Lab 1: Getting Started with C++

1. Write a program that to display the following output:

```
Microsoft Visual Studio Debug Console
Student Name           :Mien May
Student Gender         :Female
Student Age            :23
Student Home Address   :Selangor
E-wallet Amount        :RM 23.12

Student details as below:
===================================================================
|Name          | Age   | Gender   | Address   | E-wallet amount   |
===================================================================
|Mien May      | 23    | Female   | Selangor  | RM23.12           |
===================================================================
```

[Estimate Finish Time: 20 minutes]

Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
    cout << "Student Name         : Mien May" << endl;
    cout << "Student Gender       : Female" << endl;
    cout << "Student Age          : 23" << endl;
    cout << "Student Home Address: Selangor" << endl;
    cout << "E-wallet Amount      : RM 23.12" << endl << endl;

    cout << "Student details as below:" << endl;
    cout << "========================================================" <<
endl;
    cout << "| Name        | Age | Gender | Address   | E-wallet amount   |" <<
endl;
    cout << "========================================================" <<
endl;
    cout << "| Mien May    | 23  | Female | Selangor  | RM23.12           |" <<
endl;
    cout << "========================================================" <<
endl;

    return 0;
}
```
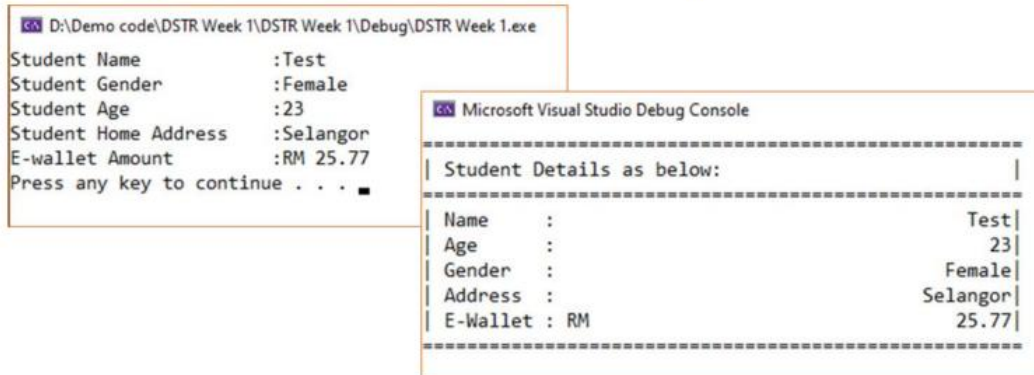
Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\Data Structures\Tutorials\Lab3>lab3.exe
Student Name       : Mien May
Student Gender     : Female
Student Age        : 23
Student Home Address: Selangor
E-wallet Amount    : RM 23.12

Student details as below:

=========================================================
| Name       | Age | Gender | Address  | E-wallet amount  |
=========================================================
| Mien May   | 23  | Female | Selangor | RM23.12          |
=========================================================
```

2. Modify the program in Question 1 to get another output as below:

```
D:\Demo code\DSTR Week 1\DSTR Week 1\Debug\DSTR Week 1.exe

Student Name        :Test
Student Gender      :Female
Student Age         :23
Student Home Address :Selangor
E-wallet Amount     :RM 25.77
Press any key to continue . . .
```

```
Microsoft Visual Studio Debug Console

=============================================================
| Student Details as below:                                 |
=============================================================
| Name    :                                           Test|
| Age     :                                             23|
| Gender  :                                         Female|
| Address :                                       Selangor|
| E-Wallet : RM                                     25.77|
=============================================================
```

[Estimate Finish Time: 15 minutes]

