LAB 1 DATA STRUCTURE TP078396

PART A

1)

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

int main() {
    string name, gender, address;
    int age;
    double eWallet;

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

    cout << "Enter Student Gender: ";
    cin >> gender;

    cout << "Enter Student Age: ";
    cin >> age;

    cin.ignore();

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

    cout << "Enter E-wallet Amount (RM): ";
    cin >> eWallet;

    cout << "\nStudent Details:" << endl;
    cout << "---------------------------" << endl;
    cout << "Student Name         : " << name << endl;
    cout << "Student Gender       : " << gender << endl;
    cout << "Student Age          : " << age << endl;
    cout << "Student Home Address : " << address << endl;
    cout << "E-wallet Amount      : RM " << fixed << setprecision(2) << eWallet << endl;
    cout << "\n";

    cout << "Student details as below:" << endl;
    cout << "================================================================================" << endl;
    cout << "| Name          | Age | Gender  | Address              | E-wallet Amount    |" << endl;
    cout << "================================================================================" << endl;
    cout << "| " << setw(12) << left << name
         << " | " << setw(3) << age
         << " | " << setw(7) << gender
         << " | " << setw(20) << address
         << " | RM " << setw(10) << fixed << setprecision(2) << eWallet << " |" << endl;
    cout << "================================================================================" << endl;

    return 0;
}
```

```
C:\Users\HP\OneDrive\Desktop\Data Structures\LAB1>a.exe
Enter Student Name: taneshen
Enter Student Gender: male
Enter Student Age: 20
Enter Student Home Address: seremban
Enter E-wallet Amount (RM): 100

Student Details:
---------------------------
Student Name         : taneshen
Student Gender       : male
Student Age          : 20
Student Home Address : seremban
E-wallet Amount      : RM 100.00

Student details as below:
================================================================================
| Name          | Age | Gender  | Address              | E-wallet Amount    |
================================================================================
| taneshen      | 20  | male    | seremban             | RM 100.00          |
================================================================================
```

2)

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

int main() {
    string name, gender, address;
    int age;
    double eWallet;

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

    cout << "Enter Student Gender: ";
    cin >> gender;

    cout << "Enter Student Age: ";
    cin >> age;

    cin.ignore();

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

    cout << "Enter E-wallet Amount (RM): ";
    cin >> eWallet;

    cout << "\nStudent Name         : " << name << endl;
    cout << "Student Gender       : " << gender << endl;
    cout << "Student Age          : " << age << endl;
    cout << "Student Home Address : " << address << endl;
    cout << "E-wallet Amount      : RM " << fixed << setprecision(2) << eWallet << endl;

    cout << "\n-----------------------------------------------------" << endl;
    cout << "| Student Details as below:                         |" << endl;
    cout << "-----------------------------------------------------" << endl;
    cout << "| Name      : " << setw(20) << right << name << " |" << endl;
    cout << "| Age       : " << setw(20) << right << age << " |" << endl;
    cout << "| Gender    : " << setw(20) << right << gender << " |" << endl;
    cout << "| Address   : " << setw(20) << right << address << " |" << endl;
    cout << "| E-Wallet  : RM " << setw(17) << right << fixed << setprecision(2) << eWallet << " |" << endl;
    cout << "-----------------------------------------------------" << endl;

    return 0;
}
```

```
Enter Student Name: taneshen
Enter Student Gender: male
Enter Student Age: 20
Enter Student Home Address: seremban
Enter E-wallet Amount (RM): 121.34

Student Name         : taneshen
Student Gender       : male
Student Age          : 20
Student Home Address : seremban
E-wallet Amount      : RM 121.34

-----------------------------------------------------
| Student Details as below:                         |
-----------------------------------------------------
| Name      :              taneshen |
| Age       :                    20 |
| Gender    :                  male |
| Address   :              seremban |
| E-Wallet  : RM             121.34 |
-----------------------------------------------------
```

PART B

1)

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

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;

