UTM

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SEMESTER 2 2023/2024

SECJ1023 PROGRAMMING TECHNIQUE II

SECTION 02

FINAL PROJECT

SELF-CHECKOUT SYSTEM

LECTURER: TS. DR. JOHANNA BINTI AHMAD

GROUP 4

Student Name	Matric No.
LAM YOKE YU	A23CS0233
GOE JIE YING	A23CS0224
TEH RU QIAN	A23CS0191
TAN YI YA	A23CS0187

1.0 Introduction

Due to the popularity of online shopping nowadays, the demand for efficient, hassle free physical shopping experience is ever-increasing. Our project addresses the need by developing a self checkout system, which was designed to enhance the shopping experience for customers while providing significant benefits to store managers. A self checkout system allows customers to scan, bag, and pay for their products without the assistance of a cashier. Because of this, customers no longer need to wait in line to pay for their products. This is especially useful for those who only want to buy a few things and don't want to wait in line behind others that purchase a large number of items. The majority of payment methods, especially credit cards, can be completed in a matter of seconds using this technology. On the other hand, through the self-checkout system, management can reduce part of the store's cost of hiring cashiers, save the store a sum of money to improve the shopping environment for customers in the store, and attract and retain more customers.

1.1 Project Synopsis

Our self-checkout system is implemented using C++ and the object-oriented programming (OOP) principles. The core data structures used in our system includes **Classes and Objects**, such as the User class, Member class, Manager Class and Item Class. User class manages each transaction process that a non-member user would carry out, such as getting item code, calculating tax and print receipt, while Member class inherits from user class to store Member details such as member name, member ID and points accumulated. Item class manages product details and functions such as adding or updating items. Manager class manages the manager only functions with the unique ID and allows them to perform actions such as Display Current Day Sales, Display Member Information. **Vectors** were used to store collections of items and member information dynamically. **Input and Output files** were also implemented for maintaining an up-to-date inventory and accurate member point after each time the program was executed and quit.

Our system is designed to offer functionalities such as **Enter member ID** to determine the member, or input -1 to proceed if the user were not a member. **Input Barcode** as product scanning. When the barcode is entered, the system will find and retrieve item name and price from the inventory list and display them on the screen. After inputting all the products, the user will enter -1 to proceed. The system will **calculate Tax** automatically to compute the amount of tax and add it in the total price. If the user was a member, the system would **calculate member discount** to automatically give discount once the member has enough member points. After payment is done, the system will **update member points**, which is to deduct member points when a discount has been given, and add member points once the member has bought things and paid. Then, **print the receipt** to print out all details including store headers, member details if applicable, item bought, price, quantity, total price, discount and tax after the checkout process of

a customer has been completed. Also, **Real-time Inventory Management**, suggests that when the item is bought by a customer, the amount of item will be updated in the inventory list in real time. For the management team, there are managerial functions available including **update item** to update the quantity of item in the inventory list or change price, **add item** to add new items into the inventory list. **Display items** to get an overview of all items including item name, price and quantity, and lastly, the functionality to **add a new member** and to **display members** to view all members and details such as name, ID and member points. The manager can also **display current day sales** to have the sales computed and printed out. Once the program has been closed, signifying the counter was closed, all data including the member details and item details will be output to a file and data were stored, waiting to be input again when the program was opened the next day.

1.2 Project Objective

The objectives of our self-checkout system are as follow:

1. To enhance the customer shopping experiences, by minimising wait time in traditional cashier-assisted checkouts counters.
2. To improve inventory management, by enabling real-time inventory management to update stock quantity, and features such as add, update, display item in inventory.
3. To provide exclusive benefits for members, with member discounts and points that compute automatically.
4. To decrease the dependency on cashier staff by automating the checkout process, resulting in cost savings for the store.
5. To support secure managerial functions that are only accessible through unique ID authentication, to handle specific tasks such as displaying current day sales, member information, and inventory updates.

