

**Source File:** ~/2336/15/lab15.(C|CPP|cpp|c++|cc|cxx|cp)  
**Input:** under control of main function  
**Output:** under control of main function  
**Value:** 1

Write a recursive function that prints the quaternary representation of a signed, nonzero 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 `lab15` to `targets2srcfiles`.

```
1 #include <iostream>
2 #include <cstdlib>
3 #include <iomanip>
4
5 using namespace std;
6
7 // printQuaternary is a recursive function that writes the quaternary
8 // representation of num to output stream os
9 void printQuaternary(int num, ostream& os);
10
11 int main()
12 {
13     int num;
14
15     while (cin >> num)
16     {
17         cout << right << setw(11) << num << " base 10 = ";
18         if (num != 0)
19             printQuaternary(num, cout);
20         else
21             cout << 0;
22         cout << " base 4" << endl;
23     }
24
25     return EXIT_SUCCESS;
26 }
```

Figure 1. /usr/local/2336/src/lab15main.C

```
1 newuser@csunix ~> cd 2336
2 newuser@csunix ~/2336> ./getlab.ksh 15
3 * Checking to see if a folder exists for Lab 15. . .No
4 * Creating a folder for Lab 15
5 * Checking to see if Lab 15 has sample input and output files. . .Yes
6 * Copying input and output files for Lab 15
7   from folder /usr/local/2336/data/15 to folder ./15
8 * Checking to see if /usr/local/2336/src/lab15main.C exists. . .Yes
9 * Copying file /usr/local/2336/src/lab15main.C to folder ./15
10 * Checking to see if /usr/local/2336/include/lab15.h exists. . .No
11 * Copying file /usr/local/2336/src/Makefile to folder ./15
12 * Adding a target of lab15 to targets2srcfiles
13 * Touching file ./15/lab15.cpp
14 * Edit file ./15/lab15.cpp in Notepad++
15 newuser@csunix ~/2336> cd 15
16 newuser@csunix ~/2336/15> ls
17 01.dat      01.out      Makefile     lab15.cpp    lab15main.C
18 newuser@csunix ~/2336/15> make lab15
19 g++ -g -Wall -std=c++11 -c lab15main.C -I/usr/local/2336/include -I.
20 g++ -g -Wall -std=c++11 -c lab15.cpp -I/usr/local/2336/include -I.
21 g++ -o lab15 lab15main.o lab15.o -L/usr/local/2336/lib -lm -lbits
22 newuser@csunix ~/2336/15> cat 01.dat
23 0 1 2 3341 2147483647
24 -1 -2 -3341 -2147483647
25 -2147483648
26 newuser@csunix ~/2336/15> cat 01.dat | ./lab15
27         0 base 10 = 0 base 4
28         1 base 10 = 1 base 4
29         2 base 10 = 2 base 4
30         3341 base 10 = 310031 base 4
31 2147483647 base 10 = 13333333333333333333 base 4
32        -1 base 10 = 33333333333333333333 base 4
33        -2 base 10 = 33333333333333333332 base 4
34       -3341 base 10 = 33333333333023303 base 4
35 -2147483647 base 10 = 200000000000000001 base 4
36 -2147483648 base 10 = 200000000000000000 base 4
37 newuser@csunix ~/2336/15> cat 01.dat | ./lab15 > my.out
38 newuser@csunix ~/2336/15> diff 01.out my.out
39 newuser@csunix ~/2336/15>
```

Figure 2. Commands to Compile, Link, & Run Lab 15