San Francisco Bay University

CS360L - Programming in C and C++ Lab
Lab Assignment #1

Due day: 5/24/2022

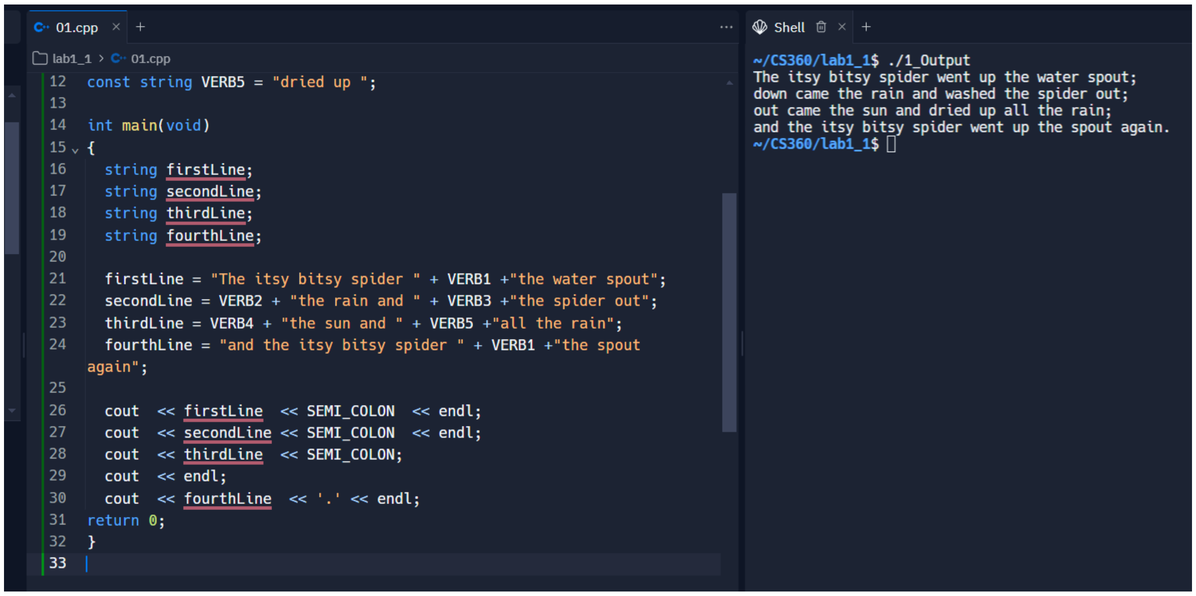
Instruction:

1. Push the answer sheets/source code to Github
2. Please follow the code style rule like programs on handout.
3. Overdue lab assignment submission can't be accepted.
4. Take academic honesty and integrity seriously (Zero Tolerance of Cheating & Plagiarism)

1. Let's examine / run the following C++ program regarding *string* data type and related operators

```
#include <iostream>

using std::cout;
using std::endl;
using std::string;

const char SEMI_COLON = ';';
const string VERB1 = "went up ";
const string VERB2 = "down came ";
const string VERB3 = "washed ";
const string VERB4 = "out came ";
const string VERB5 = "dried up ";

int main(void){
  string firstLine;
  string secondLine;
  string thirdLine;
  string fourthLine;

  firstLine = "The itsy bitsy spider " + VERB1 +"the water spout";
  secondLine = VERB2 + "the rain and " + VERB3 +"the spider out";
  thirdLine = VERB4 + "the sun and " + VERB5 +"all the rain";
  fourthLine = "and the itsy bitsy spider " + VERB1 +"the spout again";

  cout  << firstLine  << SEMI_COLON  << endl;
  cout  << secondLine << SEMI_COLON  << endl;
  cout  << thirdLine  << SEMI_COLON;
  cout  << endl;
  cout  << fourthLine  << '.' << endl;
```

```
        return 0;
       }
```



```
const string VERB5 = "dried up ";

int main(void)
{
  string firstLine;
  string secondLine;
  string thirdLine;
  string fourthLine;

  firstLine = "The itsy bitsy spider " + VERB1 +"the water spout";
  secondLine = VERB2 + "the rain and " + VERB3 +"the spider out";
  thirdLine = VERB4 + "the sun and " + VERB5 +"all the rain";
  fourthLine = "and the itsy bitsy spider " + VERB1 +"the spout
again";

  cout  << firstLine  << SEMI_COLON  << endl;
  cout  << secondLine << SEMI_COLON  << endl;
  cout  << thirdLine  << SEMI_COLON;
  cout  << endl;
  cout  << fourthLine  << '.' << endl;
return 0;
}
```

```
~/CS360/lab1_1$ ./1_Output
The itsy bitsy spider went up the water spout;
down came the rain and washed the spider out;
out came the sun and dried up all the rain;
and the itsy bitsy spider went up the spout again.
~/CS360/lab1_1$
```

2. **Focuses on constructing output statements. Program Shell is the outline of a program. Use this shell for Question#1 through #3**
    a. **Question#1: Write a program to read-in from keyboard and print the following information single spaced on the screen. Use literal constants in the output statements for each of the data items to be written on the screen. Run your program to verify that the output is as specified.**

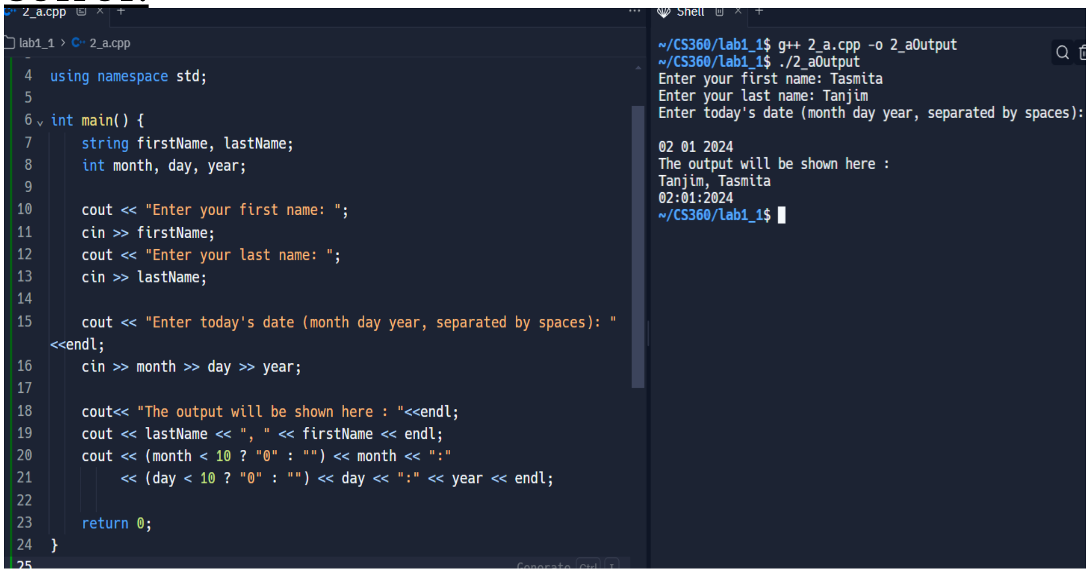
        i. **your name (last name, comma, blank, first name)**
        ii. **today's date (month:day:year)**