2.0 System Analysis and Design

2.1 Use Case Diagram

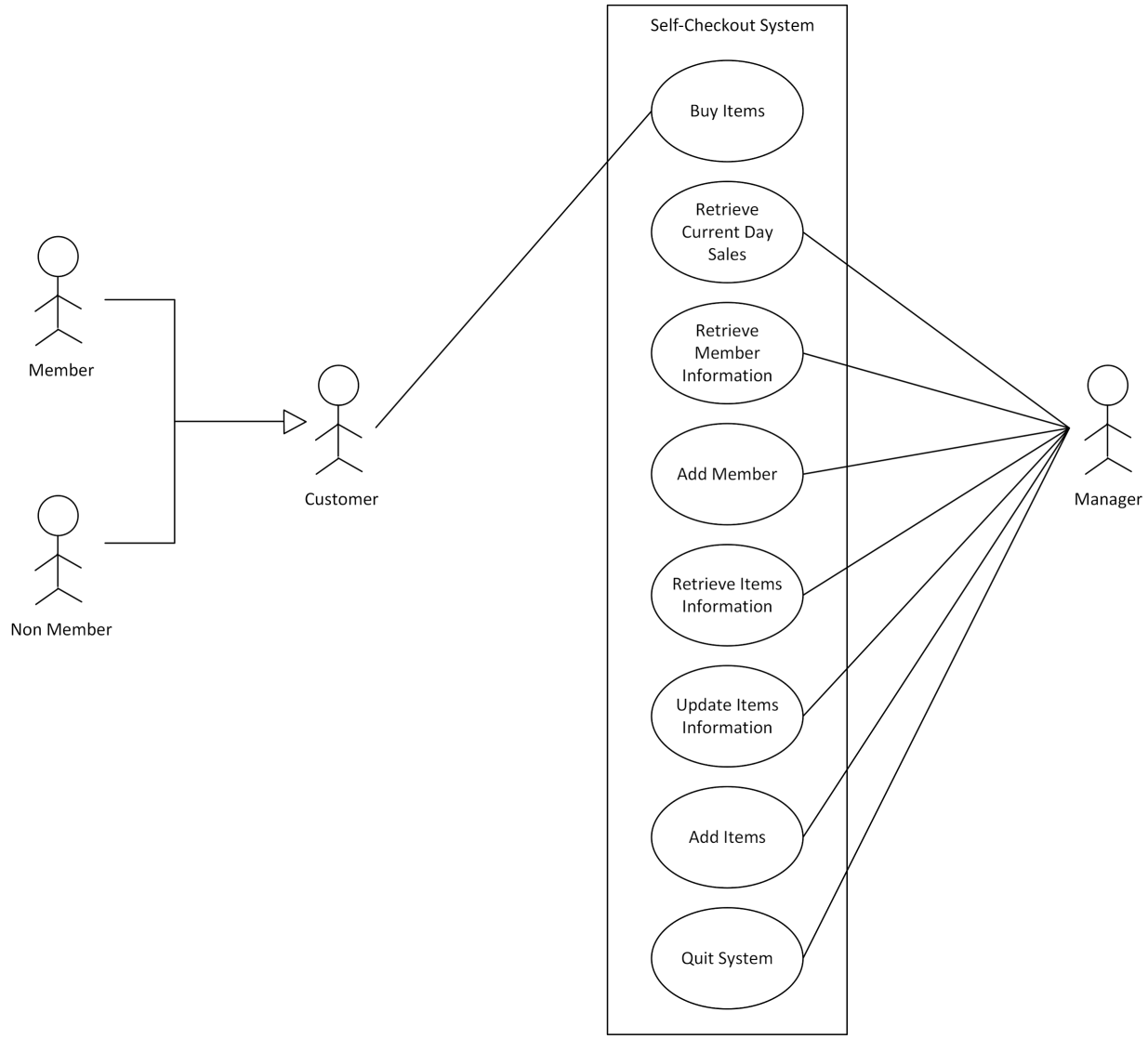


Figure 1: Use case diagram of Perfect Grocery's Self-Checkout System

Use Case Description for Self-Checkout System

The system users are customers and managers. There are 2 types of customers in our system that are members and non members.

