13 - Programming Exercises
Package Inheritance Hierarchy

Program the following task in your C++ compiler. Keep compiling and executing even after writing a single line of code.

Case Study: Package Inheritance Hierarchy

In the world of package-delivery services like OCS®, TCS®, and JCS®, there's a variety of shipping options, each with its specific costs and features. To model this scenario in a program, we'll create an inheritance hierarchy to represent various types of packages. The base class of this hierarchy will be **Package**, and we'll derive two subclasses from it: **TwoDayPackage** and **OvernightPackage**.

ADT: Package

The Package class serves as the base class for all types of packages. It includes the following private data members:

- Two strings to represent the name of the sender and receiver.
- Two strings to hold the address of the sender and receiver.
- Two strings to contain the city of the sender and receiver.
- A float named **weight** to store the weight of the package in ounces.
- A float named **costPerOunce** to store the cost per ounce of the package.

It also provides:

- A constructor that accepts the names, addresses, cities of the sender and receiver, the weight, and its cost per ounce as arguments. It assigns these values to the appropriate member variables, ensuring that the weight and cost per ounce contain positive values only.

- A **calculateCost** member function that returns the cost associated with shipping package, calculated as **weight × costPerOunce**.

ADT: TwoDayPackage

The **TwoDayPackage** class is a subclass of **Package** and represents packages with a two-day delivery service. It includes an additional private data member:

- A float named **flatFee** represents the company's charges for the two-day delivery service.

It provides:

- A constructor that accepts all the required information for the two-day delivery package, including the flat fee, as arguments. It assigns these values to the appropriate member variables, ensuring that the flat fee contains a positive value only.

- A **calculateCost** member function that computes and returns the shipping cost by adding the flat fee to the weight-based cost calculated by the base class **Package's calculateCost** function.

ADT: OvernightPackage

The **OvernightPackage** class is another subclass of **Package** and represents packages with an overnight delivery service. It includes an additional private data member:

- A float named **feePerOunce** represents the additional cost charged for overnight delivery service.

It provides:

- A constructor that accepts all the required information for the overnight package, including the additional fee per ounce, as arguments. It assigns these values to the appropriate member variables, ensuring that the fee per ounce contains a positive value only.

- A **calculateCost** member function that adds the additional fee per ounce to the standard cost per ounce before calculating the shipping cost. It then computes and returns the total shipping cost.