Source File: ~/1337/68/lab68.(C|CPP|cpp|c++|cc|cxx|cp)
Input: Under control of `main` function
Output: Under control of `main` function
Value: 2

You are to write two functions. The first function will sort an array of `Rational` objects. The elements referenced by the array should be sorted in ascending order using an exchange sort. The second function should output the elements of an array of `Rational` objects, one element per line. When implementing the functions, use pointers (do not use array indexing). Recall that the `->` operator can be used to dereference a pointer to an object. The functions should make use of existing member functions defined in the `Rational` class whenever possible. For example, the `Rational` class has a `greaterThan` member function that can be used to compare two `Rational` objects. It also has a `print` member function that can be used to output a `Rational` object's `numerator` and `denominator` in the form `a/b`.

The prototype for each of these functions can be found in the sample `main` function shown in Figure 1. Commands to compile, link, and run this assignment are shown in Figure 2. To use the `Makefile` as distributed in class, add a target of `lab68` to `targets2srcfileswithlibrary`.

```
1   #include <iostream>
2   #include <lab67.h>
3   #include <cstdlib>
4
5   using namespace std;
6
7   // Function sort - sorts the n-element array of Rationals in
8   // ascending order using an exchange sort
9   void sort(Rational array[], int n);
10
11  // Function writeArray - writes the n-element array of Rationals to
12  // output stream out, each element on a separate line
13  ostream& writeArray(ostream& out, const Rational array[], int n);
14
15  int main()
16  {
17    Rational rational[100];
18    int count = 0;
19
20    while (count < 100 && rational[count].read(cin))
21      ++count;
22
23    cout << "Before Sort:" << endl;
24    writeArray(cout, rational, count);
25    sort(rational, count);
26    cout << "After Sort:" << endl;
27    writeArray(cout, rational, count);
28
29    return EXIT_SUCCESS;
30  }
```

Figure 1. `/usr/local/1337/src/lab68main.C`

```
 1   newuser@csunix ~> cd 1337
 2   newuser@csunix ~/1337> mkdir 68
 3   newuser@csunix ~/1337> cd 68
 4   newuser@csunix ~/1337/68> cp /usr/local/1337/data/68/* .
 5   newuser@csunix ~/1337/68> cp /usr/local/1337/src/lab68main.C .
 6   newuser@csunix ~/1337/68> cp /usr/local/1337/src/Makefile .
 7   newuser@csunix ~/1337/68> touch lab68.cpp
 8   newuser@csunix ~/1337/68> # Edit Makefile and lab68.cpp
 9   newuser@csunix ~/1337/68> make lab68
10   g++ -g -Wall -std=c++11 -c lab68main.C -I/usr/local/1337/include -I.
11   g++ -g -Wall -std=c++11 -c lab68.cpp -I/usr/local/1337/include -I.
12   g++ -o lab68 lab68main.o lab68.o -L/usr/local/1337/lib -lm -lbits \
13   -Wl,-whole-archive -llab68 -Wl,-no-whole-archive
```

```
14   newuser@csunix ~/1337/68> cat 01.dat         42     [14] = 1/4
15   -3  4 -3  4                                   43     [15] = 3/-2
16   -3  4  3  4                                   44     [16] = -1/-4
17   0  5  0  7                                    45     [17] = -3/-2
18   1  1  5  4                                    46   }
19   25 45  8 99                                   47   After Sort:
20   3  4 -3  4                                    48   array
21   1  4  3  2                                    49   {
22   1  4  3 -2                                    50     [ 0] = 3/-2
23   -1 -4 -3 -2                                   51     [ 1] = -3/4
24   newuser@csunix ~/1337/68> cat 01.dat | ./lab68  52     [ 2] = -3/4
25   Before Sort:                                  53     [ 3] = -3/4
26   array                                         54     [ 4] = -3/4
27   {                                             55     [ 5] = 0/5
28     [ 0] = -3/4                                 56     [ 6] = 0/7
29     [ 1] = -3/4                                 57     [ 7] = 8/99
30     [ 2] = -3/4                                 58     [ 8] = 1/4
31     [ 3] = 3/4                                  59     [ 9] = 1/4
32     [ 4] = 0/5                                  60     [10] = -1/-4
33     [ 5] = 0/7                                  61     [11] = 25/45
34     [ 6] = 1/1                                  62     [12] = 3/4
35     [ 7] = 5/4                                  63     [13] = 3/4
36     [ 8] = 25/45                                64     [14] = 1/1
37     [ 9] = 8/99                                 65     [15] = 5/4
38     [10] = 3/4                                  66     [16] = 3/2
39     [11] = -3/4                                 67     [17] = -3/-2
40     [12] = 1/4                                  68   }
41     [13] = 3/2
```

```
69   newuser@csunix ~/1337/68> cat 01.dat | ./lab68 > my.out
70   newuser@csunix ~/1337/68> diff 01.out my.out
71   newuser@csunix ~/1337/68> cat 04.dat | ./lab68 > my.out
72   newuser@csunix ~/1337/68> diff 04.out my.out
73   newuser@csunix ~/1337/68>
```

Figure 2. Commands to Compile, Link, & Run Lab 68