Code:

```cpp
#include <iostream>
#include <string>
#include <iomanip>
using namespace std;

int main()
{

    string name, gender, address;
    int age;
    double ewalletAmount;

    cout << "Student Name        : ";
    getline(cin, name);
```

```cpp
    cout << "Student Gender      : ";
    getline(cin, gender);

    cout << "Student Age         : ";
    cin >> age;
    cin.ignore();

    cout << "Student Home Address: ";
    getline(cin, address);

    cout << "E-Wallet Amount     : RM ";
    cin >> ewalletAmount;

    cin.ignore();
    cout << "Press Enter to continue . . .";
    cin.get();


    cout << "\nStudent Details as below:\n";
    cout << "=================================================" << endl;
    cout << "| Name   : " << name << endl;
    cout << "| Age    : " << age << endl;
    cout << "| Gender : " << gender << endl;
    cout << "| Address: " << address << endl;

    cout << "| E-Wallet: RM " << fixed << setprecision(2) << ewalletAmount <<
endl;
    cout << "=================================================" << endl;

    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\Data Structures\Tutorials\Lab3>modified
Student Name         : John Cena
Student Gender       : Unknown
Student Age          : 69
Student Home Address: Dragon Deez Nuts Jalan Perdana 69
E-Wallet Amount      : RM 69
Press Enter to continue . . .

Student Details as below:
=================================================
| Name   : John Cena
| Age    : 69
| Gender : Unknown
| Address: Dragon Deez Nuts Jalan Perdana 69
| E-Wallet: RM 69.00
=================================================
```

1. A program is required to prompt for and accept a time and compute the number of seconds elapsed since midnight. The time should be entered in the format HH:MM:SS. Include some input validations in your program.

    Output sample:

    > Please enter your elapsed time (in HH:MM:SS format) = 00:02:44
    > Elapsed time in seconds = 164 seconds

Code:

```cpp
#include <iostream>
#include <string>
#include <sstream>   //
using namespace std;

bool isValidTime(int hh, int mm, int ss) {
    return (hh >= 0 && hh <24) && (mm >= 0 && mm < 60) && (ss >= 0 && ss < 60);
}

int main() {
    string input;
    int hh, mm, ss;
    char colon1, colon2;

    while (true) {
        cout << "Please enter your elapsed time (in HH:MM:SS format) = ";
        cin >> input;

        stringstream ssInput(input);

        if (ssInput >> hh >> colon1 >> mm >> colon2 >> ss
            && colon1 == ':'
            && colon2 == ':'
            && isValidTime(hh, mm, ss))
        {

            break;
        }

        cout << "Invalid input! Please enter a valid time in HH:MM:SS format.\n";
    }
```

```
    int totalSeconds = hh * 3600 + mm * 60 + ss;
    cout << "Elapsed time in seconds = " << totalSeconds << " seconds\n";

    return 0;
}
```
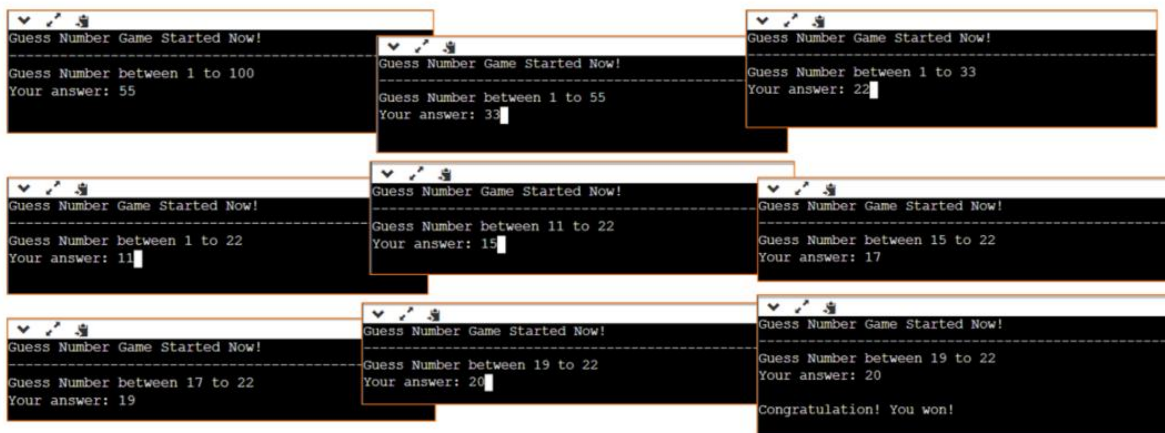
Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\Data Structures\Tutorials\Lab2>activity3
Please enter your elapsed time (in HH:MM:SS format) = 3:08:33
Elapsed time in seconds = 11313 seconds
```

2. Create a simple game in C++ that can let the user guess a random number which secretly selected from the system. The output should be similar as below:

[Estimate Finish Time: 30 minutes]

Code:

```cpp
#include <iostream>
#include <cstdlib>
#include <ctime>

using namespace std;

int main() {

    srand(static_cast<unsigned int>(time(nullptr)));
```

```cpp
    cout << "Guess Number Game Started Now!" << endl;

