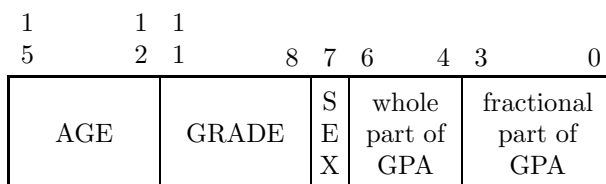


Source File: ~/1337/25/lab25.(C|CPP|cpp|c++|cc|cxx|cp)
Input: Under control of main function
Output: Under control of main function
Value: 2

Write a function to compress its input parameters. The prototype is given by

```
unsigned int compress(unsigned int age, unsigned int grade, char sex, double GPA);
```

The input parameters consist of a child's age (from 3 through 18), grade in school (from 0 through 12), sex (either 'M' or 'F'), and grade point average (a number from 0.0 [all F's] through 4.0 [all A's]). You may assume that the GPA has exactly one digit after the decimal point. Your function should store the input parameters into the low-order 16 bits of an **unsigned int**, which is then returned to the calling program. The input parameters should be compressed according to the following diagram:



A sex of 'M' should be stored as one (1), and a sex of 'F' should be stored as zero (0).

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 lab25 to targets2srcfiles.

```

1  #include <iostream>
2  #include <cstdlib>
3  #include <iomanip>
4  #include <bitset>
5  #include <climits>
6
7  using namespace std;
8
9  // printLine: prints a horizontal line of length hyphens to output
10 // stream os
11 void printLine(int length, ostream& os);
12
13 // compress: compresses age, grade, sex, and GPA into the lower 16
14 // bits of an unsigned int
15 unsigned int compress(unsigned int age, unsigned int grade, char sex, double GPA);
16
17 const int N = sizeof(int) * CHAR_BIT; // # of bits in an int
18
19 int main()
20 {
21     unsigned int age, grade, compressed;
22     char sex;
23     double GPA;
24

```

Figure 1. /usr/local/1337/src/lab25main.C (Part 1 of 2)

```
25 // Prepare for floating-point output format; show one digit after the
26 // decimal point
27 cout << fixed << showpoint << setprecision(1);
28
29 printLine(78, cout);
30 cout << setw(76) << "332222222222111111111000000000" << endl;
31 cout << " Age   Grade   Sex   GPA   Compress   "
32     << "10987654321098765432109876543210" << endl;
33 printLine(78, cout);
34
35 while (cin >> age >> grade >> sex >> GPA)
36 {
37     compressed = compress(age, grade, sex, GPA);
38     cout << setw(5) << age << setw(8) << grade << setw(7) << sex
39         << setw(8) << GPA << setw(11) << compressed << setw(5) << " "
40         << bitset<N>(compressed) << endl;
41 }
42
43 printLine(78, cout);
44
45 return EXIT_SUCCESS;
46 }
47
48 void printLine(int length, ostream& os)
49 {
50     char ch = os.fill();
51     os << setfill('-') << setw(length) << "-" << setfill(ch) << endl;
52 }
```

Figure 1. /usr/local/1337/src/lab25main.C (Part 2 of 2)

```

1 newuser@csunix ~> cd 1337
2 newuser@csunix ~/1337> mkdir 25
3 newuser@csunix ~/1337> cd 25
4 newuser@csunix ~/1337/25> cp /usr/local/1337/data/25/* .
5 newuser@csunix ~/1337/25> cp /usr/local/1337/src/lab25main.C .
6 newuser@csunix ~/1337/25> cp /usr/local/1337/src/Makefile .
7 newuser@csunix ~/1337/25> touch lab25.cpp
8 newuser@csunix ~/1337/25> # Edit Makefile and lab25.cpp
9 newuser@csunix ~/1337/25> make lab25
10 g++ -g -Wall -std=c++11 -c lab25main.C -I/usr/local/1337/include -I.
11 g++ -g -Wall -std=c++11 -c lab25.cpp -I/usr/local/1337/include -I.
12 g++ -o lab25 lab25main.o lab25.o -L/usr/local/1337/lib -lm -lbits
13 newuser@csunix ~/1337/25> cat 01.dat
14 6 1 M 4.0
15 3 0 F 0.9
16 18 12 M 3.8
17 17 11 F 2.7
18 16 10 M 1.6
19 newuser@csunix ~/1337/25> cat 01.dat | ./lab25
20 -----
21                                     33222222222211111111110000000000
22      Age      Grade      Sex      GPA      Compress      10987654321098765432109876543210
23 -----
24          6          1          M          4.0          12736      00000000000000000011000111000000
25          3          0          F          0.9              9      00000000000000000000000000000001001
26         18         12          M          3.8         64696      0000000000000000001111110010111000
27         17         11          F          2.7         60199      0000000000000000001110101100100111
28         16         10          M          1.6         55958      0000000000000000001101101010010110
29 -----
30 newuser@csunix ~/1337/25> cat 01.dat | ./lab25 > my.out
31 newuser@csunix ~/1337/25> diff 01.out my.out
32 newuser@csunix ~/1337/25>

```

Figure 2. Commands to Compile, Link, & Run Lab 25