```
1  ************************************************************
2  *   PROGRAMMED BY : Andrew Gharios
3  *   STUDENT ID    : 1449366
4  *   CLASS         : M-Th 5-7:20p
5  *   LAB #11       : Intro to Recursion - GCD
6  ************************************************************
7  Enter the first integer:  72
8  Enter the second integer: 32
9
10 Enter the first integer:  99
11 Enter the second integer: 30
12
13 Enter the first integer:  48
14 Enter the second integer: 18
15
16 Enter the first integer:  12
17 Enter the second integer: 0
18
19 Thank you for using my GCD calculator!
```

```
 1  ************************************************************
 2  *   PROGRAMMED BY : Andrew Gharios
 3  *   STUDENT ID    : 1449366
 4  *   CLASS         : M-Th 5-7:20p
 5  *   LAB #11       : Intro to Recursion - GCD
 6  ************************************************************
 7  The GCD for 72 & 32 = 8
 8
 9  The GCD for 99 & 30 = 3
10
11  The GCD for 48 & 18 = 6
12
13  The GCD for 12 & 0 = 12
14
15
```

```
1  /*****************************************************************************
   **
2  * AUTHOR     : Andrew Gharios
3  * STUDENT ID : 1449366
4  * Lab #11    : Intro to recursion - GCD
5  * CLASS      : CS1B
6  * SECTION    : M-TH: 5-7:20p
7  * DUE DATE   : 7/20/21
8  *****************************************************************************
   /
9
10 #ifndef HEADER_H_
11 #define HEADER_H_
12
13 #include <iostream> // cin, cout.
14 #include <string>   // string datatype variables.
15 #include <fstream>  // Fstream files.
16 #include <iomanip>  // fixed, setw, setprecision.
17 #include <ostream>  // Ostream data type.
18 using namespace std;
19
20 /*****************************************************************************
21  * Get Two Ints
22  *  This function will take an input of two integers from user and pass them
23  *  back to the source code by reference.
24  *  ==> returns nothing.
25  *
26                                                                              
   *****************************************************************************/
27 void GetTwoInts(int& int1,  // IN - First Integer.
28     int& int2); // IN - Second Integer.
29
30 /*****************************************************************************
31  * Get Gcd
32  *  This function will receive two integers and calculate the GCD for those
33  * two numbers.
34  *  ==> returns the calculated Gcd.
35  *
36                                                                              
   *****************************************************************************/
37 int Gcd(int in1,  // IN - First Integer.
38         int in2); // IN - Second Integer.
39
40 /*****************************************************************************
41  * Output Results
42  *  This function will output the gcd of all integers inputed into the Output
43  *  file.
44  *  ==> returns nothing
```

```
45   *
46                                                                              ↵
    *******************************************************************************/
47  void OutputResults(ofstream& OFile, // CALC - Output File variable.
48      int int1,       // IN   - First Integer.
49      int int2,       // IN   - Second Integer.
50      int gcd);       // IN   - calculated Gcd.
51
52  /*******************************************************************************
53   * PrintHeaderFile
54   *   This function will output the header information
55   *
56                                                                              ↵
    *******************************************************************************/
57  void PrintHeaderFile(ostream& output,      // IN  - output datatype.
58      ofstream& OFile,      // OUT - Output file.
59      string asName,        // IN  - assignment name
60      int asNum,             // IN  - assignment number
61      string studentName,   // IN  - student's name
62      string classInfo,     // IN  - class that is being taken
63      char asType,          // IN  - assignment type
64      long long studentID); // IN  - student ID
65
66
67  #endif
68
69
```

```cpp
/*****************************************************************************
**
* AUTHOR     : Andrew Gharios
* STUDENT ID : 1449366
* LAB #11    : Intro to Recursive
* CLASS      : CS1B
* SECTION    : M-TH: 5-7:20p
* DUE DATE   : 7/20/21
*****************************************************************************/
#include "Header.h"

/*****************************************************************************
**
* Intro to Recursion - GCD
*----------------------------------------------------------------------------
* This program will take in two integers from the user 4 times and calculate
* the GCD for these two integers using a recursive function, and outputs each
* GCD into the output file.
*----------------------------------------------------------------------------
* INPUT:
* int1 - first integer input by user.
* int2 - second integer input by user.
*
* OUTPUT:
* gcd  - GCD of the two integers inputted.
*****************************************************************************/
int main()
{
    /*************************************************************************
    **
    * CONSTANTS
    * ------------------------------------------------------------------------
    * OUTPUT - USED FOR CLASS HEADING
    * ------------------------------------------------------------------------
    * PROGRAMMER : Programmer's Name
    * CLASS   : Student's Course
    * SECTION    : Class Days and Times
    * LAB_NUM    : Lab Number (specific to this lab)
    * LAB_NAME   : Title of the Lab
    *************************************************************************/

    const string AS_NAME = "Intro to Recursion - GCD";
    const int AS_NUM = 11;
    const string STUDENT_NAME = "Andrew Gharios";
```

```
42      const string CLASS_INFO = "M-Th 5-7:20p";
43      const char AS_TYPE = 'L';
44      const long long STUDENT_ID = 1449366;
45
46      ofstream OFile;  // IN & OUT   - OutputFile variable.