    // Ask user for the maximum range
    int maxRange;
    cout << "Enter the maximum number for the range: ";
    cin >> maxRange;

    int secretNumber = rand() % maxRange + 1;
    int guess = 0;

    cout << "Guess Number between 1 to " << maxRange << endl;

    // Loop
    while (true) {
        cout << "Your answer: ";
        cin >> guess;

        if (guess == secretNumber) {
            cout << "Congratulations! You won!" << endl;
            break;
        } else if (guess < secretNumber) {
            cout << "Too low! Try again." << endl;
        } else {
            cout << "Too high! Try again." << endl;
        }
    }

    return 0;
}
```
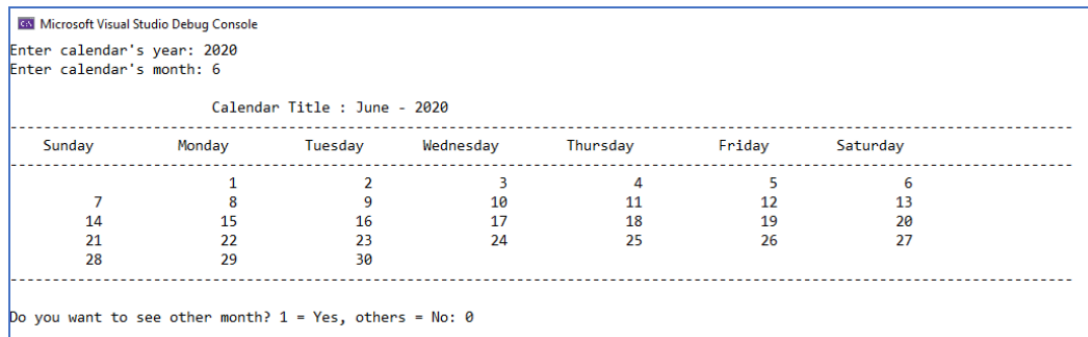
Output:

```
Guess Number Game Started Now!
Enter the maximum number for the range: 4
Guess Number between 1 to 4
Your answer: 2
Too low! Try again.
Your answer: 1
Too low! Try again.
Your answer: 3
Too low! Try again.
Your answer: 4
Congratulations! You won!
```

Submit your answer (*in doc / pdf*) to Moodle before 17 November 2023. Your answer should include your code and your program screenshot.

1. Create a calendar application by using C++. The output should be similar as below:

```
Microsoft Visual Studio Debug Console
Enter calendar's year: 2020
Enter calendar's month: 6

                    Calendar Title : June - 2020
---------------------------------------------------------------------------------
   Sunday      Monday      Tuesday    Wednesday    Thursday     Friday     Saturday
---------------------------------------------------------------------------------
                  1           2           3           4           5           6
     7            8           9          10          11          12          13
    14           15          16          17          18          19          20
    21           22          23          24          25          26          27
    28           29          30
---------------------------------------------------------------------------------

Do you want to see other month? 1 = Yes, others = No: 0
```

[Estimate Finish Time: 45 minutes]

Code:

```cpp
#include <iostream>
#include <iomanip>
using namespace std;

int main() {
    while (true) {
        int year, month;
        cout << "Enter calendar's year: ";
        cin >> year;
        cout << "Enter calendar's month (1-12): ";
        cin >> month;

        // Check for valid month input
        if (month < 1 || month > 12) {
            cout << "Invalid month! Please try again.\n";
            continue;
        }

        // Sakamoto's method
        // w = 0 means Sunday, 1 means Monday etc
        static int t[] = {0, 3, 3, 6, 1, 4, 6, 2, 5, 0, 3, 5};
        int y = year, m = month;
        if (m < 3) {
```

```cpp
        y--;
        m += 12;
    }
    // Calculate day of week for day = 1
    int w = (y + y/4 - y/100 + y/400 + t[m - 1] + 1) % 7;

    int days;
    switch (month) {
        case 2: // February
            if ((year % 400 == 0) || (year % 4 == 0 && year % 100 != 0))
                days = 29;
            else
                days = 28;
            break;
        case 4: case 6: case 9: case 11:
            days = 30;
            break;
        default:
            days = 31;
    }

    // Array
    string monthNames[] = {
        "January", "February", "March", "April", "May", "June",
        "July",    "August",   "September", "October", "November", "December"
    };

