# Exercises: Implementing an OOP Hierarchy

Tasks for exercise in class and for homework to the course  ["Programming Advanced for QA" @ SoftUni](https://softuni.bg/trainings/4257/programming-advanced-for-qa-november-2023).

Test your tasks in the Judge system: <https://judge.softuni.org/Contests/4475/OOP-Hierarchy>

# MenuItem

We will be making a simple **OOP project** representing a **restaurant**. You'll be able to create **different menu items**, make new **customers** and manage their **orders**. Let's start by going into the MenuItem **class:**

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You can observe the class is **abstract**. We will use **abstraction** and **inheritance** to be able to make different items.

The class needs the following:

* **Property** Name – string.
* **Property** Description – string.
* **Property** Price – decimal.
* **Method** **override** ToString() - **"**{this.Name} - {this.Description} - ${this.Price}**".**
* **Constructor accepting** the **three properties**.

# AppetizerMenuItem

Create a new class called AppetizerMenuItem and **inherit** from MenuItem. Call the **base** **constructor** and **override** the ToString() **method**: **"**Appetizer: {base.ToString()}**"**

# MainCourseMenuItem

Create a new class called MainCourseMenuItem and **inherit** from MenuItem. Call the **base** **constructor** and **override** the ToString() **method**: **"**Main Course: {base.ToString()}**"**

# DessertMenuItem

Create a new class called DessertMenuItem and **inherit** from MenuItem. Call the **base** **constructor** and **override** the ToString() **method**: **"**Dessert: {base.ToString()}**"**

# Order

Create a new class called Order. This class will be responsible for **keeping a list of menu items** and being able to **tell us the total all items cost**.

Start by making a **private list of menu items named** \_items. We will use **encapsulation** to protect the collection from outside use. To still be able to use it create an AddItem(MenuItem item) **method** to be able to add an item to the collection from the outside. Using **polymorphism,** we will be able to add **any menu item**:

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We also need the method for getting the total amount, so create a **method** decimal GetTotal() and return the **total price of each item in the collection**.

To wrap the class up let's allow **read only access to the collection** by adding a IReadOnlyCollection **property**:



# Customer

Create a new class called Customer. The customer will hold information for each of his orders. The class needs:

* **Field** \_orderHistory – **list** of **orders**.
* **Property** Name – string.
* **Property** Email – string.
* **Property** OrderHistory– **read only order collection** from\_orderHistrory.
* **Constructor accepting** the **two properties**.
* **Method** AddOrder(Order order) **–** addsthegiven **order** to the\_orderHistory **list.**

# Restaurant

The final class Restaurant will hold the most logic, combining all classes. Here is what the class will have:

* **Field** \_customers – **list** of **customers**.
* **Field** \_menu – **list** of **menu items**.
* **Method** AddCustomer(Customer customer) **–** addsthegiven **order** tothe\_customers **list.**
* **Method** GetMenuItem(int index) **– returns** the **menu item** at the **given index.**
  + Check if the index **is in bounds**!If not **throw** anIndexOutOfRangeException.
* **Method** AddMenuItem(MenuItem item) **–** addsthegiven **menu item** tothe\_menu **list.**
* **Method** PlaceOrder(Customer customer, Order order) **–** addsthegiven **order** tothe **customers** \_orderHistory **list through the method we wrote.**
* **Method** DisplayMenu() **–** First write to the console **"**Menu Items:**"** then **foreach** **menu item** in \_menu **write the item to the console**.
* **Method** DisplayOrderHistory(Customer customer) **–** First:
  + Write to the console **"**{customer.Name}'s Order History:**".**
  + Then **foreach** **order in the customers read only order collection** **write to the console "**Order Total: ${order.GetTotal()}**"**.
  + Finally **foreach item in the orders items write to the console on each line "** {item}**".**

All these methods allow us to communicate with the collection not only in this class but in others.

Now go ahead and run the code in Program.cs and look at the result!

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