

**Source File:** ~/1337/30/lab30.(C|CPP|cpp|c++|cc|cxx|cp)  
**Input:** Under control of main function  
**Output:** Under control of main function  
**Value:** 2

Write a function whose prototype is given by

```
unsigned int scan0(unsigned int word, unsigned int startingBit);
```

The function scans `word`, starting from bit `startingBit`, toward more significant bits, until the first zero (0) bit is found. The function returns the index of the found bit. If the bit at `startingBit` is already what's sought, then `startingBit` is returned. If there's no bit found, then `UINT_MAX` (defined in `climits`) is returned.

A sample `main` function for testing your function is shown in Figure 1 and a sample execution sequence is shown in Figure 2. To use the `Makefile` as distributed in class, add a target of `lab30` to `targets2srcfiles`.

```
1  #include <iostream>
2  #include <iomanip>
3  #include <cstdlib>
4  #include <bitset>
5  #include <climits>
6
7  using namespace std;
8
9  /*
10 Scan word, starting from bit startingBit, toward more significant
11 bits, until the first 0 bit is found. Return the index of the found
12 bit. If the bit at startingBit is already what's sought, then
13 startingBit is returned. If there's no bit found, then UINT_MAX is
14 returned.
15 */
16 unsigned int scan0(unsigned int word, unsigned int startingBit);
17
18 extern const int N = sizeof(int) * CHAR_BIT; // # of bits in an int
19
20 int main()
21 {
22     unsigned int i, x;
23
24     while (cin >> x)
25     {
26         cout << setw(10) << x << " base 10 = "
27              << bitset<N>(x) << " base 2" << endl;
28         for (i = 0; i < static_cast<unsigned int>(N); ++i)
29             cout << "scan0(x, " << setw(2) << i << ") = "
30                  << setw(2) << scan0(x, i) << endl;
31         cout << endl;
32     }
33
34     return EXIT_SUCCESS;
35 }
```

Figure 1. /usr/local/1337/src/lab30main.C

```
1 newuser@csunix ~> cd 1337
2 newuser@csunix ~/1337> mkdir 30
3 newuser@csunix ~/1337> cd 30
4 newuser@csunix ~/1337/30> cp /usr/local/1337/data/30/* .
5 newuser@csunix ~/1337/30> cp /usr/local/1337/src/lab30main.C .
6 newuser@csunix ~/1337/30> cp /usr/local/1337/src/Makefile .
7 newuser@csunix ~/1337/30> touch lab30.cpp
8 newuser@csunix ~/1337/30> # Edit Makefile and lab30.cpp
9 newuser@csunix ~/1337/30> make lab30
10 g++ -g -Wall -std=c++11 -c lab30main.C -I/usr/local/1337/include -I.
11 g++ -g -Wall -std=c++11 -c lab30.cpp -I/usr/local/1337/include -I.
12 g++ -o lab30 lab30main.o lab30.o -L/usr/local/1337/lib -lm -lbits
13 newuser@csunix ~/1337/30> cat 01.dat
14 1362
15 4294967295
16 newuser@csunix ~/1337/30> cat 01.dat | ./lab30
17     1362 base 10 = 0000000000000000000010101010010 base 2
18 scan0(x, 0) = 0
19 scan0(x, 1) = 2
20 scan0(x, 2) = 2
21 scan0(x, 3) = 3
22 scan0(x, 4) = 5
23 scan0(x, 5) = 5
24 scan0(x, 6) = 7
25 scan0(x, 7) = 7
26 scan0(x, 8) = 9
27 scan0(x, 9) = 9
28 scan0(x, 10) = 11
29 scan0(x, 11) = 11
30 scan0(x, 12) = 12
31 scan0(x, 13) = 13
32 scan0(x, 14) = 14
33 scan0(x, 15) = 15
34 scan0(x, 16) = 16
35 scan0(x, 17) = 17
36 scan0(x, 18) = 18
37 scan0(x, 19) = 19
38 scan0(x, 20) = 20
39 scan0(x, 21) = 21
40 scan0(x, 22) = 22
41 scan0(x, 23) = 23
42 scan0(x, 24) = 24
43 scan0(x, 25) = 25
44 scan0(x, 26) = 26
45 scan0(x, 27) = 27
46 scan0(x, 28) = 28
47 scan0(x, 29) = 29
48 scan0(x, 30) = 30
49 scan0(x, 31) = 31
```

**Figure 2.** Commands to Compile, Link, & Run Lab 30 (Part 1 of 2)

