Source File: `~/2336/25/lab25.cpp`
Input: under control of `main` function
Output: under control of `main` function
Value: 1

The header file shown in Figure 1 is a specification for the template-based `Accumulator` class, which maintains a `total` value for the object. The constructor, which initializes `total`, can use the default constructor for the object type `T` as a default value. The data member is updated by `addValue()` and accessed by `getTotal()`. An overloaded output operator is also available for outputting the data member.

A sample `main` function for testing your implementation is shown in Figure 2, and a sample execution sequence is shown in Figure 3. You will need to add a target of `lab25main` to the definition of `targets1srcfile` in your `Makefile`.

```
1   #ifndef LAB25_H
2   #define LAB25_H
3
4   #include <iostream>
5
6   using namespace std;
7
8   template<typename T>
9   class Accumulator
10  {
11    // overloaded operator << as a friend
12    template<typename U>
13    friend ostream& operator<<(ostream& output, const Accumulator<U>& obj);
14
15   public:
16    Accumulator(const T& value = T());    // constructor
17
18    // access and update functions
19    T getTotal() const;                   // return total
20    void addValue(const T& value);        // add (+) value to total
21
22   private:
23    T total;                              // data stored by the object
24  };
25
26  #include "lab25.cpp"
27
28  #endif
```

Figure 1. `/usr/local/2336/include/lab25.h`

```
1  #include <iostream>
2  #include <cstdlib>
3  #include <string>
4  #include <lab25.h>
5
6  using namespace std;
7
8  int main()
9  {
10    Accumulator<int> intAcc(5), sum;
11    Accumulator<string> words;
12    Accumulator<char> letter('A');
13    string vowels("aeiou");
14
15    cout << "intAcc = " << intAcc.getTotal() << endl;
16    cout << "sum = " << sum.getTotal() << endl;
17    cout << "words = " << words.getTotal() << endl;
18    cout << "letter = " << letter.getTotal() << endl << endl;
19
20    while (intAcc.getTotal() > 0)
21    {
22      sum.addValue(intAcc.getTotal());
23      intAcc.addValue(-1);
24      words.addValue("b" + vowels.substr(intAcc.getTotal(), 1) + "t");
25      letter.addValue(1);
26      cout << "intAcc = " << intAcc << endl;
27      cout << "sum = " << sum << endl;
28      cout << "words = " << words << endl;
29      cout << "letter = " << letter << endl << endl;
30    }
31
32    return EXIT_SUCCESS;
33  }
```

Figure 2. /usr/local/2336/src/lab25main.C

```
 1   newuser@csunix ~> cd 2336
 2   newuser@csunix ~/2336> ./getlab.ksh 25
 3     * Checking to see if a folder exists for Lab 25. . .No
 4     * Creating a folder for Lab 25
 5     * Checking to see if Lab 25 has sample input and output files. . .Yes
 6     * Copying input and output files for Lab 25
 7       from folder /usr/local/2336/data/25 to folder ./25
 8     * Checking to see if /usr/local/2336/src/lab25main.C exists. . .Yes
 9     * Copying file /usr/local/2336/src/lab25main.C to folder ./25
10     * Checking to see if /usr/local/2336/include/lab25.h exists. . .Yes
11     * Copying file /usr/local/2336/include/lab25.h to folder ./25
12     * Copying file /usr/local/2336/src/Makefile to folder ./25
13     * Adding a target of lab25main to targets1srcfile
14     * Touching file ./25/lab25.cpp
15     * Edit file ./25/lab25.cpp in Notepad++
16   newuser@csunix ~/2336> cd 25
17   newuser@csunix ~/2336/25> ls
18   01.out       Makefile     lab25.cpp    lab25.h      lab25main.C
19   newuser@csunix ~/2336/25> make lab25main
20   g++ -g -Wall -std=c++11 -c lab25main.C -I/usr/local/2336/include -I.
21   g++ -o lab25main lab25main.o -L/usr/local/2336/lib -lm -lbits
```

```
22   newuser@csunix ~/2336/25> ./lab25main       38   intAcc = 2
23   intAcc = 5                                   39   sum = 12
24   sum = 0                                      40   words = butbotbit
25   words =                                      41   letter = D
26   letter = A                                   42
27                                                43   intAcc = 1
28   intAcc = 4                                   44   sum = 14
29   sum = 5                                      45   words = butbotbitbet
30   words = but                                  46   letter = E
31   letter = B                                   47
32                                                48   intAcc = 0
33   intAcc = 3                                   49   sum = 15
34   sum = 9                                      50   words = butbotbitbetbat
35   words = butbot                               51   letter = F
36   letter = C                                   52
37
```

```
53   newuser@csunix ~/2336/25> ./lab25main > my.out
54   newuser@csunix ~/2336/25> diff 01.out my.out
55   newuser@csunix ~/2336/25>
```

Figure 3. Commands to Compile, Link, & Run Lab 25