

Source File: ~/2336/46/lab46.(C|CPP|cpp|c++|cc|cxx|cp)
Input: Under control of main function
Output: Under control of main function
Value: 5

Extend the `BigInt` class from Lab 45 to provide overloaded operators for performing addition and subtraction with `BigInt` numbers.

A header file is shown in Figure 1, a sample `main` function for testing your implementation is shown in Figure 2, and a sample execution sequence is shown in Figure 3. To use the `Makefile` as distributed in class, add a target of `lab46` to `targets2srcfileswithlibrary`.

```

1  #ifndef LAB46_H
2  #define LAB46_H
3
4  #include <iostream>
5  #include <string>
6  #include <deque>
7
8  using namespace std;
9
10 typedef enum {NEGATIVE, ZERO, POSITIVE} Sign;
11
12 bool isInt(string s);
13
14 class BigInt
15 {
16     friend ostream& operator<<( ostream& output, const BigInt& );
17     friend istream& operator>>( istream& input, BigInt& );
18 public:
19     BigInt(); // constructor; digits = 0
20     BigInt( int num ); // constructor; digits = num
21     BigInt( const string str ); // constructor; digits = str
22     BigInt( const BigInt& other ); // copy constructor
23
24     bool operator==( const BigInt& rhs ) const; // Equality
25     bool operator< ( const BigInt& rhs ) const; // Less Than
26
27     BigInt operator+ ( const BigInt& rhs ) const; // Addition
28     BigInt operator- ( const BigInt& rhs ) const; // Subtraction
29
30 private:
31     Sign sign; // Sign of #
32     deque<char> digits; // Deque of digits of #
33 };
34
35 #endif

```

Figure 1. /usr/local/2336/include/lab46.h

```
1  #include <lab46.h>
2
3  using namespace std;
4
5  int main()
6  {
7      BigInt a, b;
8
9      while (cin >> a >> b)
10     {
11         cout << a << " + " << b << " = " << a + b << endl;
12         cout << a << " - " << b << " = " << a - b << endl;
13         cout << b << " - " << a << " = " << b - a << endl;
14     }
15
16     cout << endl;
17     cout << "Fibonacci Sequence" << endl;
18     BigInt i(1), end(51), first(1), second(1);
19
20     while (i < end)
21     {
22         cout << "Fib(" << i << ") = " << first << endl;
23         second = first + second;
24         first = second - first;
25         i = i + 1;
26     }
27
28     return EXIT_SUCCESS;
29 }
```

Figure 2. /usr/local/2336/src/lab46main.C

```

1 newuser@csunix ~> cd 2336
2 newuser@csunix ~/2336> ./getlab.ksh 46
3 * Checking to see if a folder exists for Lab 46. . .No
4 * Creating a folder for Lab 46
5 * Checking to see if Lab 46 has sample input and output files. . .Yes
6 * Copying input and output files for Lab 46
7   from folder /usr/local/2336/data/46 to folder ./46
8 * Checking to see if /usr/local/2336/src/lab46main.C exists. . .Yes
9 * Copying file /usr/local/2336/src/lab46main.C to folder ./46
10 * Checking to see if /usr/local/2336/include/lab46.h exists. . .Yes
11 * Copying file /usr/local/2336/include/lab46.h to folder ./46
12 * Copying file /usr/local/2336/src/Makefile to folder ./46
13 * Adding a target of lab46 to targets2srcfileswithlibrary
14 * Touching file ./46/lab46.cpp
15 * Edit file ./46/lab46.cpp in Notepad++
16 newuser@csunix ~/2336> cd 46
17 newuser@csunix ~/2336/46> ls
18 01.dat      01.out      Makefile     lab46.cpp    lab46.h      lab46main.C
19 newuser@csunix ~/2336/46> make lab46
20 g++ -g -Wall -std=c++11 -c lab46main.C -I/usr/local/2336/include -I.
21 g++ -g -Wall -std=c++11 -c lab46.cpp -I/usr/local/2336/include -I.
22 g++ -o lab46 lab46main.o lab46.o -L/usr/local/2336/lib \
23 -Wl,-whole-archive -llab46 -Wl,-no-whole-archive -lm -lbits

```

<pre> 24 newuser@csunix ~/2336/46> cat 01.dat 25 -12345678901234567890 0 26 -1 1 27 +0 -12345678901234567890 28 -0 12345678901234567890 29 12345678901234567890 -12345678901234567890 30 12345678901234567890 0 31 0 0 32 -98765432109876543210 -12345678901234567890 33 -99999999999999999999 -99999999999999999998 34 -99999999999999999998 -99999999999999999999 35 -1234567890123456789 -1234 36 -1234 -1234567890123456789 37 12345678901234567890 12345678901234567890 </pre>	<pre> 38 12345678901234567890 98765432109876543210 39 98765432109876543210 12345678901234567890 40 1234567890123456789 1234 41 1234 1234567890123456789 42 -0 -0 43 0 -0 44 +0 -0 45 -0 0 46 0 0 47 +0 0 48 -0 +0 49 0 +0 50 +0 +0 </pre>
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```

51 newuser@csunix ~/2336/46> cat 01.dat | ./lab46
52 -12345678901234567890 + 0 = -12345678901234567890
53 -12345678901234567890 - 0 = -12345678901234567890
54 0 - -12345678901234567890 = 12345678901234567890
55 -1 + 1 = 0
56 -1 - 1 = -2
57 1 - -1 = 2
58 0 + -12345678901234567890 = -12345678901234567890
59 0 - -12345678901234567890 = 12345678901234567890
60 -12345678901234567890 - 0 = -12345678901234567890
61 0 + 12345678901234567890 = 12345678901234567890
62 0 - 12345678901234567890 = -12345678901234567890
63 12345678901234567890 - 0 = 12345678901234567890
64 12345678901234567890 + -12345678901234567890 = 0
65 12345678901234567890 - -12345678901234567890 = 24691357802469135780

```

Figure 3. Commands to Compile, Link, & Run Lab 46 (Part 1 of 3)

