2025

Assignment

WEEK 1

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Part 1

Q1

```cpp
#include <iostream>
#include <iomanip>
#include <string>

using namespace std;

int main() {
    // Define items and prices
    string items[5] = { "Tomatoes", "Potatoes", "Onions", "Carrots", "Spinach"
};
    double prices[5] = { 200, 180, 260, 190, 110 }; // per kg
    double quantities[5];  //kg
    double total = 0.0;

    // Get quantities from the user
    cout << "Enter the quantity (in kg) for each item:\n";
    for (int i = 0; i < 5; i++) {
        cout << items[i] << " (Rs " << prices[i] << "/kg): ";
        cin >> quantities[i];
        total += prices[i] * quantities[i];
    }

    // Print the bill
    cout << "\n========== BILL ==========\n";
    cout << setw(15) << left << "Item"
        << setw(10) << "Price"
        << setw(10) << "Quantity"
        << setw(10) << "Total" << endl;

    cout << setprecision(2) << fixed;
    for (int i = 0; i < 5; i++) {
        cout << setw(15) << left << items[i]
            << setw(10) << prices[i]
            << setw(10) << quantities[i]
            << setw(10) << prices[i] * quantities[i] << endl;
    }

    cout << "==========================\n";
    cout << setw(35) << "Grand Total: Rs" << total << endl;

    return 0;
}
```

Output

```
Enter the quantity (in kg) for each item:
Tomatoes (Rs 200/kg): 1
Potatoes (Rs 180/kg): 2.5
Onions (Rs 260/kg): 1.3
Carrots (Rs 190/kg): 2.2
Spinach (Rs 110/kg): 0

========== BILL ==========
Item            Price     Quantity  Total
Tomatoes        200.00    1.00      200.00
Potatoes        180.00    2.50      450.00
Onions          260.00    1.30      338.00
Carrots         190.00    2.20      418.00
Spinach         110.00    0.00      0.00
==========================
Grand Total: Rs                     1406.00
```

Q2

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

int main() {
    int marks;
    char grade;

    cout << "Enter the marks obtained (0-100): ";
    cin >> marks;

    // Determine the grade based on marks using switch
    switch (marks / 10) {
    case 10:
    case 9:
        grade = 'S';
        break;
    case 8:
        grade = 'A';
        break;
    case 7:
        grade = 'B';
        break;
    case 6:
        grade = 'C';
        break;
    case 5:
        grade = 'D';
        break;
    case 4:
        grade = 'E';
```

```
        break;
    default:
        grade = 'F';
    }

    cout << "The grade is: " << grade << endl;

    return 0;
}
```

Output

```
Enter the marks obtained (0-100): 33
The grade is: F
```

Q3

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


double add(const vector<double>& operands);
double subtract(const vector<double>& operands);
double multiply(const vector<double>& operands);
double divide(const vector<double>& operands);

int main() {
    int numOperands;
    char operation;
    vector<double> operands;

    cout << "Enter the operation you want to perform (+, -, *, /): ";
    cin >> operation;

    // Validate operation
    while (operation != '+' && operation != '-' && operation != '*' &&
operation != '/') {
        cout << "Invalid operation. Try again\n";
    }

    cout << "How many operands do you want to use? ";
    cin >> numOperands;

    if (numOperands < 2) {
        cout << "You need at least two operands to perform an operation.\n";
        return 1;
    }
```

```
    cout << "Enter the operands:\n";
    for (int i = 0; i < numOperands; ++i) {
        double value;
        cin >> value;
        operands.push_back(value);
    }

    double result;
    switch (operation) {
    case '+':
        result = add(operands);
        break;
    case '-':
        result = subtract(operands);
        break;
    case '*':
        result = multiply(operands);
        break;
    case '/':
        result = divide(operands);
        break;
    default:
        cout << "Unexpected error.\n";
        return 1;
    }

    cout << "The result is: " << result << endl;
    return 0;
}


double add(const vector<double>& operands) {
    double sum = 0;
    for (double op : operands) {
        sum += op;
    }
    return sum;
}

double subtract(const vector<double>& operands) {
    double result = operands[0];
    for (size_t i = 1; i < operands.size(); ++i) {
        result -= operands[i];
    }
    return result;
}

double multiply(const vector<double>& operands) {
```

```
    double product = 1;
    for (double op : operands) {
        product *= op;
    }
    return product;
}

double divide(const vector<double>& operands) {
    double result = operands[0];
    for (size_t i = 1; i < operands.size(); ++i) {
        if (operands[i] == 0) {
            cout << "Error: Division by zero detected.\n";
            exit(1);
        }
        result /= operands[i];
    }
    return result;
}
```