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

        stringstream ssInput(input);
        if (ssInput >> hh >> mm >> ss && isValidTime(hh, mm, ss)) {
            break;
        } else {
            cout << "Invalid input!\n";
        }
    }

    int elapsedSeconds = (hh * 3600) + (mm * 60) + ss;

    cout << "Elapsed time in seconds = " << elapsedSeconds << " seconds\n";

    return 0;
}
```

```
Please enter your elapsed time (in HH:MM:SS format) = 23:22:21
Elapsed time in seconds = 84141 seconds
```

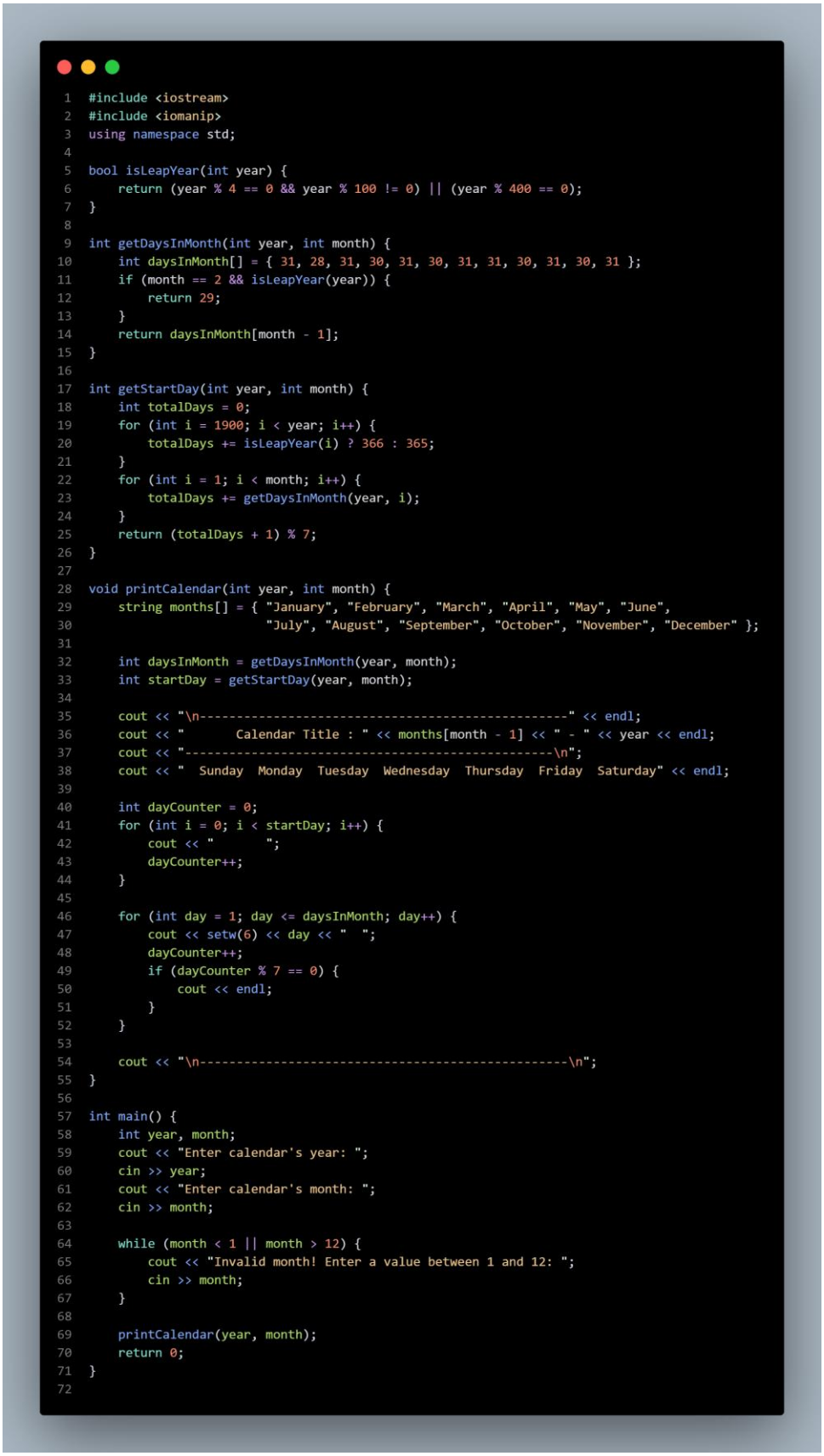
2)

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

using namespace std;

int main() {
    srand(time(0));

    int lower, upper, secretNumber, guess;

    cout << "=======================================\n";
    cout << "           Guess Number Game    \n";
    cout << "=======================================\n";
    cout << "Enter the lower bound: ";
    cin >> lower;
    cout << "Enter the upper bound: ";
    cin >> upper;

    while (lower >= upper) {
        //error handling
        cout << "Invalid range! Lower bound must be less than upper bound.\n";
        cout << "Enter the lower bound: ";
        cin >> lower;
        cout << "Enter the upper bound: ";
        cin >> upper;
    }

    secretNumber = lower + rand() % (upper - lower + 1);
    cout << "Guess Number between " << lower << " to " << upper << endl;

    do {
        cout << "Your answer: ";
        cin >> guess;

        if (guess > secretNumber) {
            cout << "Too high! Try again.\n";
        } else if (guess < secretNumber) {
            cout << "Too low! Try again.\n";
        }
    } while (guess != secretNumber);

    cout << "Congratulations! You won!\n";

    return 0;
}
```

```
=======================================
   Guess Number Game
=======================================
Enter the lower bound: 5
Enter the upper bound: 20
Guess Number between 5 to 20
Your answer: 5
Too low! Try again.
Your answer: 78
Too high! Try again.
Your answer: 8
Too high! Try again.
Your answer: 6
Congratulations! You won!
```

