  bb
40  aaa
41  baa
42  aba
43  bbb
44  abba
45  baba
46  babba
47  abbbba
48  bbabababa
49  bbaaaabaaa
50  babaaaabaaa
51  abaaaaaaaaaaa
52  bababaabababa
```

Figure 2. Commands to Compile, Link, & Run Lab 03 (Part 2 of 3)

```
53 newuser@csunix ~/4301/03> cat 00.dat | ./lab03
54 aab is valid
55 aba is invalid
56 baa is valid
57 babab is invalid
58 aabbb is valid
59 bbbbaa is valid
60 abbba is invalid
61 aabbbbb is valid
62 bbbbbbbbaa is valid
63 bbbabbbabbb is invalid
64   is invalid
65 a is invalid
66 b is invalid
67 aa is valid
68 ab is invalid
69 ba is invalid
70 bb is invalid
71 aaa is invalid
72 baa is valid
73 aba is invalid
74 bbb is invalid
75 abba is invalid
76 baba is invalid
77 babba is invalid
78 abbbba is invalid
79 bbabababa is invalid
80 bbaaaabaaa is valid
81 babaaaabaaa is invalid
82 abaaaaaaaaaaaa is invalid
83 bababaabababa is valid
84 newuser@csunix ~/4301/03> cat 00.dat | ./lab03 > my.out
85 newuser@csunix ~/4301/03> diff 00.out my.out
86 newuser@csunix ~/4301/03>
```

Figure 2. Commands to Compile, Link, & Run Lab 03 (Part 3 of 3)