Output

```
Enter the operation you want to perform (+, -, *, /): +
How many operands do you want to use? 5
Enter the operands:
1 2 3 4 5
The result is: 15
```

Q4

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

int main() {
    int matrix[3][3]{};

    cout << "Enter 9 integers for the 3x3 matrix:\n";

    // Input data into the matrix using nested for loops
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 3; j++) {
            cout << "Enter element [" << i << "][" << j << "]: ";
            cin >> matrix[i][j];
        }
    }

    // Output the 3x3 matrix
    cout << "\nThe 3x3 matrix is:\n";
```

```
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 3; j++) {
            cout << setw(5) << left << matrix[i][j] << " ";
        }
        cout << endl;
    }

    return 0;
}
```

Output

```
Enter 9 integers for the 3x3 matrix:
Enter element [0][0]: 1
Enter element [0][1]: 22
Enter element [0][2]: 333
Enter element [1][0]: 4
Enter element [1][1]: 5
Enter element [1][2]: 6
Enter element [2][0]: 77
Enter element [2][1]: 89
Enter element [2][2]: 564

The 3x3 matrix is:
1     22    333
4     5     6
77    89    564
```

Q5

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

int main() {
    int rows = 6;

    for (int i = 1; i <= rows; i++) {
        for (int j = 1; j <= i; j++) {
            cout << "*";
        }
        cout << endl;
    }

    return 0;
}
```

Output

Q6

```cpp
// This program creates a 6x7 matrix and stores the calender in it, then it prints it out.

#include <iostream>
#include <iomanip>
#include <vector>
#include <string>

int main()
{
    // Initialize a 6x7 matrix to represent the calendar (6 weeks, 7 days each)
    std::vector<std::vector<int>> calendar(6, std::vector<int>(7, 0));

    // August 2014 starts on a Friday
    int start_day = 5; // 0 for Sunday, so Friday is 5
    int days_in_month = 31;

    int day = 1; // Start from the 1st of August

    // Fill the calendar with the days of August 2014
    for (int index = start_day; index < start_day + days_in_month; ++index)
    {
        int week = index / 7;
        int day_of_week = index % 7;
        calendar[week][day_of_week] = day;
        ++day;
    }

    // Weekday labels
    std::vector<std::string> weekdays = {"Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"};

    // Print the calendar
    std::cout << "Calendar of August 2014:" << std::endl;
```

```
    for (const auto &weekday : weekdays)
    {
        std::cout << weekday << "\t";
    }
    std::cout << std::endl;

    for (const auto &row : calendar)
    {
        for (const auto &col : row)
        {
            if (col != 0)
            {
                std::cout << std::setw(3) << col << "\t";
            }
            else
            {
                std::cout << "   \t";
            }
        }
        std::cout << std::endl;
    }

    return 0;
}
```

Output

```
Calendar of August 2014:
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      29      30
 31
```

Q7

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

int main()
{
    int number;

    // Input the 6-digit number
```

```
    cout << "Enter a 6-digit number: ";
    cin >> number;

    // Check if the number is a 6-digit number
    if (number < 100000 || number > 999999)
    {
        cout << "The number entered is not a 6-digit number." << endl;
        return 1;
    }

    int reversedNumber = 0, sumOfDigits = 0;
    int originalNumber = number;

    // Reverse the number and calculate the sum of its digits
    while (number > 0)
    {
        int digit = number % 10;
        reversedNumber = reversedNumber * 10 + digit;
        sumOfDigits += digit;
        number /= 10;
    }

    // Output the results
    cout << "Reversed Number: " << reversedNumber << endl;
    cout << "Sum of Digits: " << sumOfDigits << endl;