PART C

1)



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

bool isLeapYear(int year) {
    return (year % 4 == 0 && year % 100 != 0) || (year % 400 == 0);
}

int getDaysInMonth(int year, int month) {
    int daysInMonth[] = { 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31 };
    if (month == 2 && isLeapYear(year)) {
        return 29;
    }
    return daysInMonth[month - 1];
}

int getStartDay(int year, int month) {
    int totalDays = 0;
    for (int i = 1900; i < year; i++) {
        totalDays += isLeapYear(i) ? 366 : 365;
    }
    for (int i = 1; i < month; i++) {
        totalDays += getDaysInMonth(year, i);
    }
    return (totalDays + 1) % 7;
}

void printCalendar(int year, int month) {
    string months[] = { "January", "February", "March", "April", "May", "June",
                        "July", "August", "September", "October", "November", "December" };

    int daysInMonth = getDaysInMonth(year, month);
    int startDay = getStartDay(year, month);

    cout << "\n-------------------------------------------------" << endl;
    cout << "       Calendar Title : " << months[month - 1] << " - " << year << endl;
    cout << "-------------------------------------------------\n";
    cout << "  Sunday  Monday  Tuesday  Wednesday  Thursday  Friday  Saturday" << endl;

    int dayCounter = 0;
    for (int i = 0; i < startDay; i++) {
        cout << "        ";
        dayCounter++;
    }

    for (int day = 1; day <= daysInMonth; day++) {
        cout << setw(6) << day << "  ";
        dayCounter++;
        if (dayCounter % 7 == 0) {
            cout << endl;
        }
    }

    cout << "\n-------------------------------------------------\n";
}

int main() {
    int year, month;
    cout << "Enter calendar's year: ";
    cin >> year;
    cout << "Enter calendar's month: ";
    cin >> month;

    while (month < 1 || month > 12) {
        cout << "Invalid month! Enter a value between 1 and 12: ";
        cin >> month;
    }

    printCalendar(year, month);
    return 0;
}
```

```
Enter calendar's year: 2023
Enter calendar's month: 3

-----------------------------------------------
       Calendar Title : March - 2023
-----------------------------------------------
  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      31
-----------------------------------------------
```

2)

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

int main() {
    string month;
    int days, hotDays = 0, rainyDays = 0, cloudyDays = 0;
    char weather;

    cout << "Enter Your Month (e.g. August 2019): ";
    getline(cin, month);

    cout << "Enter number of days this month: ";
    cin >> days;

    for (int i = 1; i <= days; i++) {
        cout << "Day " << i << " : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: ";
        cin >> weather;

        while (weather != 'H' && weather != 'R' && weather != 'C' && weather != 'h' && weather != 'r' && weather != 'c') {
            cout << "Invalid input! Please enter 'H' for Hot, 'R' for Rainy, or 'C' for Cloudy: ";
            cin >> weather;
        }

        if (weather == 'H' || weather == 'h') {
            hotDays++;
        } else if (weather == 'R' || weather == 'r') {
            rainyDays++;
        } else if (weather == 'C' || weather == 'c') {
            cloudyDays++;
        }
    }

    cout << "\nNumber of hot days this month: " << hotDays << endl;
    cout << "Number of rainy days this month: " << rainyDays << endl;
    cout << "Number of cloudy days this month: " << cloudyDays << endl;

    return 0;
}
```

```
Enter Your Month (e.g. August 2019): January 2022
Enter number of days this month: 31
Day 1 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: h
Day 2 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: h
Day 3 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: y
Invalid input! Please enter 'H' for Hot, 'R' for Rainy, or 'C' for Cloudy: r
```

```
Day 24 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: c
Day 25 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: c
Day 26 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: c
Day 27 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: c
Day 28 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: c
Day 29 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: c
Day 30 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: r
Day 31 : Enter 'H' for Hot, 'R' for Rainy, 'C' for Cloudy: h

Number of hot days this month: 8
Number of rainy days this month: 10
Number of cloudy days this month: 13
```