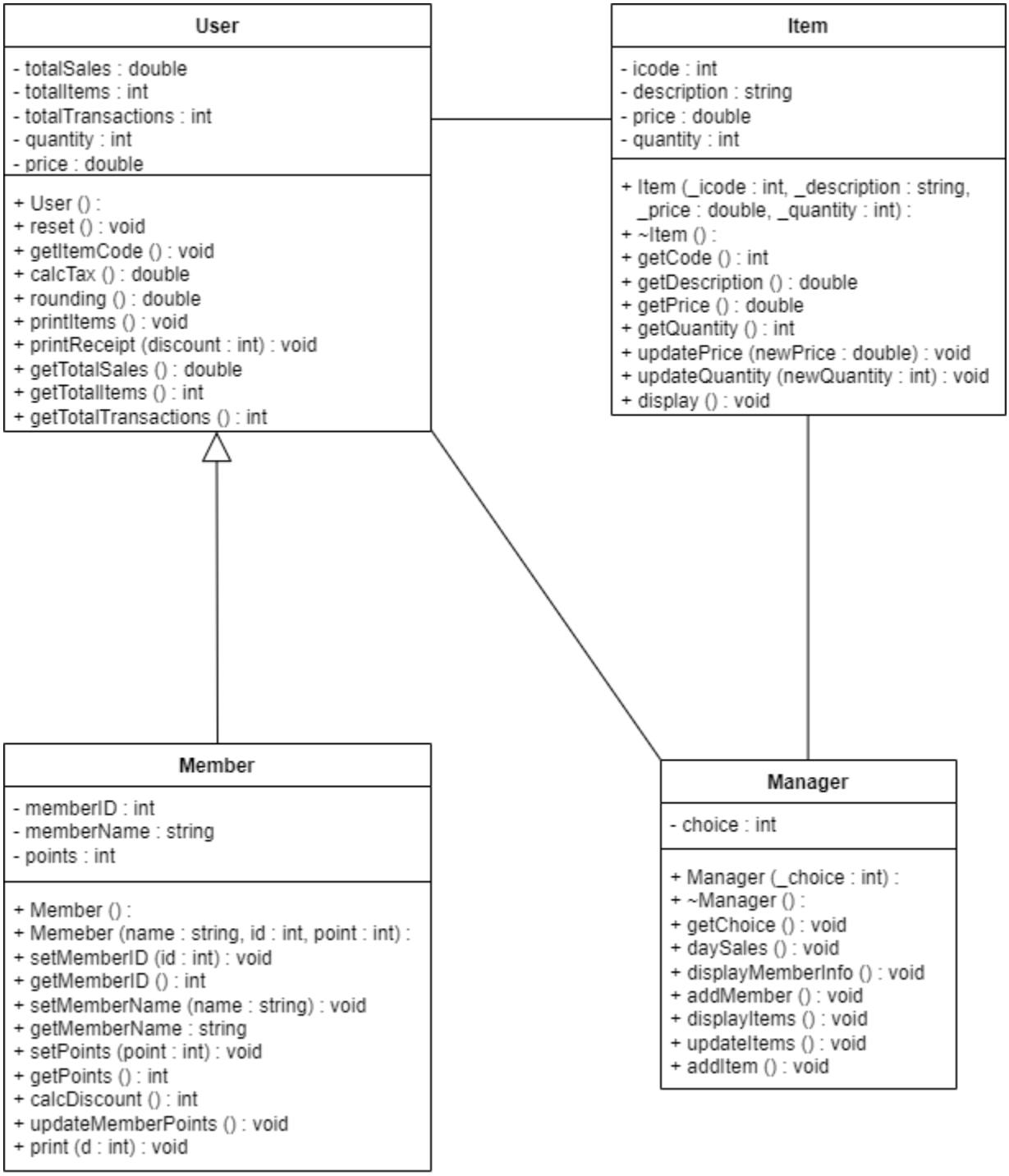
Actor	Task
Customers	Both types of customer have the same task, which is to **buy items**. Initially, they need to indicate if they are a member by entering their member ID for members or -1 for non members. If a positive integer is entered and if the member ID does not exist, the system will prompt the customer to re enter the member ID. After that, they enter the item code of the items they wish to purchase. Finally, they enter -1, to proceed to the next step where the system generates a receipt. In this process, discounts and member points are calculated if the customer is a member. Members receive RM 1 discount for every 100 points accumulated, and earn 1 member point for every RM 1 spent. The system also computes tax, final total of the transaction, and updates the day's sales data.
Manager	Managers would be able to **view various information** within the system. To enter each module of the system, a menu is displayed after entering the manager ID instead of member ID. In the system, the manager ID can be 0 or any negative integer except for -1. The manager can make a choice to execute the 7 modules as shown in Figure 1.

Detail Description for Each Use Cases

The system has 7 main use cases.