    // Title
    cout << "\nCalendar Title : " << monthNames[month - 1]
         << " " << year << "\n\n";

    // Header
    cout << " Sun  Mon  Tue  Wed  Thu  Fri  Sat\n";

    // First row spacing
    for (int i = 0; i < w; i++) {
        cout << "     ";  // 5 spaces
    }

    // Print all days of the month
    for (int d = 1; d <= days; d++) {
        // Print day with fixed width for alignment
        cout << setw(4) << d << " ";

        if (++w == 7) {
```

```
                w = 0;
                cout << "\n";
            }
        }
        cout << "\n\n";

        // Asking user
        cout << "Do you want to see another month? (1=Yes, 2=No): ";
        int choice;
        cin >> choice;
        if (choice != 1) {
            break;
        }
    }
    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\Data Str
Enter calendar's year: 2025
Enter calendar's month (1-12): 2

Calendar Title : February 2025

 Sun  Mon  Tue  Wed  Thu  Fri  Sat
                  1    2    3    4
  5    6    7    8    9   10   11
 12   13   14   15   16   17   18
 19   20   21   22   23   24   25
 26   27   28

Do you want to see another month? (1=Yes, 2=No): 2
```

2. Develop an interactive program that will keep track of the weather forecast in a month. On any given day, the weather forecast may be hot, rainy, or cloudy. Your program should input the weather forecast for each day in the month and should display the number of hot, rainy, and cloudy days in a month. You should use a loop and a conditional structure to develop this program. Array is not allowed to use in this question.

Code:

```cpp
#include <iostream>
#include <string>
using namespace std;

int main() {
    int totalDays;
    cout << "How many days in this month? ";
    cin >> totalDays;

    // Counters for each weather type
    int hotCount = 0;
    int rainyCount = 0;
    int cloudyCount = 0;

    // Loop
    for (int day = 1; day <= totalDays; day++) {
        string forecast;
        cout << "Day " << day << " forecast (hot/rainy/cloudy): ";
        cin >> forecast;

        if (forecast == "hot") {
            hotCount++;
        }
        else if (forecast == "rainy") {
            rainyCount++;
        }
        else if (forecast == "cloudy") {
            cloudyCount++;
        }
        else {
            cout << "Invalid input. Please enter hot, rainy, or cloudy.\n";
        }
    }

    // Results
    cout << "\nWeather Summary for the Month:\n";
```

```cpp
    cout << "Hot days   : " << hotCount << endl;
    cout << "Rainy days : " << rainyCount << endl;
    cout << "Cloudy days: " << cloudyCount << endl;

    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\
How many days in this month? 3
Day 1 forecast (hot/rainy/cloudy): hot
Day 2 forecast (hot/rainy/cloudy): hot
Day 3 forecast (hot/rainy/cloudy): rainy

Weather Summary for the Month:
Hot days   : 2
Rainy days : 1
Cloudy days: 0

C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\
```

3.

(*Financials: currency exchange*) Write a program that prompts the user to enter the exchange rate from currency in U.S. dollars to Chinese RMB. Prompt the user to enter **0** to convert from U.S. dollars to Chinese RMB and **1** to convert from Chinese RMB and U.S. dollars. Prompt the user to enter the amount in U.S. dollars or Chinese RMB to convert it to Chinese RMB or U.S. dollars, respectively. Here are the sample runs:

```
Enter the exchange rate from dollars to RMB: 6.81  ↵Enter
Enter 0 to convert dollars to RMB and 1 vice versa: 0  ↵Enter
Enter the dollar amount:  100  ↵Enter
$100.0 is 681.0 yuan
```

```
Enter the exchange rate from dollars to RMB: 6.81  ↵Enter
Enter 0 to convert dollars to RMB and 1 vice versa: 5  ↵Enter
Enter the RMB amount:  10000  ↵Enter
10000.0 yuan is $1468.43
```

[Estimate Finish Time: 15 minutes]

Code:

```cpp
#include <iostream>

using namespace std;

int main() {
    double rate;
    cout << "Exchange rate (dollar to RMB): ";
    cin >> rate;

    int type;
    cout << "Enter 0 to convert dollars to RMB, 1 for RMB to dollars: ";
    cin >> type;

    if (type == 0) {
        double dollars;
        cout << "Enter dollars: ";
        cin >> dollars;
        cout << dollars << " dollars is " << dollars * rate << " RMB\n";
    } else {
```
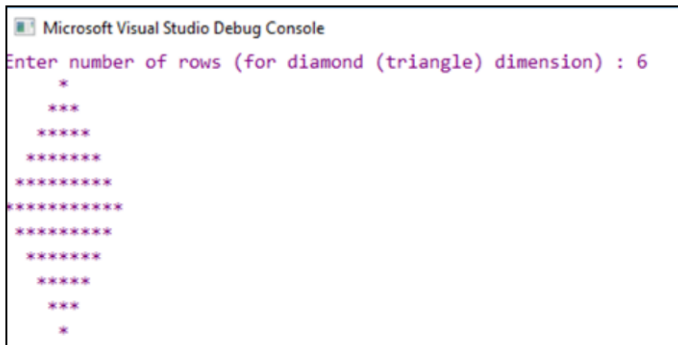
```
        double rmb;
        cout << "Enter RMB: ";
        cin >> rmb;
        cout << rmb << " RMB is " << rmb / rate << " dollars\n";
    }

    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\Data Structures\Tutc
Exchange rate (dollar to RMB): 20
Enter 0 to convert dollars to RMB, 1 for RMB to dollars: 0
Enter dollars: 20
20 dollars is 400 RMB
```

4. Write a C++ program ask to the user to enter number of rows for diamond dimension to print the diamond pattern, then display the result on the screen. Note: Must use loops to print the diamond.

```
Microsoft Visual Studio Debug Console
Enter number of rows (for diamond (triangle) dimension) : 6
    *
   ***
  *****
 *******
*********
***********
 *********
  *******
   *****
    ***
     *
```

[Estimate Finish Time: 30 minutes]

Code:

```cpp
#include <iostream>

using namespace std;

int main() {
    int n;
    cout << "Enter number of rows (for diamond dimension): ";
    cin >> n;

    // Upper Diamond
    for(int i = 1; i <= n; i++) {
        // Print spaces
        for(int space = 0; space < n - i; space++) {
            cout << " ";
        }
        // Stars
        for(int star = 0; star < (2 * i - 1); star++) {
            cout << "*";
        }
        cout << endl;
    }

    // Lower Diamond
    for(int i = n - 1; i >= 1; i--) {
        // Print spaces
        for(int space = 0; space < n - i; space++) {
            cout << " ";
        }
```

```cpp
        // Print stars
        for(int star = 0; star < (2 * i - 1); star++) {
            cout << "*";
        }
        cout << endl;
    }

    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\L
Enter number of rows (for diamond dimension): 4
     *
    ***
   *****
  *******
   *****
    ***
     *
```

5. Write a program that can print the even numbers that in the between of 1 to 50.

Output sample:

2	4	6	8	10
12	14	16	18	20
22	24	26	28	30
32	34	36	38	40
42	44	46	48	50

[Estimate Finish Time: 10 minutes]

Code:

```cpp
#include <iostream>
using namespace std;

int main() {
    int count = 0;
    for(int i = 2; i <= 50; i += 2) {
        cout << i << " ";
        count++;
        // Move to a new line after every 5 numbers
        if(count % 5 == 0) {
            cout << endl;
        }
    }
    return 0;
}
```

Output:

```
C:\Users\Sanji\Desktop\W
2 4 6 8 10
12 14 16 18 20
22 24 26 28 30
32 34 36 38 40
42 44 46 48 50
```

6. Write a program that determines a student's grade. The program will read three types of scores in percentage (quiz, mid-term, and final scores) and determine the grade based on the following rules:
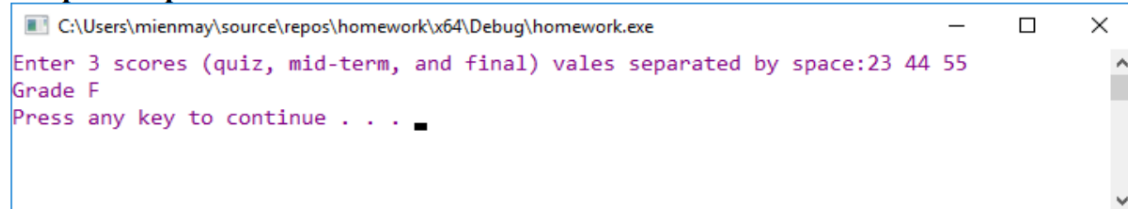
if the average score =90% =>grade=A
if the average score >= 70% and <90% => grade=B
if the average score>=50% and <70% =>grade=C
if the average score<50% =>grade=F

Output sample:

C:\Users\mienmay\source\repos\homework\x64\Debug\homework.exe   —   □   ✕

