

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 $\Sigma = \{1, 2, 3\}$, 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

$$\{x \mid x \in \{1, 2, 3\}^+ \text{ and } x \text{ is divisible by nine}\}$$

A number is divisible by nine (9) if the sum of its digits is divisible by nine (9). Valid strings include 333, 1332, 2133, 3213, 333333, 1233333, 2323233, 33333333111, and 121212121212, but not ϵ , 0, 1, 2, 3, 10, 3330, 1331, 23223, 31233, 111333, or 232323232323.

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/include/lab03.h exists. . .No
11 * Copying file /usr/local/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
24 0
25 1
26 2
27 3
28 10
29 11
30 12
31 13
32 21
33 22
34 23
35 31
36 32
37 33
38 123
39 132
40 213
41 231
42 312
43 321
44 111
45 222
46 232
47 333
48 3330
49 1331
50 1332
51 2133
52 3213
53 23223
54 31233
55 111333
56 333333
57 1233333
58 2323233
59 3333333111
60 121212121212
```

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

```
61 232323232323  
62 111222333111222333111222333111222333111222333111222333111222333  
63 newuser@csunix ~/4301/03> cat 00.dat | ./lab03  
64 is invalid  
65 0 is invalid  
66 1 is invalid  
67 2 is invalid  
68 3 is invalid  
69 10 is invalid  
70 11 is invalid  
71 12 is invalid  
72 13 is invalid  
73 21 is invalid  
74 22 is invalid  
75 23 is invalid  
76 31 is invalid  
77 32 is invalid  
78 33 is invalid  
79 123 is invalid  
80 132 is invalid  
81 213 is invalid  
82 231 is invalid  
83 312 is invalid  
84 321 is invalid  
85 111 is invalid  
86 222 is invalid  
87 232 is invalid  
88 333 is valid  
89 3330 is invalid  
90 1331 is invalid  
91 1332 is valid  
92 2133 is valid  
93 3213 is valid  
94 23223 is invalid  
95 31233 is invalid  
96 111333 is invalid  
97 333333 is valid  
98 1233333 is valid  
99 2323233 is valid  
100 3333333111 is valid  
101 1212121212 is valid  
102 2323232323 is invalid  
103 111222333111222333111222333111222333111222333111222333 is valid  
104 newuser@csunix ~/4301/03> cat 00.dat | ./lab03 > my.out  
105 newuser@csunix ~/4301/03> diff 00.out my.out  
106 newuser@csunix ~/4301/03>
```

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