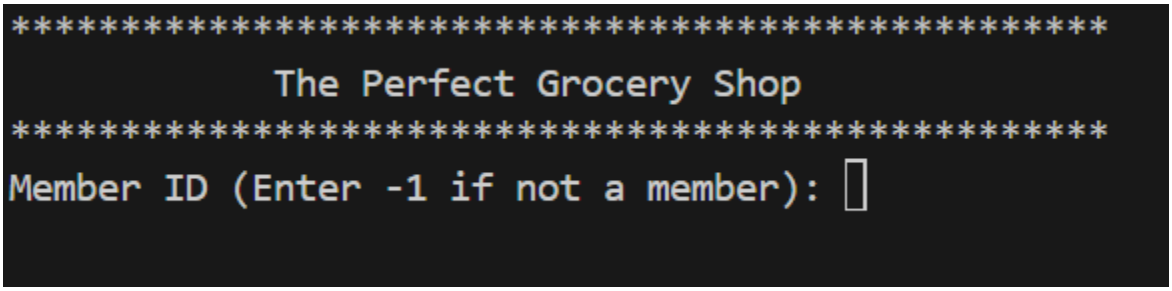
Use Case	Purpose
Buy Items	The customer **enters the item code** that they would like to purchase. If the item code exists, it would be added to the purchase list and the subtotal is accumulated. At the same time, the item quantity is deducted by 1. The customer then enters -1 to proceed to the next step, where the system **generates a receipt**. For members, discounts and member points will be calculated. After that the tax and final total of the transaction will be computed. Besides, the current day sales data will also be updated.
Retrieve Current Day Sales	Managers can view total sales, items sold, total transactions, and average transaction amount since the system's opening. This module does not allow modifications to the data.
Retrieve Member Information	Managers can view a list of all members registered in the system. This module does not allow modifications to the member data.
Add Member	The manager will be prompted to **enter the name of the member**. A member ID will be automatically assigned to the member and the member points will be initialised to zero.
Retrieve Items Information	Managers can view a list of all items available in the system. This module does not allow modifications to the item data.
Update Item Information	The manager will be prompted to **enter the item code**. If the item code exists, the manager can proceed to **update the price and quantity** of the item; otherwise, the manager is prompted to re-enter the item code.
Add Items	The manager is prompted to **enter a code** for the item. If the code does not exist in the system, the manager is prompted to **enter the item description, price and the quantity** and a new item will be added to the system. If the item code already exists, the manager will be prompted to re-enter the code.
Quit System	The manager can select to quit the program. The **updated items and member information will be saved** for retrieval upon reopening.