CODE:

```
#include <iostream>
#include <string>

using namespace std;

int main() {
   string firstName, lastName;
   int month, day, year;

   cout << "Enter your first name: ";
   cin >> firstName;
   cout << "Enter your last name: ";
   cin >> lastName;

   cout << "Enter today's date (month day year, separated by spaces): "<<endl;
   cin >> month >> day >> year;
```

```
    cout<< "The output will be shown here : "<<endl;
    cout << lastName << ", " << firstName << endl;
    cout << (month < 10 ? "0" : "") << month << ":"
         << (day < 10 ? "0" : "") << day << ":" << year << endl;

    return 0;
}
```

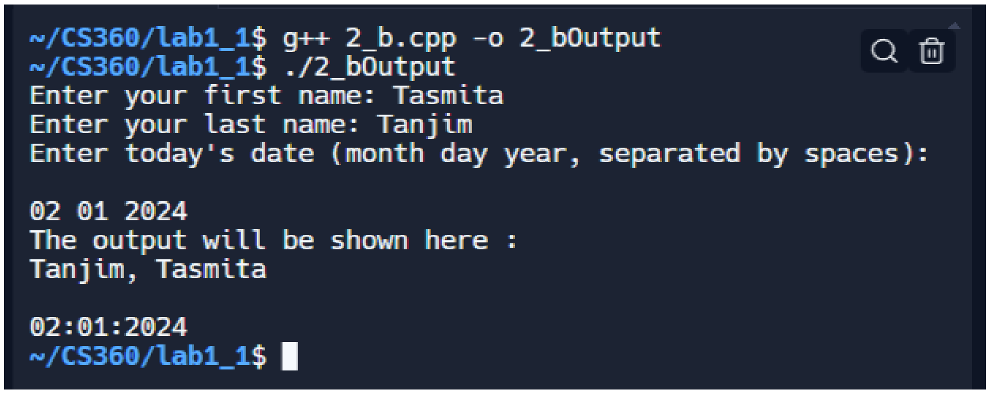
OUTPUT:



```
using namespace std;

int main() {
    string firstName, lastName;
    int month, day, year;

    cout << "Enter your first name: ";
    cin >> firstName;
    cout << "Enter your last name: ";
    cin >> lastName;

    cout << "Enter today's date (month day year, separated by spaces): "
<<endl;
    cin >> month >> day >> year;

    cout<< "The output will be shown here : "<<endl;
    cout << lastName << ", " << firstName << endl;
    cout << (month < 10 ? "0" : "") << month << ":"
         << (day < 10 ? "0" : "") << day << ":" << year << endl;

    return 0;
}
```

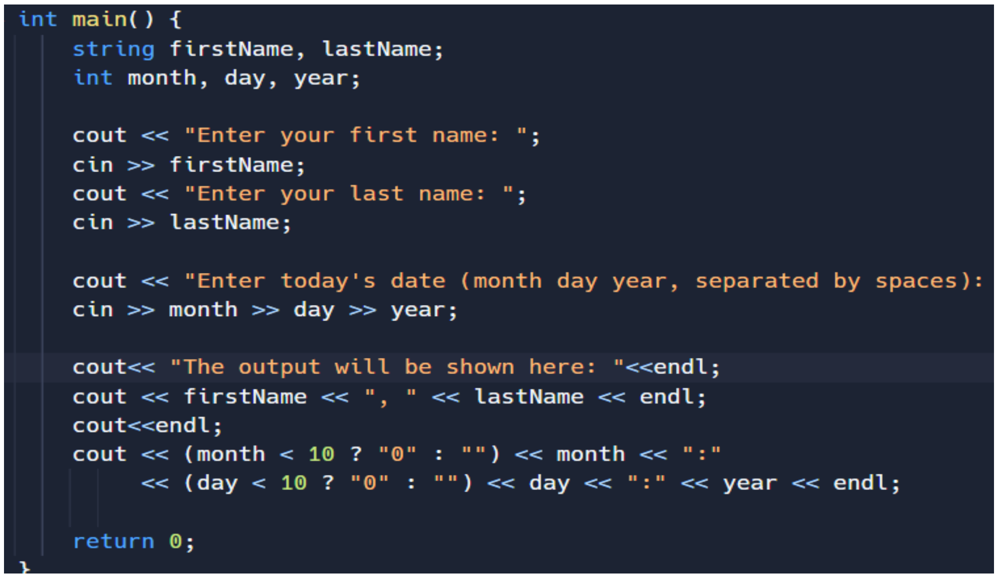
```
~/CS360/lab1_1$ g++ 2_a.cpp -o 2_aOutput
~/CS360/lab1_1$ ./2_aOutput
Enter your first name: Tasmita
Enter your last name: Tanjim
Enter today's date (month day year, separated by spaces):

02 01 2024
The output will be shown here :
Tanjim, Tasmita
02:01:2024
~/CS360/lab1_1$
```

b. Question#2: Change your program so that there is a space between the two output lines.