47      int      int1;   // IN & CALC  - First integer input by user.
48      int      int2;   // IN & CALC  - Second integer input by user.
49      int      gcd;    // CALC & OUT - GCD to be calculated.
50      int      index;  // CALC       - index for Array manipulation.
51
52      OFile.open("OutFile.txt");
53
54      PrintHeaderFile(cout, OFile, AS_NAME, AS_NUM, STUDENT_NAME, CLASS_INFO,
55          AS_TYPE, STUDENT_ID);
56      PrintHeaderFile(OFile, OFile, AS_NAME, AS_NUM, STUDENT_NAME, CLASS_INFO,
57          AS_TYPE, STUDENT_ID);
58
59      for (index = 0; index < 4; index++)
60      {
61          GetTwoInts(int1, int2);
62          gcd = Gcd(int1, int2);
63          OutputResults(OFile, int1, int2, gcd);
64      }
65
66      cout << "Thank you for using my GCD calculator!";
67
68      OFile.close();
69
70      return 0;
71
72  }
73
74
```

```cpp
#include "Header.h"

/*****************************************************************************
 * PrintHeaderFile
 *   This function will output the header information
 *
 *---------------------------------------------------------------------------
 * PRE-CONDITIONS
 *   The following parameters need to have a defined value prior to calling
 *   the function
 *          asName: The name of the assignment given in the course
 *          asNum: The number of the assignment given in the course
 *          studentName: The name of the student writing the code
 *          classInfo: The course name, date, and time of the class
 *          asType: Will either output as a lab or an assignment
 *          studentID: The Identification Number of the student
 *
 *****************************************************************************/

void PrintHeaderFile(ostream& output,       // IN - output datatype.
    ofstream& OFile,
    string asName,      // IN - assignment name
    int asNum,          // IN - assignment number
    string studentName,  // IN - student's name
    string classInfo,    // IN - class that is being taken
    char asType,         // IN - assignment type
    long long studentID) // IN - student ID
{
    output << left;
    output << "*************************************************************   \n";
    output << "*   PROGRAMMED BY : " << studentName << endl;
    output << "*   " << setw(14) << "STUDENT ID " << ": " << studentID << endl;
    output << "*   " << setw(14) << "CLASS " << ": " << classInfo << endl;
    output << "*   ";

    // PROCESSING - This will adjust setws and format appropriately based
    //              on if this is a lab 'L' or assignment

    if (toupper(asType) == 'L')
    {
        output << "LAB #" << setw(9);
    }
    else
    {
        output << "ASSIGNMENT #" << setw(2);
    }
    output << asNum << ": " << asName << endl;
    output << "*************************************************************";
```

```
47      output << right << endl;
48
49      return;
50  }
```

```cpp
#include "Header.h"

/*****************************************************************************
 * Get Two Ints
 *  This function will take an input of two integers from user and pass them
 *  back to the source code by reference.
 *
 * INPUTS:
 *  int1 - First integer.
 *  int2 - Second integer.
 *
 * No Outputs.
 *
 *****************************************************************************/
void GetTwoInts(int& int1, // IN - First Integer.
    int& int2)  // IN - Second Integer.
{
    const int INPUT_COL = 26; // CALC - Input setw size.

    cout << left;
    cout << setw(INPUT_COL) << "Enter the first integer:";
    cin >> int1;
    cin.ignore(10000, '\n');

    cout << setw(INPUT_COL) << "Enter the second integer:";
    cin >> int2;
    cin.ignore(10000, '\n');

    cout << right;
    cout << endl;
}
```

```cpp
#include "Header.h"

int Gcd(int in1, int in2)
{
    if (in1 == 0)
    {
        return in2;
    }
    return Gcd(in2 % in1, in1);
}
```

```cpp
#include "Header.h"

/*****************************************************************************
 * Output Results
 *  This function will output the gcd of all integers inputed into the Output
 *  file.
 *
 * INPUTS:
 *  OFile - Output file.
 *  int1  - First Integer.
 *  int2  - Second Integer.
 *  gcd   - Calculated gcd.
 *
 * No Ouputs.
 *                                                                           ↵
*****************************************************************************/
void OutputResults(ofstream& OFile, // CALC - Output File variable.
    int int1,       // IN   - First Integer.
    int int2,       // IN   - Second Integer.
    int gcd)        // IN   - calculated Gcd.
{
    OFile << "The GCD for " << int1 << " & " << int2;
    OFile << " = " << gcd << endl << endl;
}
```