2.2 Class Diagram



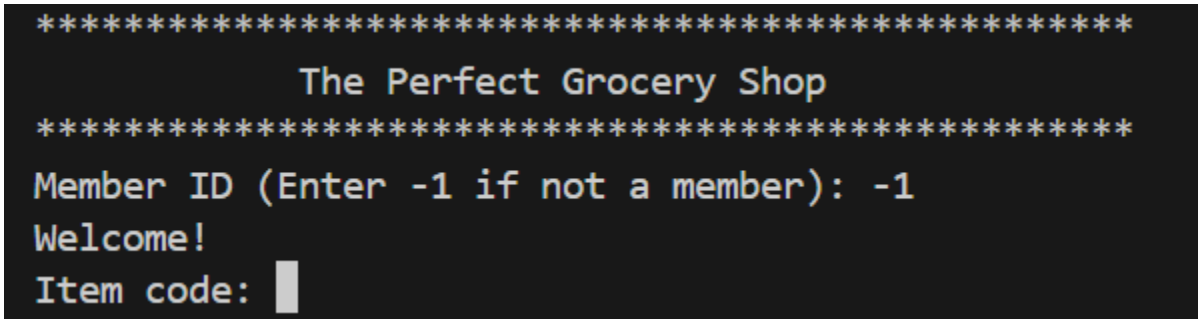
3.0 System Prototype

Screen 1 : Home Page



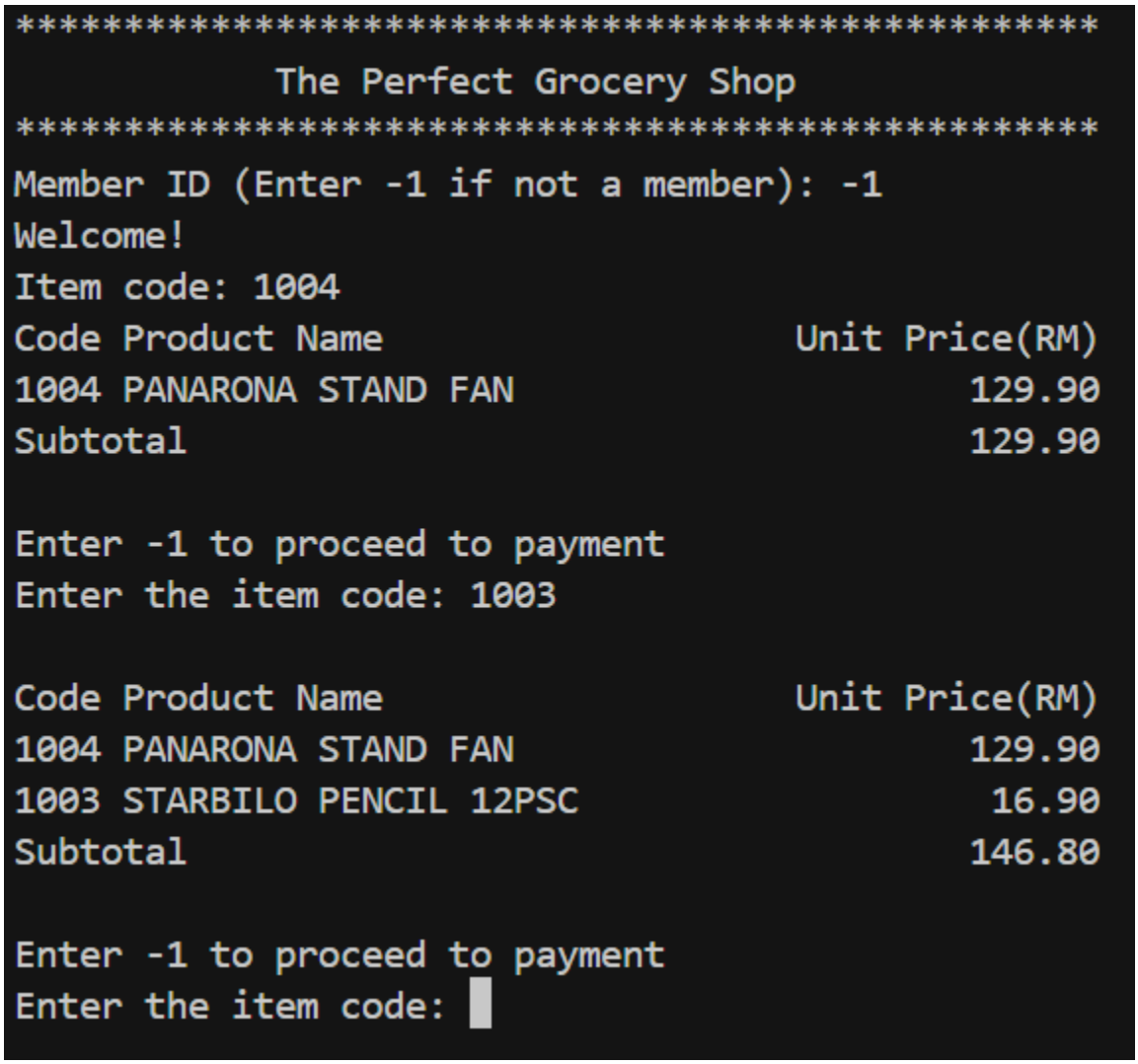
There are two types of users for this system: customers and managers. A customer can enter their member ID if they are a store member. If an incorrect member ID is entered, the system will display an error message and prompt the user to try again. Alternatively, customers can enter '-1' to proceed to the payment process. Managers should enter '0' to access the menu for listing and editing members and items.

Screen 2 : Welcome Page (Customer is Not a Member)



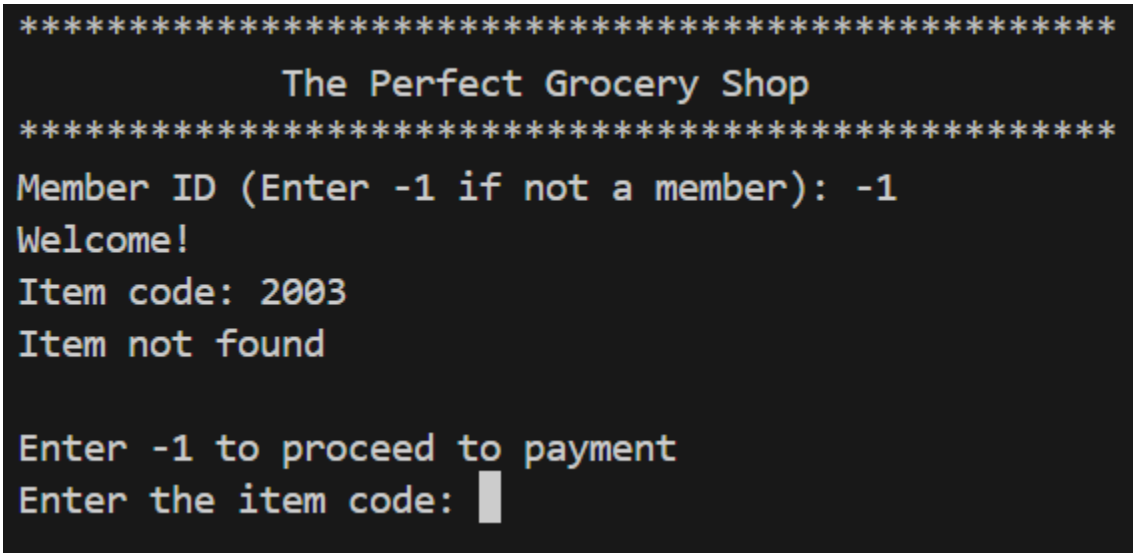
The system will display a welcome message, after which the customer can enter the item code for their purchase.