3)

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

int main() {
    double exchangeRate, amount, result;
    int choice;

    cout << "Enter the exchange rate from dollars to RMB: ";
    cin >> exchangeRate;

    cout << "Enter 0 to convert dollars to RMB and 1 to convert RMB to dollars: ";
    cin >> choice;

    if (choice == 0) {
        cout << "Enter the dollar amount: ";
        cin >> amount;
        result = amount * exchangeRate;
        cout << "$" << amount << " is " << result << " yuan" << endl;
    }
    else if (choice == 1) {
        cout << "Enter the RMB amount: ";
        cin >> amount;
        result = amount / exchangeRate;
        cout << amount << " yuan is $" << result << endl;
    }
    else {
        cout << "Invalid choice! Please enter 0 or 1." << endl;
    }

    return 0;
}

```

```
Enter the exchange rate from dollars to RMB: 7.26
Enter 0 to convert dollars to RMB and 1 to convert RMB to dollars: 1
Enter the RMB amount: 200
200 yuan is $27.5482
```

4)

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

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

    //upper part of the diamond
    for (int i = 1; i <= n; i += 2) {
        for (int j = 0; j < (n - i) / 2; j++)
            cout << " ";
        for (int j = 0; j < i; j++)
            cout << "*";
        cout << endl;
    }

    //lower part of the diamond
    for (int i = n - 2; i > 0; i -= 2) {
        for (int j = 0; j < (n - i) / 2; j++)
            cout << " ";
        for (int j = 0; j < i; j++)
            cout << "*";
        cout << endl;
    }

    return 0;
}
```

```
Enter number of rows (for diamond dimension): 10
     *
    ***
   *****
  *******
*********
 *********
  *******
   *****
    ***
     *
```

5)

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

int main() {
    for (int i = 2; i <= 50; i += 2) {
        cout << i << "\t";
        if (i % 10 == 0)
            cout << endl;
    }
    return 0;
}
```

```
C:\Users\HP\OneDrive\Desktop\Data Structures\LAB1>a.exe
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)

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

int main() {
    double quiz, midterm, finalExam, average;

    cout << "Enter 3 scores (quiz, mid-term, and final) separated by space: ";
    cin >> quiz >> midterm >> finalExam;

    average = (quiz + midterm + finalExam) / 3.0;

    cout << "Grade ";
    if (average >= 90)
        cout << "A" << endl;
    else if (average >= 70)
        cout << "B" << endl;
    else if (average >= 50)
        cout << "C" << endl;
    else
        cout << "F" << endl;

    return 0;
}
```

```
C:\Users\HP\OneDrive\Desktop\Data Structures\LAB1>a.exe
Enter 3 scores (quiz, mid-term, and final) separated by space: 20 40 67
Grade F
```

7)

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

int main() {
    double widthA, heightA, widthB, heightB, areaA, areaB;

    cout << "Rectangle A:\n";
    cout << "Width = ";
    cin >> widthA;
    cout << "Height = ";
    cin >> heightA;

    cout << "\nRectangle B:\n";
    cout << "Width = ";
    cin >> widthB;
    cout << "Height = ";
    cin >> heightB;

    areaA = widthA * heightA;
    areaB = widthB * heightB;

    cout << "\n";
    if (areaA > areaB)
        cout << "Area in rectangle A is bigger than rectangle B.\n";
    else if (areaB > areaA)
        cout << "Area in rectangle B is bigger than rectangle A.\n";
    else
        cout << "Both rectangles have the same area.\n";

    return 0;
}
```

```
Rectangle A:
Width = 10
Height = 14

Rectangle B:
Width = 13
Height = 17

Area in rectangle B is bigger than rectangle A.
```

8)

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

int main() {
    double mealCost, gst, tipPercent, totalAfterGST, totalAfterGSTAndTip;

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

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

    gst = mealCost * 0.06;
    totalAfterGST = mealCost + gst;
    totalAfterGSTAndTip = totalAfterGST + (totalAfterGST * (tipPercent / 100));

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

    return 0;
}
```

```
C:\Users\HP\OneDrive\Desktop\Data Structures\LAB1>a.exe
Enter the cost of the meal (before GST and tipping): 27
Enter the tip percentage: 10

The total cost of the meal BEFORE GST and tipping: $27
The total cost of the meal AFTER GST: $28.62
The total cost of the meal AFTER GST and tipping: $31.482
```