Source File: `~/2336/13/lab13.(C|CPP|cpp|c++|cc|cxx|cp)`
Input: under control of `main` function
Output: under control of `main` function
Value: 2

Write a recursive function that returns the number of 1s in the binary representation of a signed integer. A sample `main` function for testing your function is shown in Figure 1 and commands for compiling, linking, and running this assignment are shown in Figure 2. To use the `Makefile` as distributed in class, add a target of `lab13` to `targets2srcfiles`.

```
1  #include <iostream>
2  #include <cstdlib>
3
4  using namespace std;
5
6  int countOneBits(int);
7
8  int main()
9  {
10   int i, count;
11
12   while (cin >> i)
13   {
14     count = countOneBits(i);
15     cout << i << " has " << count
16          << (count == 1 ? " bit" : " bits")
17          << " equal to 1 in its internal binary "
18          << "representation" << endl;
19   }
20
21   return EXIT_SUCCESS;
22 }
```

Figure 1. `/usr/local/2336/src/lab13main.C`

```
newuser@csunix ~> cd 2336
newuser@csunix ~/2336> ./getlab.ksh 13
  * Checking to see if a folder exists for Lab 13. . .No
  * Creating a folder for Lab 13
  * Checking to see if Lab 13 has sample input and output files. . .Yes
  * Copying input and output files for Lab 13
    from folder /usr/local/2336/data/13 to folder ./13
  * Checking to see if /usr/local/2336/src/lab13main.C exists. . .Yes
  * Copying file /usr/local/2336/src/lab13main.C to folder ./13
  * Checking to see if /usr/local/2336/include/lab13.h exists. . .No
  * Copying file /usr/local/2336/src/Makefile to folder ./13
  * Adding a target of lab13 to targets2srcfiles
  * Touching file ./13/lab13.cpp
  * Edit file ./13/lab13.cpp in Notepad++
newuser@csunix ~/2336> cd 13
newuser@csunix ~/2336/13> ls
01.dat       01.out       Makefile     lab13.cpp    lab13main.C
newuser@csunix ~/2336/13> make lab13
g++ -g -Wall -std=c++11 -c lab13main.C -I/usr/local/2336/include -I.
g++ -g -Wall -std=c++11 -c lab13.cpp -I/usr/local/2336/include -I.
g++ -o lab13 lab13main.o lab13.o -L/usr/local/2336/lib -lm -lbits
newuser@csunix ~/2336/13> cat 01.dat
0 1 2 3341 2147483647
-1 -2 -3341 -2147483647
-2147483648
newuser@csunix ~/2336/13> cat 01.dat | ./lab13
0 has 0 bits equal to 1 in its internal binary representation
1 has 1 bit equal to 1 in its internal binary representation
2 has 1 bit equal to 1 in its internal binary representation
3341 has 6 bits equal to 1 in its internal binary representation
2147483647 has 31 bits equal to 1 in its internal binary representation
-1 has 32 bits equal to 1 in its internal binary representation
-2 has 31 bits equal to 1 in its internal binary representation
-3341 has 27 bits equal to 1 in its internal binary representation
-2147483647 has 2 bits equal to 1 in its internal binary representation
-2147483648 has 1 bit equal to 1 in its internal binary representation
newuser@csunix ~/2336/13> cat 01.dat | ./lab13 > my.out
newuser@csunix ~/2336/13> diff 01.out my.out
newuser@csunix ~/2336/13>
```

Figure 2. Commands to Compile, Link, & Run Lab 13