Screen 3 : Enter Item Code



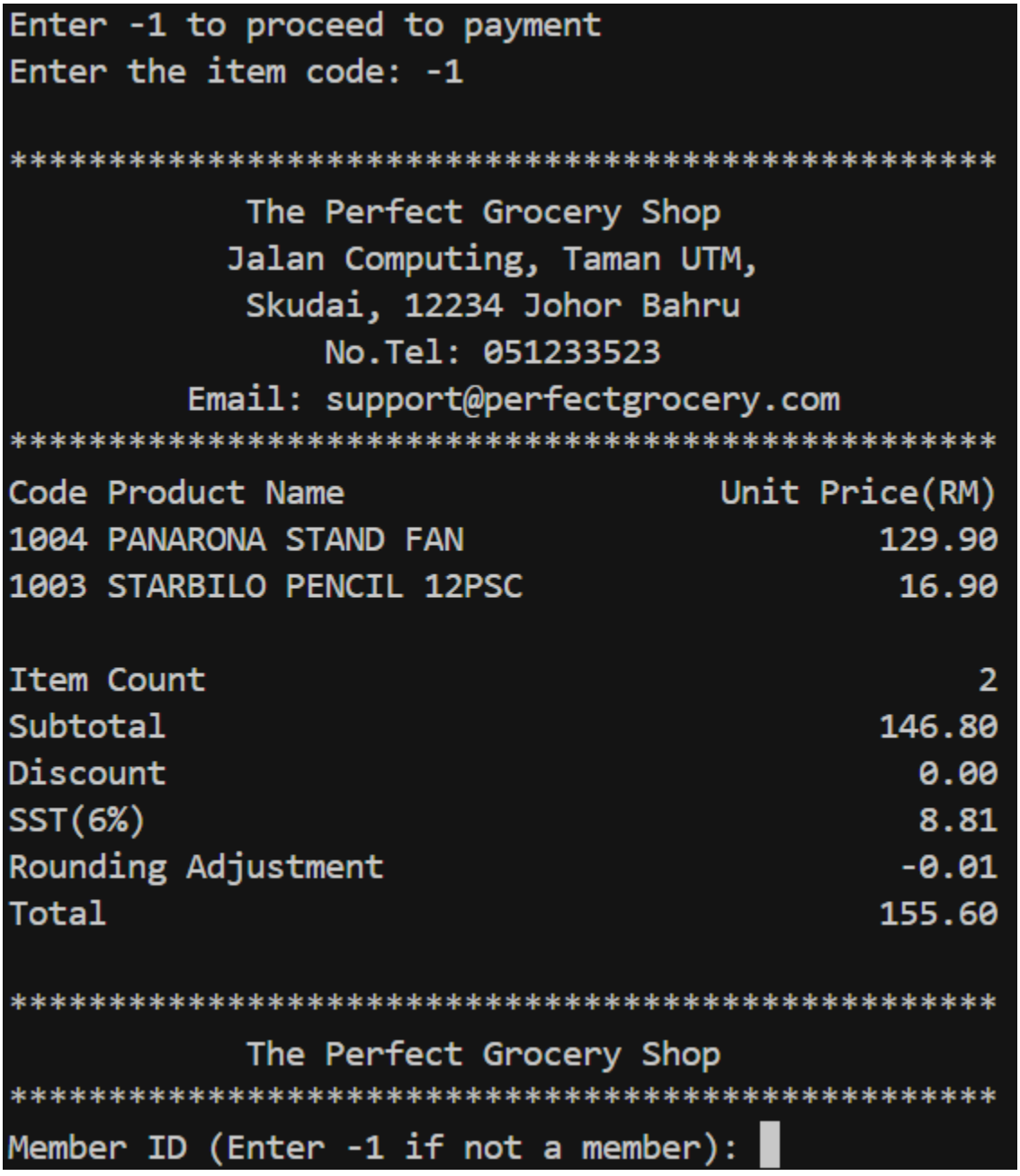
After entering the item code, the system will display the item's description and price. If multiple items are entered, the system will automatically total the cost and display it on the screen. If the customer enters an invalid item code, a prompt message will be displayed. Once the customer is finished, they can enter '-1' to proceed to payment.