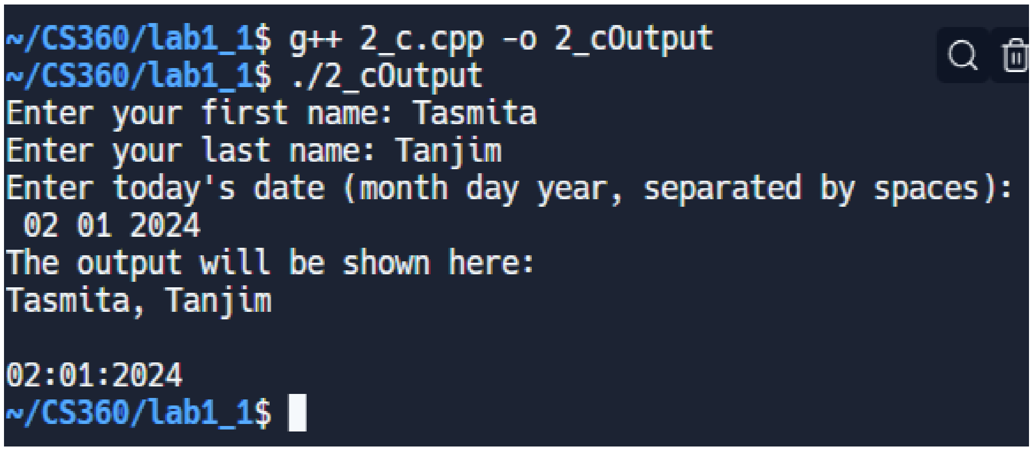


```
~/CS360/lab1_1$ g++ 2_b.cpp -o 2_bOutput
~/CS360/lab1_1$ ./2_bOutput
Enter your first name: Tasmita
Enter your last name: Tanjim
Enter today's date (month day year, separated by spaces):

02 01 2024
The output will be shown here :
Tanjim, Tasmita

02:01:2024
~/CS360/lab1_1$
```

c. Question#3: Change your program so that your first name is printed followed by your last name, with a blank in between the names.



```
int main() {
    string firstName, lastName;
    int month, day, year;

    cout << "Enter your first name: ";
    cin >> firstName;
    cout << "Enter your last name: ";
    cin >> lastName;

    cout << "Enter today's date (month day year, separated by spaces):
    cin >> month >> day >> year;

    cout<< "The output will be shown here: "<<endl;
    cout << firstName << ", " << lastName << endl;
    cout<<endl;
    cout << (month < 10 ? "0" : "") << month << ":"
         << (day < 10 ? "0" : "") << day << ":" << year << endl;

    return 0;
}
```



```
~/CS360/lab1_1$ g++ 2_c.cpp -o 2_cOutput
~/CS360/lab1_1$ ./2_cOutput
Enter your first name: Tasmita
Enter your last name: Tanjim
Enter today's date (month day year, separated by spaces):
 02 01 2024
The output will be shown here:
Tasmita, Tanjim

02:01:2024
~/CS360/lab1_1$ 
```

3. Use the following program shell for Question#1 through #3

a. Question#1: Write a named string constant made up of your first and last names with a blank in between. Write the statements to print out the result of applying *length* and *size* to your named constant object. Compile and run your program.

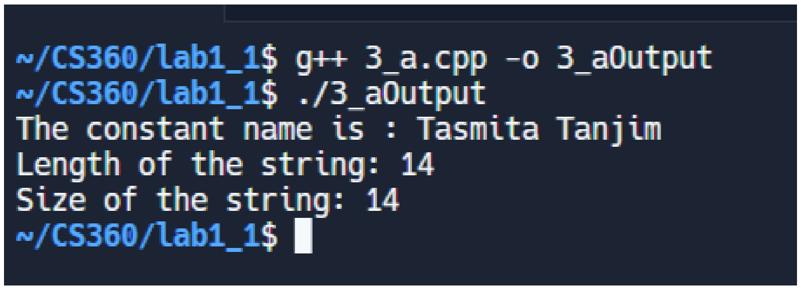
CODE:

#include <iostream>
#include <string>

using namespace std;

int main(void) {

```
    const string name = "Tasmita Tanjim";

    cout<<"The constant name is : "<<name<<endl;
    cout << "Length of the string: " << name.length() << "\n";
    cout << "Size of the string: " << name.size() << "\n";

    return 0;
}
```

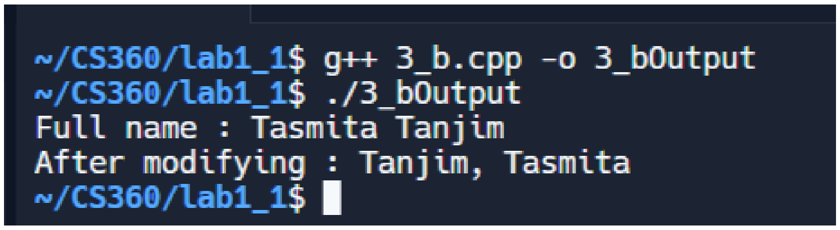


```
~/CS360/lab1_1$ g++ 3_a.cpp -o 3_aOutput
~/CS360/lab1_1$ ./3_aOutput
The constant name is : Tasmita Tanjim
Length of the string: 14
Size of the string: 14
~/CS360/lab1_1$
```

b. Question#2: Add statements to your Question#1 program to print your name formatted as last name first, followed by a comma and your first name. Use function *substr* to accomplish this task. Compile and run your program.

CODE:

```
#include <iostream>
#include <string>

using namespace std;

int main() {
    const string fullName = "Tasmita Tanjim";
    cout<<"Full name : "<<fullName<<endl;

    const size_t spaceIdx = fullName.find(' ');
    const string lastName = fullName.substr(spaceIdx + 1);
    const string firstName = fullName.substr(0, spaceIdx);

    cout << "After modifying : "<<lastName << ", " << firstName << endl;

    return 0;
}
```

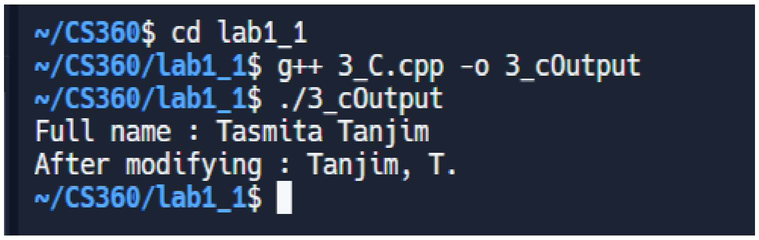


```
~/CS360/lab1_1$ g++ 3_b.cpp -o 3_bOutput
~/CS360/lab1_1$ ./3_bOutput
Full name : Tasmita Tanjim
After modifying : Tanjim, Tasmita
~/CS360/lab1_1$
```

c. Question#3: Add the statements necessary to print your last name, followed by a comma and your first initial. Compile and run your program

