Overloading Operators

1. **Write a program contains a class Data that has data members: A[20] (double), B[20] (double), n (number of elements of A and B). This class contains the following:**
   - i. **Operator: >> (only A) ,**
   - ii. **Function to set the elements of data member B, such that each B_i is equal to $\sum_{j=1}^{i+1} A_i^j$.**
   - iii. **Function to return the sum of elements of B.**
   - iv. **Operators: << (only A), [ ] (only B).**
   - v. **< (only A) , ==(only sum of elements of B)**

This class contains the following:
   - i. **Friend function to compare two objects and return min object (use operator <).**
   - ii. **Friend function to compare two objects and display a message if these objects are equal or not (use operator ==).**

In main function, define several objects and apply all functions on them.

Composition (Containership)

Write a program contains a class Data that has:
   - i. **Data members: name (string), age (float), ID(int), salary[5](float), tax[5](float).**
   - ii. **The operators >> and <<.**

It contains a class Employees that has:
   - i. **Data members: P[20] (Data), Ntax[20](float), n(number of elements of P and Ntax).**
   - ii. **A function to read data members, and set the elements of Ntax (each element in Ntax is the net salary for each P_i).**
   - iii. **A function to display data members in tabular form.**
   - iv. **A function to compare between all net salaries for all employees in one object and return the max value.**
   - v. **operator > (compare between the max net salary)**
   - vi. **Friend function compares between the max net salaries for two objects and display the data for the max object.**

In main function, define to objects of Employee and apply all functions on them.

Inheritance (Single Inheritance)

Write a program contains a class Level that has:
- **i.** Data members: Course [5] (string), Dg [5] (float), Credit[5] (int).
- **ii.** A function to read data members.
- **iii.** A function <u>Display ()</u> to display data members in tabular form.

It contains a class Student which is a subclass from Level that has:
- **i.** Data member: name (string), ID(int), total_d(float), total_c(int), GPA(char).
- **ii.** A function to read data members, set the value of total_d which is the sum of Dg elements, total_c which is the sum of Credit elements, and set the value of GPA according to the following:

GPA	Average of degree %
A	≥ 90
B+	85:<90
B	80:<85
C+	75:<80
C	65:<70
D	60:<65
F	<60

- **iii.** A function <u>Display ()</u> to display data members in one line.

  In main function, define an array of Student class with length n, read and write the elements of this array in suitable form for each object.

(Multiple Inheritance)

Write a program contains a class Data1 that has:
- **i.** Data members: ND1 (string), D1 [20] (int), n (number of elements).
- **ii.** A function to read data members.
- **iii.** A function <u>Total()</u> to return the following sum:
  $$\sum_{j=1}^{i+1} D1_i^{2j} \ \ if \ D1_i \ even \ or \ \sum_{j=1}^{i+1} D1_i^{j} \ otherwise$$
- **iv.** A function <u>Print()</u> to display data members.

It contains a class Data2 that has:

    i.   Data members: ND2 (string), D2[20](int), m (number of elements).

    ii.   A function to read data members.

    iii. A function **Total()** to return the following sum:

$$\sum_{j=1}^{i+1} D2_i^{2j} \quad if \ D2_i \ negative \ \ or \ \sum_{j=1}^{i+1} D2_i^{j} \ \ otherwise$$

    iv. A function **Print()** to display data members.

It contains a class Data is a subclass of Data1 and Data2 that has:

    i.   Data members: ND (string), Tsum (int).

    ii.   A function to set data members, such that Tsum is the total sum for all totals for two classes (use function **Total()** for each class).

    iii. A function **Print()** to display data members.

In main function, define an object of student class and apply all functions on it.

(Multilevel Inheritance)

Write a program contains a class Rectangle that has:

    i.   Data members: RD[10][2] (float), n (number of rows).

    ii.   A function to read data members.

    iii. A function Area(int i) to return the area of rectangle with dimensions $RD_{i\,0}$, RD_{i1} .

    iv. A function **Print()** to display data members.

It contains a class RArea which is a subclass of Rectangle that has:

    i.   Data member: RA[10] (float).

    ii.   A function to set data members, such that each RA_i is the area of rectangle with dimensions in RD matrix for i=0..n-1(use function Area).

    iii. A function **Print()** to display data members.

It contains a class Pvolum which is a subclass from class RArea that has:

     i.   **Data members: H[10] (float), V[10] (float).**

     ii.   **A function to set data members such that each element $V_i = H_i \times RA_i$ for i=0…n-1.**

     iii.   **A function <u>Print()</u> to display data members.**

In main function, define an object of Pvolum class and apply all functions on it.