Screen 4 : Error Prompt (Item Not Found)



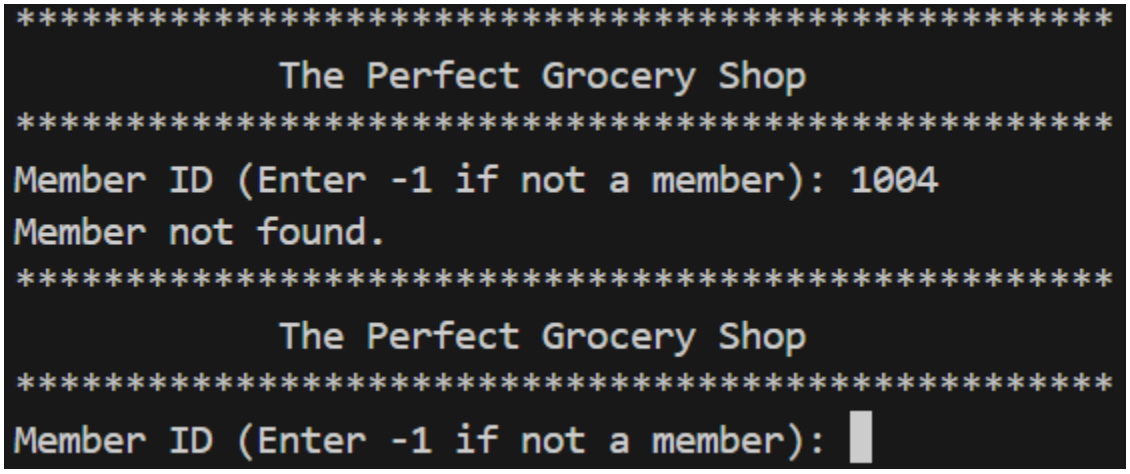
A prompt message is displayed when the item is not found in the item list, prompting the customer to enter the code again.

Screen 5 : Receipt Page (Customer is Not a Member)



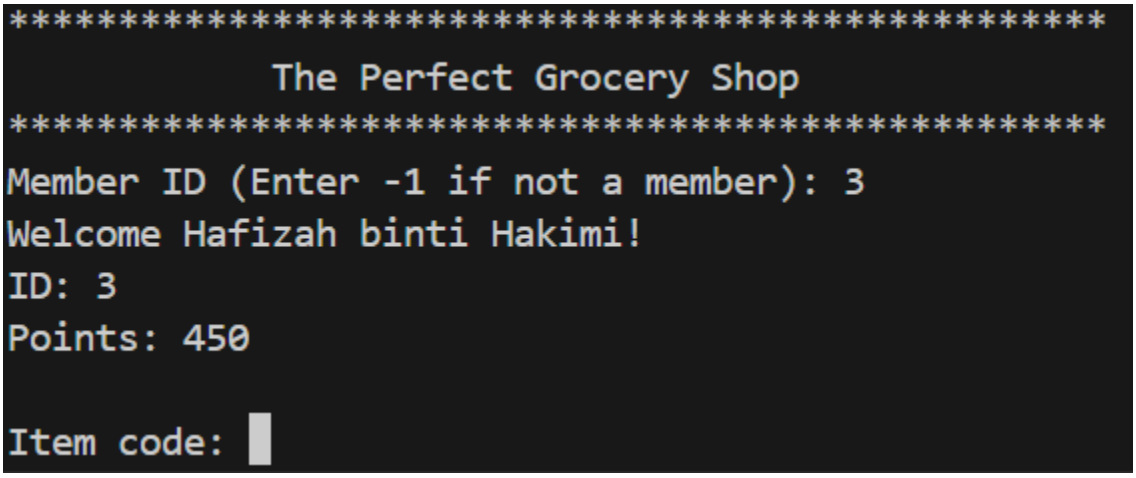
The customer enters '-1' to proceed with the payment. The system will then display a receipt that includes the code, description, quantity, and price (RM) of all items. The system will also total the number and price of the items, calculate SST (6%), and apply any rounding adjustments. The final amount displayed as the total represents the amount the customer needs to pay. After this, a main page will be displayed for a new user.