CODE:

```
#include <iostream>
#include <string>

using namespace std;

int main() {
    const string fullName = "Tasmita Tanjim";
    cout<<"Full name : "<<fullName<<endl;

    const size_t spaceIndex = fullName.find(' ');
    const string lastName = fullName.substr(spaceIndex + 1);
    const char firstInitial = fullName[0];

    cout << "After modifying : "<<lastName << ", " << firstInitial << '.' << endl;

    return 0;
}
```



```
~/CS360$ cd lab1_1
~/CS360/lab1_1$ g++ 3_C.cpp -o 3_cOutput
~/CS360/lab1_1$ ./3_cOutput
Full name : Tasmita Tanjim
After modifying : Tanjim, T.
~/CS360/lab1_1$
```

4. Use the following program shell for Question#1 through Question#4

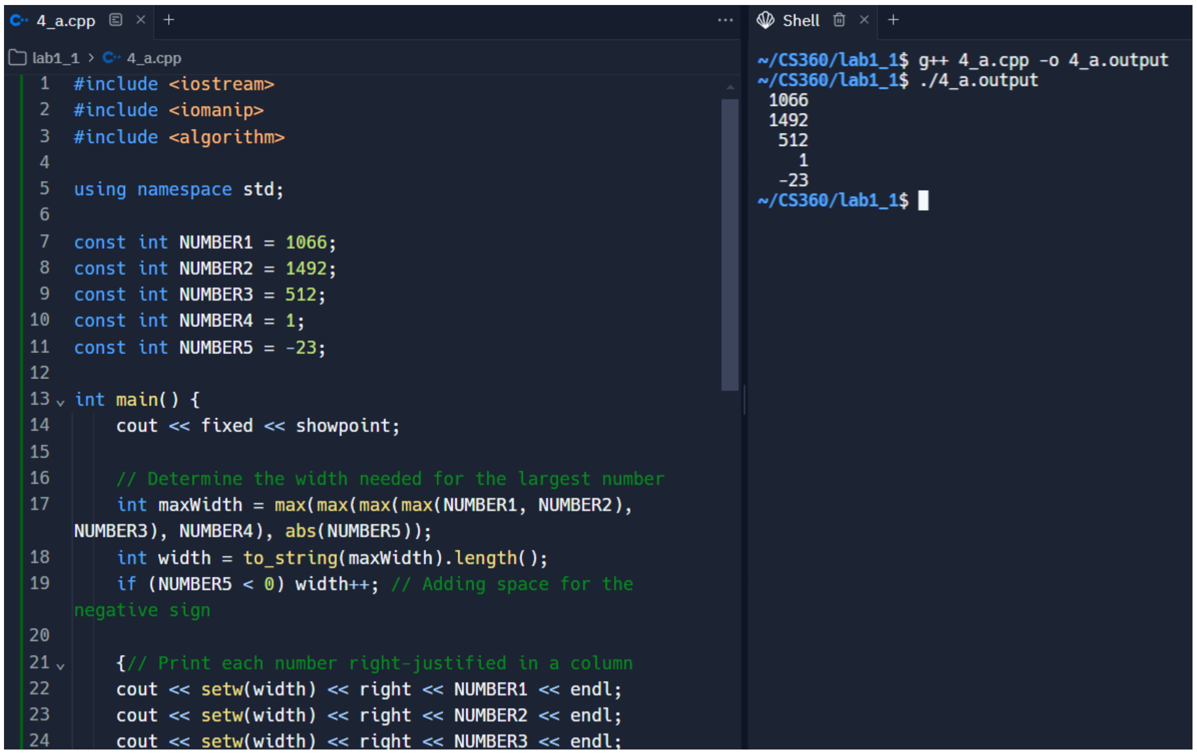
a. **Question#1:** Write a program to print the following numbers right-justified in a column on the screen. Make the values named constants.

1066 1492 512 1 -23

ANSWER:

```
#include <iostream>
#include <iomanip>
#include <algorithm>

using namespace std;

const int NUMBER1 = 1066;
const int NUMBER2 = 1492;
const int NUMBER3 = 512;
const int NUMBER4 = 1;
const int NUMBER5 = -23;

int main() {
    cout << fixed << showpoint;

    // Determine the width needed for the largest number
    int maxWidth = max(max(max(max(NUMBER1, NUMBER2), NUMBER3),
NUMBER4), abs(NUMBER5));
    int width = to_string(maxWidth).length();
    if (NUMBER5 < 0) width++; // Adding space for the negative sign

    {// Print each number right-justified in a column
    cout << setw(width) << right << NUMBER1 << endl;
    cout << setw(width) << right << NUMBER2 << endl;
    cout << setw(width) << right << NUMBER3 << endl;
    cout << setw(width) << right << NUMBER4 << endl;
    cout << setw(width) << right << NUMBER5 << endl;
    }

    return 0;
}
```

OUTPUT:



```
#include <iostream>
#include <iomanip>
#include <algorithm>

using namespace std;

const int NUMBER1 = 1066;
const int NUMBER2 = 1492;
const int NUMBER3 = 512;
const int NUMBER4 = 1;
const int NUMBER5 = -23;

int main() {
    cout << fixed << showpoint;

    // Determine the width needed for the largest number
    int maxWidth = max(max(max(max(NUMBER1, NUMBER2),
NUMBER3), NUMBER4), abs(NUMBER5));
    int width = to_string(maxWidth).length();
    if (NUMBER5 < 0) width++; // Adding space for the
negative sign

    {// Print each number right-justified in a column
    cout << setw(width) << right << NUMBER1 << endl;
    cout << setw(width) << right << NUMBER2 << endl;
    cout << setw(width) << right << NUMBER3 << endl;
```