    return 0;
}
```

Output

```
Enter a 6-digit number: 654321
Reversed Number: 123456
Sum of Digits: 21
```

Set 2

Q1

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

long factorial(int number);
long pow(int base, int exponent);
static double SumofSequence(int x, int count);
```

```
int main()
{
    cout << "Enter a number \n";
    int number = 0;
    int count = 0;
    cin >> number;
    cout << "Enter number of terms for the sequence\n";
    cin >> count;
    cout << "sum" << SumofSequence(number, count) << "\n";
    return 0;
}

static double SumofSequence(int x, int count)
{
    double sum = x;
    count = count * 2 - 1;
    bool plusOrMinus = true;

    for (int i = 3; i <= count; i += 2)
    {
        if (plusOrMinus)
        {
            sum += static_cast<double>(pow(x, i)) / factorial(i - 1);
        }
        else
        {
            sum -= static_cast<double>(pow(x, i)) / factorial(i - 1);
        }

        plusOrMinus = !plusOrMinus;
    }
    return sum;
}

long pow(int base, int exponent)
{
    // returns the power of a number
    long result = 1;
    for (int i = 0; i < exponent; i++)
    {
        result *= base;
    }
    return result;
}

long factorial(int number)
{
```

```
    // returns the factorial of a number
    long result = 1;
    for (int i = 1; i <= number; i++)
    {
        result *= i;
    }
    return result;
}
```

Output

```
Enter a number
5
Enter number of terms for the sequence
10
sum9.9159
```

Q2

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

char *CreateExpression(int line, int pos);

int main()
{
    for (int i = 1; i < 6; i++)
    {
        static char line[30];

        int offset = 15 - 3 * i;
        for (int j = 0; j < offset; j++)
        {
            line[j] = ' ';
        }

        for (int j = 0; j < i; j++)
        {
            char *expression = CreateExpression(i, j + 1);
            for (int k = 0; k < 5; k++)
            {
                line[j * 6 + k + offset] = expression[k];
            }
            line[j * 6 + 5 + offset] = ' ';
        }
        line[6 * i - 1 + offset] = '\0';
        cout << line;
        cout << "\n";
```

```
    }

    return 0;
}

char *CreateExpression(int line, int pos)
{
    char expression[5] = {'x', '^', line + '0', '+', pos + '0'};

    return expression;
}
```

Output

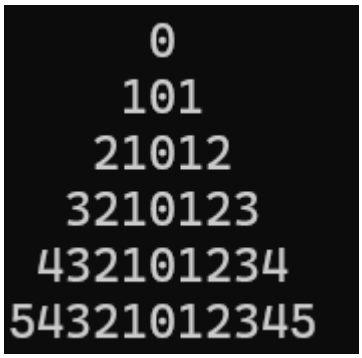
```
            x^1+1
         x^2+1 x^2+2
      x^3+1 x^3+2 x^3+3
   x^4+1 x^4+2 x^4+3 x^4+4
x^5+1 x^5+2 x^5+3 x^5+4 x^5+5
```

Q3

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

int numUpto = 5;
void MakePattern(char *pattern, int line);
void align(char *pattern, int line);

int main()
{

    for (int i = 0; i <= numUpto; i++)
    {
        char *pattern = new char[numUpto + i + 2];

        align(pattern, i);
        MakePattern(pattern, i);
        pattern[numUpto + i + 1] = '\0';

        cout << pattern << endl;

        delete[] pattern;
    }

    return 0;
}
```

```
void MakePattern(char *pattern, int line)
{
    for (int i = 0; i <= line; i++)
    {
        pattern[numUpto + i] = '0' + i;
        pattern[numUpto - i] = '0' + i;
    }
}

void align(char *pattern, int line)
{
    for (int i = 0; i < numUpto - line; i++)
    {
        pattern[i] = ' ';
    }
}
```

Output



Q4

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

int main()
{
    char num1[7];
    char num2[7];
    char num3[7];

    char num1rev[7] = "000000";
    char num2rev[7] = "000000";
    char num3rev[7] = "000000";

    cout << "Enter first number: ";
    cin >> num1;
    cout << "Enter second number: ";
```

```
    cin >> num2;
    cout << "Enter third number: ";
    cin >> num3;

    // Reverse the numbers
    for (int i = 0; i < 6; i++)
    {
        num1rev[i] = num1[5 - i];
        num2rev[i] = num2[5 - i];
        num3rev[i] = num3[5 - i];
    }

    // Convert the numbers to integers
    int num1Int = atoi(num1rev);
    int num2Int = atoi(num2rev);
    int num3Int = atoi(num3rev);

    // Print the reversed numbers
    cout << "Reversed first number: ";
    cout << num1rev << endl;
    cout << "Reversed second number: ";
    cout << num2rev << endl;
    cout << "Reversed third number: ";
    cout << num3rev << endl;

    // Finding the largest of the reversed

    int largest = num1Int;
    if (num2Int > largest)
        largest = num2Int;
    if (num3Int > largest)
        largest = num3Int;
    cout << "Largest number among the reversed numbers: " << largest << endl;

    return 0;
}
```

Output

```
Enter first number: 123456
Enter second number: 654321
Enter third number: 987654
Reversed first number: 654321
Reversed second number: 123456
Reversed third number: 456789
Largest number among the reversed numbers: 654321
```

Q5