```

66 -12345678901234567890 - 12345678901234567890 = -24691357802469135780
67 12345678901234567890 + 0 = 12345678901234567890
68 12345678901234567890 - 0 = 12345678901234567890
69 0 - 12345678901234567890 = -12345678901234567890
70 0 + 0 = 0
71 0 - 0 = 0
72 0 - 0 = 0
73 -98765432109876543210 + -12345678901234567890 = -1111111101111111100
74 -98765432109876543210 - -12345678901234567890 = -86419753208641975320
75 -12345678901234567890 - -98765432109876543210 = 86419753208641975320
76 -99999999999999999999 + -9999999999999999998 = -19999999999999999997
77 -99999999999999999999 - -9999999999999999998 = -1
78 -99999999999999999998 - -9999999999999999999 = 1
79 -99999999999999999998 + -9999999999999999999 = -19999999999999999997
80 -99999999999999999998 - -9999999999999999999 = 1
81 -99999999999999999999 - -9999999999999999998 = -1
82 -1234567890123456789 + -1234 = -1234567890123458023
83 -1234567890123456789 - -1234 = -1234567890123455555
84 -1234 - -1234567890123456789 = 1234567890123455555
85 -1234 + -1234567890123456789 = -1234567890123458023
86 -1234 - -1234567890123456789 = 1234567890123455555
87 -1234567890123456789 - -1234 = -1234567890123455555
88 12345678901234567890 + 12345678901234567890 = 24691357802469135780
89 12345678901234567890 - 12345678901234567890 = 0
90 12345678901234567890 - 12345678901234567890 = 0
91 12345678901234567890 + 98765432109876543210 = 1111111101111111100
92 12345678901234567890 - 98765432109876543210 = -86419753208641975320
93 98765432109876543210 - 12345678901234567890 = 86419753208641975320
94 98765432109876543210 + 12345678901234567890 = 1111111101111111100
95 98765432109876543210 - 12345678901234567890 = 86419753208641975320
96 12345678901234567890 - 98765432109876543210 = -86419753208641975320
97 1234567890123456789 + 1234 = 1234567890123458023
98 1234567890123456789 - 1234 = 1234567890123455555
99 1234 - 1234567890123456789 = -1234567890123455555
100 1234 + 1234567890123456789 = 1234567890123458023
101 1234 - 1234567890123456789 = -1234567890123455555
102 1234567890123456789 - 1234 = 1234567890123455555

```

Figure 3. Commands to Compile, Link, & Run Lab 46 (Part 2 of 3)

103	0 + 0 = 0	144	Fib(13) = 233
104	0 - 0 = 0	145	Fib(14) = 377
105	0 - 0 = 0	146	Fib(15) = 610
106	0 + 0 = 0	147	Fib(16) = 987
107	0 - 0 = 0	148	Fib(17) = 1597
108	0 - 0 = 0	149	Fib(18) = 2584
109	0 + 0 = 0	150	Fib(19) = 4181
110	0 - 0 = 0	151	Fib(20) = 6765
111	0 - 0 = 0	152	Fib(21) = 10946
112	0 + 0 = 0	153	Fib(22) = 17711
113	0 - 0 = 0	154	Fib(23) = 28657
114	0 - 0 = 0	155	Fib(24) = 46368
115	0 + 0 = 0	156	Fib(25) = 75025
116	0 - 0 = 0	157	Fib(26) = 121393
117	0 - 0 = 0	158	Fib(27) = 196418
118	0 + 0 = 0	159	Fib(28) = 317811
119	0 - 0 = 0	160	Fib(29) = 514229
120	0 - 0 = 0	161	Fib(30) = 832040
121	0 + 0 = 0	162	Fib(31) = 1346269
122	0 - 0 = 0	163	Fib(32) = 2178309
123	0 - 0 = 0	164	Fib(33) = 3524578
124	0 + 0 = 0	165	Fib(34) = 5702887
125	0 - 0 = 0	166	Fib(35) = 9227465
126	0 - 0 = 0	167	Fib(36) = 14930352
127	0 + 0 = 0	168	Fib(37) = 24157817
128	0 - 0 = 0	169	Fib(38) = 39088169
129	0 - 0 = 0	170	Fib(39) = 63245986
130		171	Fib(40) = 102334155
131	Fibonacci Sequence	172	Fib(41) = 165580141
132	Fib(1) = 1	173	Fib(42) = 267914296
133	Fib(2) = 1	174	Fib(43) = 433494437
134	Fib(3) = 2	175	Fib(44) = 701408733
135	Fib(4) = 3	176	Fib(45) = 1134903170
136	Fib(5) = 5	177	Fib(46) = 1836311903
137	Fib(6) = 8	178	Fib(47) = 2971215073
138	Fib(7) = 13	179	Fib(48) = 4807526976
139	Fib(8) = 21	180	Fib(49) = 7778742049
140	Fib(9) = 34	181	Fib(50) = 12586269025
141	Fib(10) = 55	182	newuser@csunix ~/2336/46> cat 01.dat ./lab46 > my.out
142	Fib(11) = 89	183	newuser@csunix ~/2336/46> diff 01.out my.out
143	Fib(12) = 144	184	newuser@csunix ~/2336/46>

Figure 3. Commands to Compile, Link, & Run Lab 46 (Part 3 of 3)