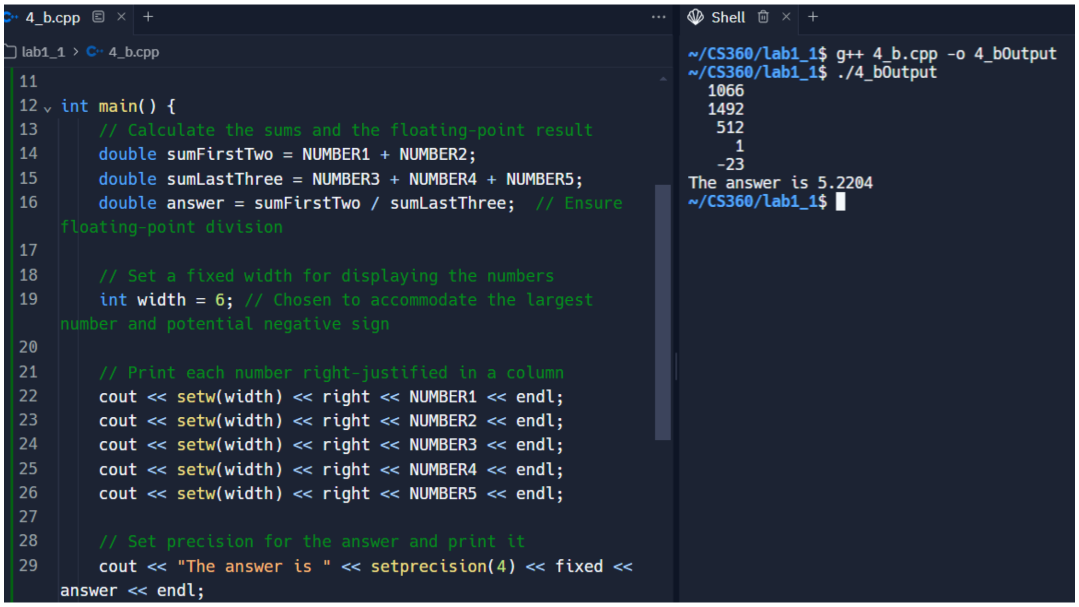
```
~/CS360/lab1_1$ g++ 4_a.cpp -o 4_a.output
~/CS360/lab1_1$ ./4_a.output
 1066
 1492
  512
    1
  -23
~/CS360/lab1_1$ 
```

b. Question#2: Add two statements to your program. Calculate the floating-point result from dividing the sum of the first two values by the sum of the last three values and store it in answer. The second statement should write the contents of answer on the screen to four decimal places. (Do not forget to declare *answer*.)

   The answer is ________________.

CODE:

```
#include <iostream>
#include <iomanip>

using namespace std;

const int NUMBER1 = 1066;
const int NUMBER2 = 1492;
const int NUMBER3 = 512;
const int NUMBER4 = 1;
const int NUMBER5 = -23;

int main() {
   // Calculate the sums and the floating-point result
   double sumFirstTwo = NUMBER1 + NUMBER2;
   double sumLastThree = NUMBER3 + NUMBER4 + NUMBER5;
   double answer = sumFirstTwo / sumLastThree;  // Ensure floating-point division

   // Set a fixed width for displaying the numbers
   int width = 6; // Chosen to accommodate the largest number and potential negative sign

   // Print each number right-justified in a column
   cout << setw(width) << right << NUMBER1 << endl;
   cout << setw(width) << right << NUMBER2 << endl;
   cout << setw(width) << right << NUMBER3 << endl;
   cout << setw(width) << right << NUMBER4 << endl;
   cout << setw(width) << right << NUMBER5 << endl;

   // Set precision for the answer
   cout << "The answer is " << setprecision(4) << fixed << answer << endl;

   return 0;
}
```


4_b.cpp   Shell

lab1_1 > 4_b.cpp

```
int main() {
    // Calculate the sums and the floating-point result
    double sumFirstTwo = NUMBER1 + NUMBER2;
    double sumLastThree = NUMBER3 + NUMBER4 + NUMBER5;
    double answer = sumFirstTwo / sumLastThree;  // Ensure floating-point division

    // Set a fixed width for displaying the numbers
    int width = 6; // Chosen to accommodate the largest number and potential negative sign

    // Print each number right-justified in a column
    cout << setw(width) << right << NUMBER1 << endl;
    cout << setw(width) << right << NUMBER2 << endl;
    cout << setw(width) << right << NUMBER3 << endl;
    cout << setw(width) << right << NUMBER4 << endl;
    cout << setw(width) << right << NUMBER5 << endl;

    // Set precision for the answer and print it
    cout << "The answer is " << setprecision(4) << fixed << answer << endl;
```

```
~/CS360/lab1_1$ g++ 4_b.cpp -o 4_bOutput
~/CS360/lab1_1$ ./4_bOutput
  1066
  1492
   512
     1
   -23
The answer is 5.2204
~/CS360/lab1_1$
```

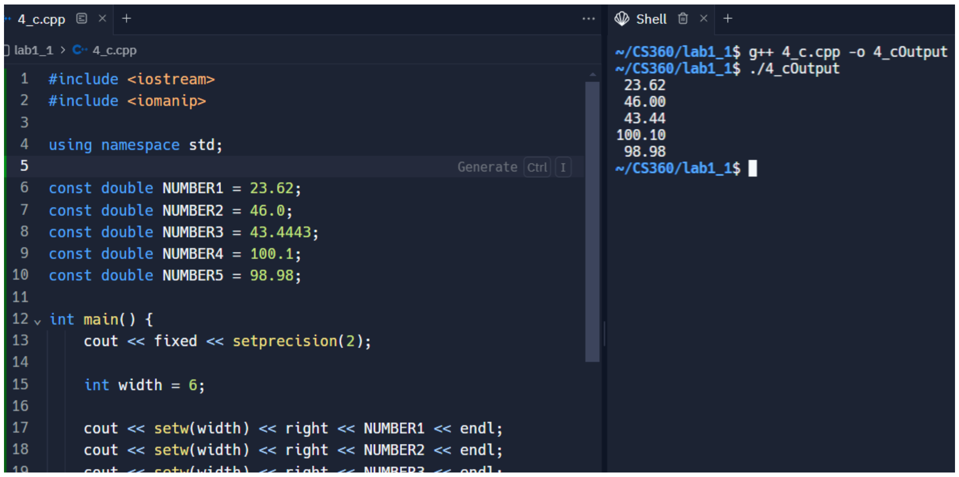
c. Question#3: Write the following numbers right-justified in a column on the screen. Each of the data values should be written in formatted floating-point notation with two decimal places. Use field width specifications rather than listing the numbers in your program with the proper formatting. You may use either literal constants or named constants.