```
#include <iostream>

void generateFibonacci(int *fibArray, int n)
{
    if (n <= 0)
        return;

    if (n >= 1)
        fibArray[0] = 0;
    if (n >= 2)
        fibArray[1] = 1;

    for (int i = 2; i < n; ++i)
    {
        fibArray[i] = fibArray[i - 1] + fibArray[i - 2];
    }
}

static unsigned long factorial(int n)
{
    unsigned long result = 1;
    for (int i = 1; i <= n; i++)
    {
        result *= i;
    }
    return result;
}

int main()
{
    int n;
    std::cout << "Enter the number of Fibonacci numbers to generate: ";
    std::cin >> n;

    if (n <= 0)
    {
        std::cout << "Invalid input. Please enter a positive integer." <<
std::endl;
        return 1;
    }

    int *fibArray = new int[n];
    generateFibonacci(fibArray, n);

    std::cout << "Num\tFact\n";
    for (int i = 0; i < n; ++i)
    {
```

```
        std::cout << fibArray[i] << "\t" << factorial(fibArray[i]) << "\n";
    }
    std::cout << std::endl;

    delete[] fibArray;

    return 0;
}
```

Output

```
Enter the number of Fibonacci numbers to generate: 8
Num     Fact
0       1
1       1
1       1
2       2
3       6
5       120
8       40320
13      1932053504
```

Q6

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

int main()
{
    char string[1000];
    int stringLength = 0;

    cout << "Enter a string: ";
    cin >> string;

    for (stringLength = 0; string[stringLength] != '\0'; stringLength++)
    {
        continue;
    }

    bool *isVowel = new bool[stringLength];
    bool *isNotChar = new bool[stringLength];

    for (int i = 0; i < stringLength; i++)
    {
        if (string[i] == 'a' || string[i] == 'e' || string[i] == 'i' ||
string[i] == 'o' || string[i] == 'u')
```

```
        {
            isVowel[i] = true;
        }
        else
        {
            isVowel[i] = false;
        }

        if ((string[i] >= 'A' && string[i] <= 'Z') || (string[i] >= 'a' &&
string[i] <= 'z'))
        {
            isNotChar[i] = false;
        }
        else
        {
            isNotChar[i] = true;
        }
    }

    cout << "Vowels are at positions: ";
    for (int i = 0; i < stringLength; i++)
    {
        if (isVowel[i] == true)
        {
            cout << i + 1 << ", ";
        }
    }

    cout << "\nNon-Characters are at positions: ";
    for (int i = 0; i < stringLength; i++)
    {
        if (isNotChar[i] == true)
        {
            cout << i + 1 << ", ";
        }
    }

    int firstVowel = -1;

    for (int i = 0; i < stringLength; i++)
    {
        if (isVowel[i] == true)
        {
            firstVowel = i + 1;
            break;
        }
    }
    cout << "\nfirst vowel is at position: " << firstVowel;
```

```
    return 0;
}
```

Output

```
Enter a string: Write a program to find the number of occurrence of vowels
 and non-alphabetic characters in a sentence entered by the user. Also the
 find the first occurrence of vowel.
Vowels are at positions: 3, 5,
Non-Characters are at positions:
first vowel is at position: 3
```

Q7

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

void removeConsecutiveCharacters(const char *input, char *output, int
&originalCount, int &processedCount)
{
    originalCount = strlen(input);
    int j = 0;

    for (int i = 0; i < originalCount; ++i)
    {
        if (i == 0 || input[i] != input[i - 1])
        {
            output[j++] = input[i];
        }
    }

    output[j] = '\0';
    processedCount = j;
}

int main()
{
    char input[1000];
    char output[1000];

    cout << "Enter a string: ";
    cin.getline(input, 1000);

    int originalCount = 0;
    int processedCount = 0;

    removeConsecutiveCharacters(input, output, originalCount, processedCount);
```

```
    cout << "Original string: " << input << endl;
    cout << "Original character count: " << originalCount << endl;
    cout << "Processed string: " << output << endl;
    cout << "Processed character count: " << processedCount << endl;

    return 0;
}
```

Output

```
Enter a string: aabbbccccdddeee
Original string: aabbbccccdddeee
Original character count: 15
Processed string: abcde
Processed character count: 5
```