```
Enter 3 scores (quiz, mid-term, and final) vales separated by space:23 44 55
Grade F
Press any key to continue . . . ▪
```

[Estimate Finish Time: 15 minutes]

Code:

```cpp
#include <iostream>
using namespace std;

int main() {
    double quiz, midTerm, finalScore;

    cout << "Enter 3 scores (quiz, mid-term, and final) in percentage: ";
    cin >> quiz >> midTerm >> finalScore;

    double average = (quiz + midTerm + finalScore) / 3.0;

    cout << "Average score = " << average << endl;

    char grade;
    if (average >= 90) {
        grade = 'A';
    } else if (average >= 70) {
        grade = 'B';
    } else if (average >= 50) {
        grade = 'C';
    } else {
        grade = 'F';
    }

    cout << "Grade = " << grade << endl;
```

```
    return 0;
}
```

Output:

```
c:\Users\sanji\Desktop\work\university\y2\SEM 2\Data Structures\Tutorials
Enter 3 scores (quiz, mid-term, and final) in percentage: 20 60 90
Average score = 56.6667
Grade = C
```

7. The area of a rectangle is the rectangle's length times its width. Write a program that asks for the length and width of two rectangles. The program should tell the user which rectangle has the greater area, or if the areas are the same.

Output sample:

Rectangle A:
Width = 2
Height = 4

Rectangle B:
Width = 3
Height = 10

Area in rectangle B is bigger rectangle A.

[Estimate Finish Time: 15 minutes]

Code:

```cpp
#include <iostream>
using namespace std;

int main() {
    double lengthA, widthA, lengthB, widthB;

    cout << "Enter the length and width for rectangle A: ";
    cin >> lengthA >> widthA;

    cout << "Enter the length and width for rectangle B: ";
    cin >> lengthB >> widthB;

    double areaA = lengthA * widthA;
    double areaB = lengthB * widthB;

    cout << "Rectangle A: Width = " << lengthA << ", Height = " << widthA <<
endl;
    cout << "Rectangle B: Width = " << lengthB << ", Height = " << widthB <<
endl;

    if(areaA > areaB) {
        cout << "Area in rectangle A is bigger than rectangle B." << endl;
    }
    else if(areaA < areaB) {
        cout << "Area in rectangle B is bigger than rectangle A." << endl;
    }
    else {
```

```
        cout << "Both rectangles have the same area." << endl;
    }

    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\work\University\Y2\SEM 2\Da
Enter the length and width for rectangle A: 40
10
Enter the length and width for rectangle B: 30
13
Rectangle A: Width = 40, Height = 10
Rectangle B: Width = 30, Height = 13
Area in rectangle A is bigger than rectangle B.
```

8. Compute the total cost of a meal inclusive of GST (Goods and Service Tax) and tipping. Assume that the GST is fixed at 6% but the amount to tip will depend on the customer. Your program should input the cost of the meal (before GST and tipping) and the tip amount (to be input as a percentage).

Your program should display:

The total cost of the meal BEFORE GST and tipping
The total cost of the meal AFTER GST
The total cost of the meal AFTER GST and tipping

Code:

```cpp
#include <iostream>
using namespace std;

int main() {
    double mealCost, tipPercent;

    cout << "Enter the cost of the meal (before GST and tipping): ";
    cin >> mealCost;

    cout << "Enter the tip percentage: ";
    cin >> tipPercent;

    double costAfterGST = mealCost * 1.06;
    double totalCost = costAfterGST + (costAfterGST * tipPercent / 100.0);

    cout << "\nThe total cost of the meal BEFORE GST and tipping: " << mealCost
<< endl;
    cout << "The total cost of the meal AFTER GST: " << costAfterGST << endl;
    cout << "The total cost of the meal AFTER GST and tipping: " << totalCost <<
endl;

    return 0;
}
```

Output:

```
C:\Users\sanji\Desktop\Work\University\Y2\SEM 2\Data Struct
Enter the cost of the meal (before GST and tipping): 26.50
Enter the tip percentage: 30

The total cost of the meal BEFORE GST and tipping: 26.5
The total cost of the meal AFTER GST: 28.09
The total cost of the meal AFTER GST and tipping: 36.517
```