23.62 46.0 43.4443 100.1 98.98

CODE:

```
#include <iostream>
#include <iomanip>

using namespace std;

const double NUMBER1 = 23.62;
const double NUMBER2 = 46.0;
const double NUMBER3 = 43.4443;
const double NUMBER4 = 100.1;
const double NUMBER5 = 98.98;

int main() {
   cout << fixed << setprecision(2);

   int width = 6;

   cout << setw(width) << right << NUMBER1 << endl;
   cout << setw(width) << right << NUMBER2 << endl;
   cout << setw(width) << right << NUMBER3 << endl;
   cout << setw(width) << right << NUMBER4 << endl;
   cout << setw(width) << right << NUMBER5 << endl;
```

```
    return 0;
}
```



```
4_c.cpp
lab1_1 > 4_c.cpp
#include <iostream>
#include <iomanip>

using namespace std;

const double NUMBER1 = 23.62;
const double NUMBER2 = 46.0;
const double NUMBER3 = 43.4443;
const double NUMBER4 = 100.1;
const double NUMBER5 = 98.98;

int main() {
    cout << fixed << setprecision(2);

    int width = 6;

    cout << setw(width) << right << NUMBER1 << endl;
    cout << setw(width) << right << NUMBER2 << endl;
```

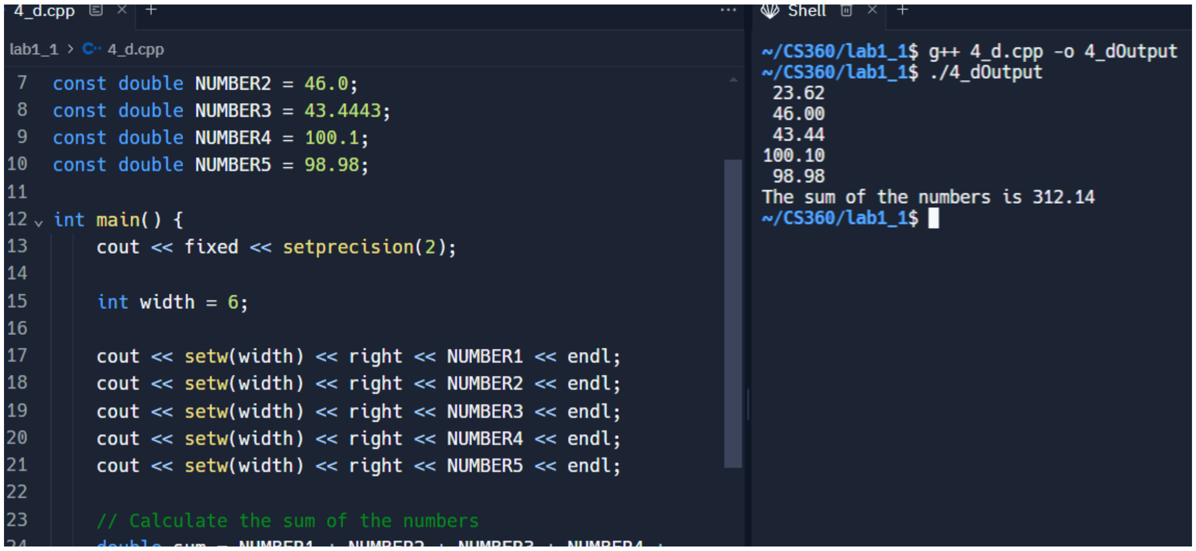
```
~/CS360/lab1_1$ g++ 4_c.cpp -o 4_cOutput
~/CS360/lab1_1$ ./4_cOutput
 23.62
 46.00
 43.44
100.10
 98.98
~/CS360/lab1_1$
```

d. Question#4: Add two statements to your program for Question#3. The first statement should calculate the sum of the numbers and store the result in variable sum. The second statement should write *sum* on the screen, properly labeled.

The sum of the numbers is __________________.

<u>CODE:</u>

```
#include <iostream>
#include <iomanip>

using namespace std;

const double NUMBER1 = 23.62;
const double NUMBER2 = 46.0;
const double NUMBER3 = 43.4443;
const double NUMBER4 = 100.1;
const double NUMBER5 = 98.98;

int main() {
    cout << fixed << setprecision(2);

    int width = 6;

    cout << setw(width) << right << NUMBER1 << endl;
    cout << setw(width) << right << NUMBER2 << endl;
    cout << setw(width) << right << NUMBER3 << endl;
    cout << setw(width) << right << NUMBER4 << endl;
    cout << setw(width) << right << NUMBER5 << endl;
    // Calculate the sum of the numbers
    double sum = NUMBER1 + NUMBER2 + NUMBER3 + NUMBER4 + NUMBER5;

    // Print the sum
    cout << "The sum of the numbers is " << sum << endl;

    return 0;
}
```



```
const double NUMBER2 = 46.0;
const double NUMBER3 = 43.4443;
const double NUMBER4 = 100.1;
const double NUMBER5 = 98.98;

int main() {
    cout << fixed << setprecision(2);

    int width = 6;

    cout << setw(width) << right << NUMBER1 << endl;
    cout << setw(width) << right << NUMBER2 << endl;
    cout << setw(width) << right << NUMBER3 << endl;
    cout << setw(width) << right << NUMBER4 << endl;
    cout << setw(width) << right << NUMBER5 << endl;

    // Calculate the sum of the numbers
```

```
~/CS360/lab1_1$ g++ 4_d.cpp -o 4_dOutput
~/CS360/lab1_1$ ./4_dOutput
 23.62
 46.00
 43.44
100.10
 98.98
The sum of the numbers is 312.14
~/CS360/lab1_1$
```

5. Use the following program shell for Question#1through #3.

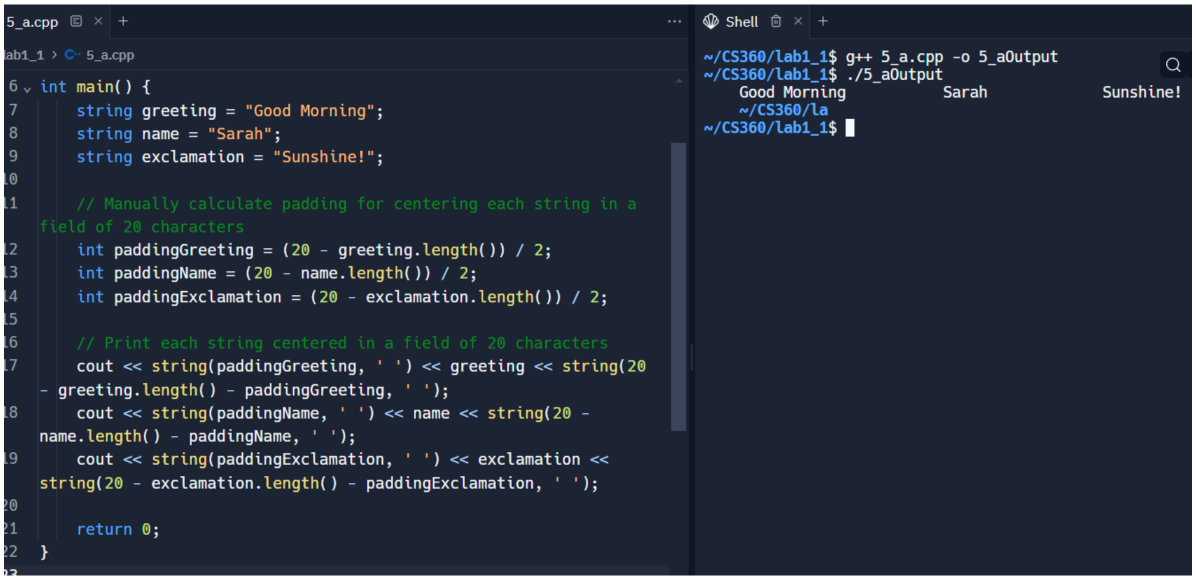
```
// Program Center sends strings to the output stream in
// specified formats.

#include <iostream>
#include <iomanip>

using std::cout;

int main (void){
        return 0;
}
```

a. Question#1: Add the statements necessary to print the following strings centered in fields of *20* characters, all on one line: *"Good Morning"*, *"Sarah"*, and *"Sunshine!"*. Do not use manipulators. Compile and run your program; show your output.

CODE:

```
#include <iostream>
#include <string>

using namespace std;
```

```
int main() {
    string greeting = "Good Morning";
    string name = "Sarah";
    string exclamation = "Sunshine!";

    int paddingGreeting = (20 - greeting.length()) / 2;
    int paddingName = (20 - name.length()) / 2;
    int paddingExclamation = (20 - exclamation.length()) / 2;

    cout << string(paddingGreeting, ' ') << greeting << string(20 - greeting.length() -
paddingGreeting, ' ');

    cout << string(paddingName, ' ') << name << string(20 - name.length() - paddingName, '
');

    cout << string(paddingExclamation, ' ') << exclamation << string(20 -
exclamation.length() - paddingExclamation, ' ');

    return 0;
}
```



5_a.cpp

lab1_1 > 5_a.cpp

```
int main() {
    string greeting = "Good Morning";
    string name = "Sarah";
    string exclamation = "Sunshine!";

    // Manually calculate padding for centering each string in a
field of 20 characters
    int paddingGreeting = (20 - greeting.length()) / 2;
    int paddingName = (20 - name.length()) / 2;
    int paddingExclamation = (20 - exclamation.length()) / 2;

    // Print each string centered in a field of 20 characters
    cout << string(paddingGreeting, ' ') << greeting << string(20
- greeting.length() - paddingGreeting, ' ');
    cout << string(paddingName, ' ') << name << string(20 -
name.length() - paddingName, ' ');
    cout << string(paddingExclamation, ' ') << exclamation <<
string(20 - exclamation.length() - paddingExclamation, ' ');

    return 0;
}
```

Shell

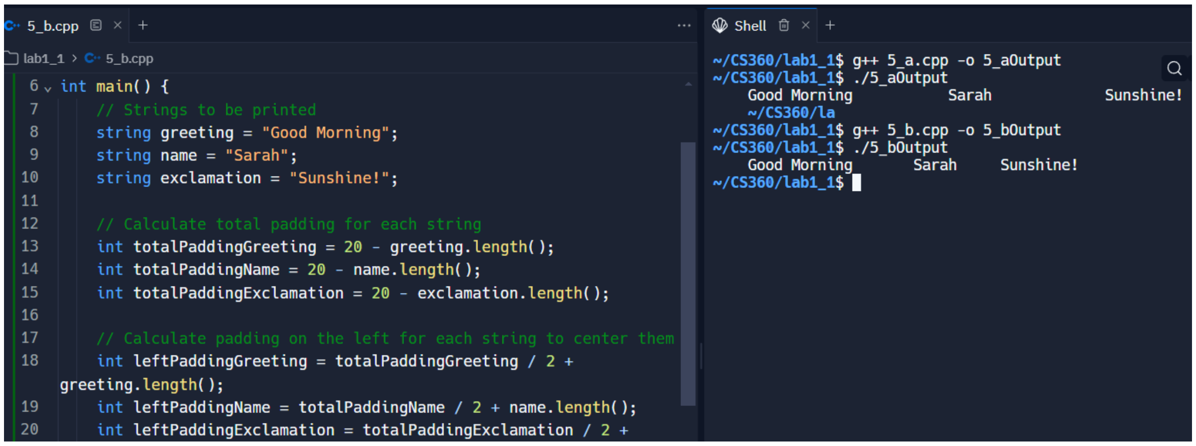
```
~/CS360/lab1_1$ g++ 5_a.cpp -o 5_aOutput
~/CS360/lab1_1$ ./5_aOutput
    Good Morning           Sarah                 Sunshine!
    ~/CS360/la
~/CS360/lab1_1$ 
```

b. Question#2: Repeat Question#1using manipulators to help center your strings. Compile and run your program. Your output should be the same.

<u>CODE:</u>

```
#include <iostream>
#include <iomanip>

using namespace std;
```

```
int main() {
    // Strings to be printed
    string greeting = "Good Morning";
    string name = "Sarah";
    string exclamation = "Sunshine!";

    // Calculate total padding for each string
    int totalPaddingGreeting = 20 - greeting.length();
    int totalPaddingName = 20 - name.length();
    int totalPaddingExclamation = 20 - exclamation.length();

    // Calculate padding on the left for each string to center them
    int leftPaddingGreeting = totalPaddingGreeting / 2 + greeting.length();
    int leftPaddingName = totalPaddingName / 2 + name.length();
    int leftPaddingExclamation = totalPaddingExclamation / 2 + exclamation.length();

    // Print each string centered in a field of 20 characters
    cout << setw(leftPaddingGreeting) << greeting;
    cout << setw(leftPaddingName) << name;
    cout << setw(leftPaddingExclamation) << exclamation << endl;

    return 0;
}
```



```
int main() {
    // Strings to be printed
    string greeting = "Good Morning";
    string name = "Sarah";
    string exclamation = "Sunshine!";

    // Calculate total padding for each string
    int totalPaddingGreeting = 20 - greeting.length();
    int totalPaddingName = 20 - name.length();
    int totalPaddingExclamation = 20 - exclamation.length();

    // Calculate padding on the left for each string to center them
    int leftPaddingGreeting = totalPaddingGreeting / 2 +
greeting.length();
    int leftPaddingName = totalPaddingName / 2 + name.length();
    int leftPaddingExclamation = totalPaddingExclamation / 2 +
```

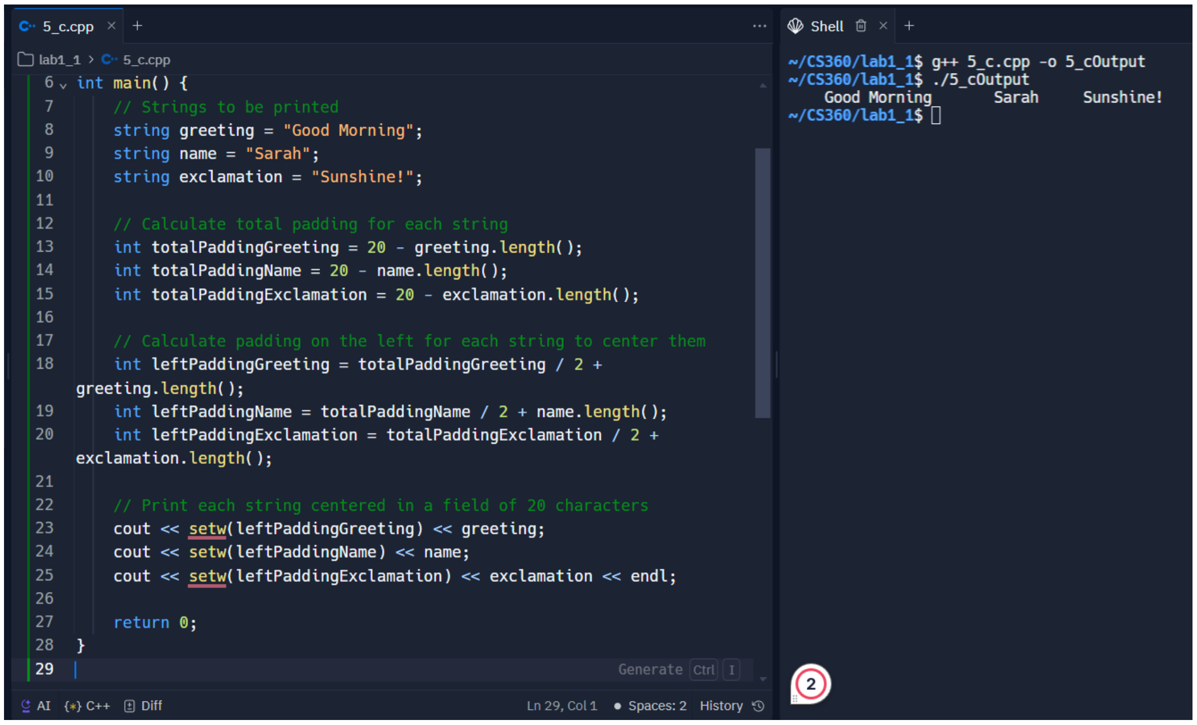
```
~/CS360/lab1_1$ g++ 5_a.cpp -o 5_aOutput
~/CS360/lab1_1$ ./5_aOutput
    Good Morning          Sarah             Sunshine!
    ~/CS360/la
~/CS360/lab1_1$ g++ 5_b.cpp -o 5_bOutput
~/CS360/lab1_1$ ./5_bOutput
    Good Morning      Sarah     Sunshine!
~/CS360/lab1_1$
```

c. Question#3: Change the program in Question#2 so that the three strings are printed on three separate lines with a blank line in between each string.

CODE:

```
#include <iostream>
#include <iomanip>

using namespace std;

int main()
```

```
{
    // Strings to be printed
    string greeting = "Good Morning";
    string name = "Sarah";
    string exclamation = "Sunshine!";

    // Calculate total padding for each string
    int totalPaddingGreeting = 20 - greeting.length();
    int totalPaddingName = 20 - name.length();
    int totalPaddingExclamation = 20 - exclamation.length();

    // Calculate padding on the left for each string to center them
    int leftPaddingGreeting = totalPaddingGreeting / 2 + greeting.length();
    int leftPaddingName = totalPaddingName / 2 + name.length();
    int leftPaddingExclamation = totalPaddingExclamation / 2 + exclamation.length();

    // Print each string centered in a field of 20 characters
    cout << setw(leftPaddingGreeting) << greeting;
    cout << setw(leftPaddingName) << name;
    cout << setw(leftPaddingExclamation) << exclamation << endl;

    return 0;
}
```



```
int main() {
  // Strings to be printed
  string greeting = "Good Morning";
  string name = "Sarah";
  string exclamation = "Sunshine!";

  // Calculate total padding for each string
  int totalPaddingGreeting = 20 - greeting.length();
  int totalPaddingName = 20 - name.length();
  int totalPaddingExclamation = 20 - exclamation.length();

  // Calculate padding on the left for each string to center them
  int leftPaddingGreeting = totalPaddingGreeting / 2 + greeting.length();
  int leftPaddingName = totalPaddingName / 2 + name.length();
  int leftPaddingExclamation = totalPaddingExclamation / 2 + exclamation.length();

  // Print each string centered in a field of 20 characters
  cout << setw(leftPaddingGreeting) << greeting;
  cout << setw(leftPaddingName) << name;
  cout << setw(leftPaddingExclamation) << exclamation << endl;

  return 0;
}
```

```
~/CS360/lab1_1$ g++ 5_c.cpp -o 5_cOutput
~/CS360/lab1_1$ ./5_cOutput
    Good Morning       Sarah     Sunshine!
~/CS360/lab1_1$ 
```