Screen 6 : Error Prompt (Member Not Found)



If a customer enters an incorrect member ID, the screen will display the message 'Member not found.' and prompt the customer to try again.

Screen 7 : Welcome Page (Customer is a Member)



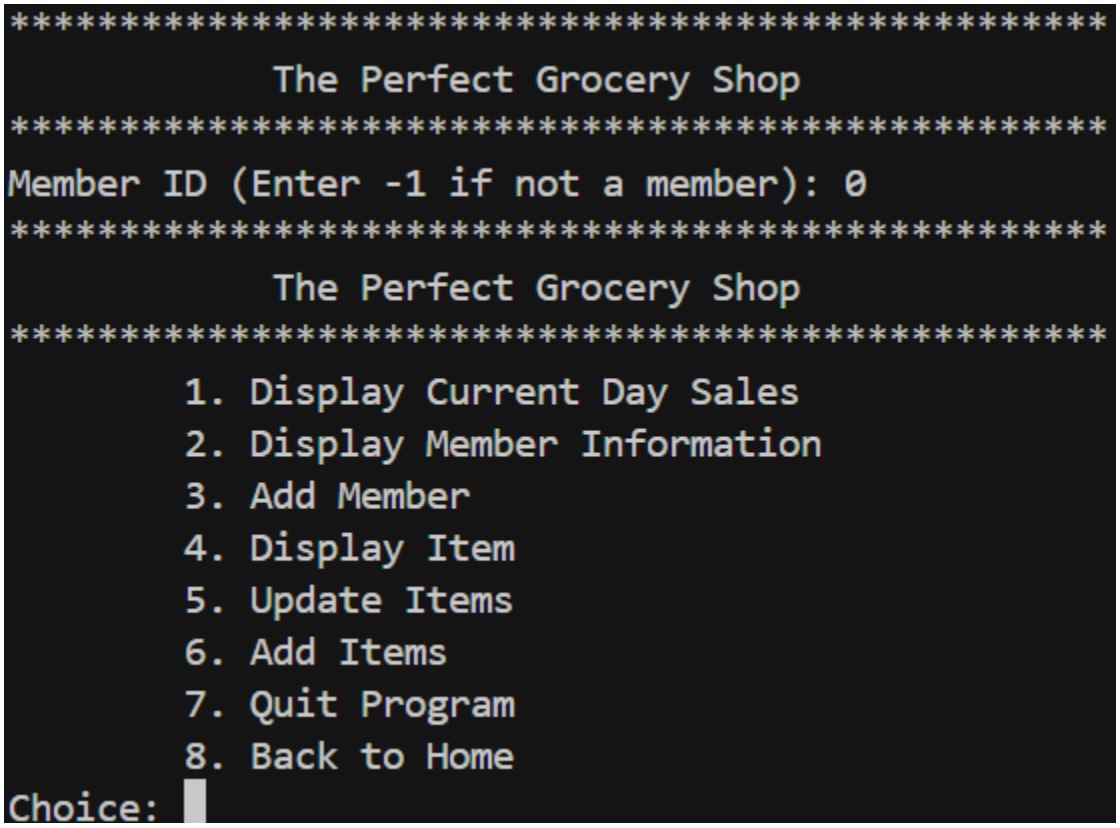
After the customer enters their member ID, the screen will welcome them and display their ID and points. They can then proceed with their purchase by entering the item code.

Screen 8 : Receipt Page (Customer is a Member)

```
Item code: 1006
Code Product Name                        Unit Price(RM)
1006 MOONQUICK ORANG JUICE 100                     9.99
Subtotal                                           9.99

Enter -1 to proceed to payment
Enter the item code: -1

**************************************************
            The Perfect Grocery Shop
           Jalan Computing, Taman UTM,
            Skudai, 12234 Johor Bahru
                No.Tel: 051233523
         Email: support@perfectgrocery.com
**************************************************
Code Product Name                        Unit Price(RM)
1006 MOONQUICK ORANG JUICE 100                     9.99

Item Count                                           1
Subtotal                                           9.99
Discount                                           4.00
SST(6%)                                            0.36
Rounding Adjustment                                0.00
Total                                              6.35
Member points                                        55

**************************************************
            The Perfect Grocery Shop
**************************************************
Member ID (Enter -1 if not a member):
```

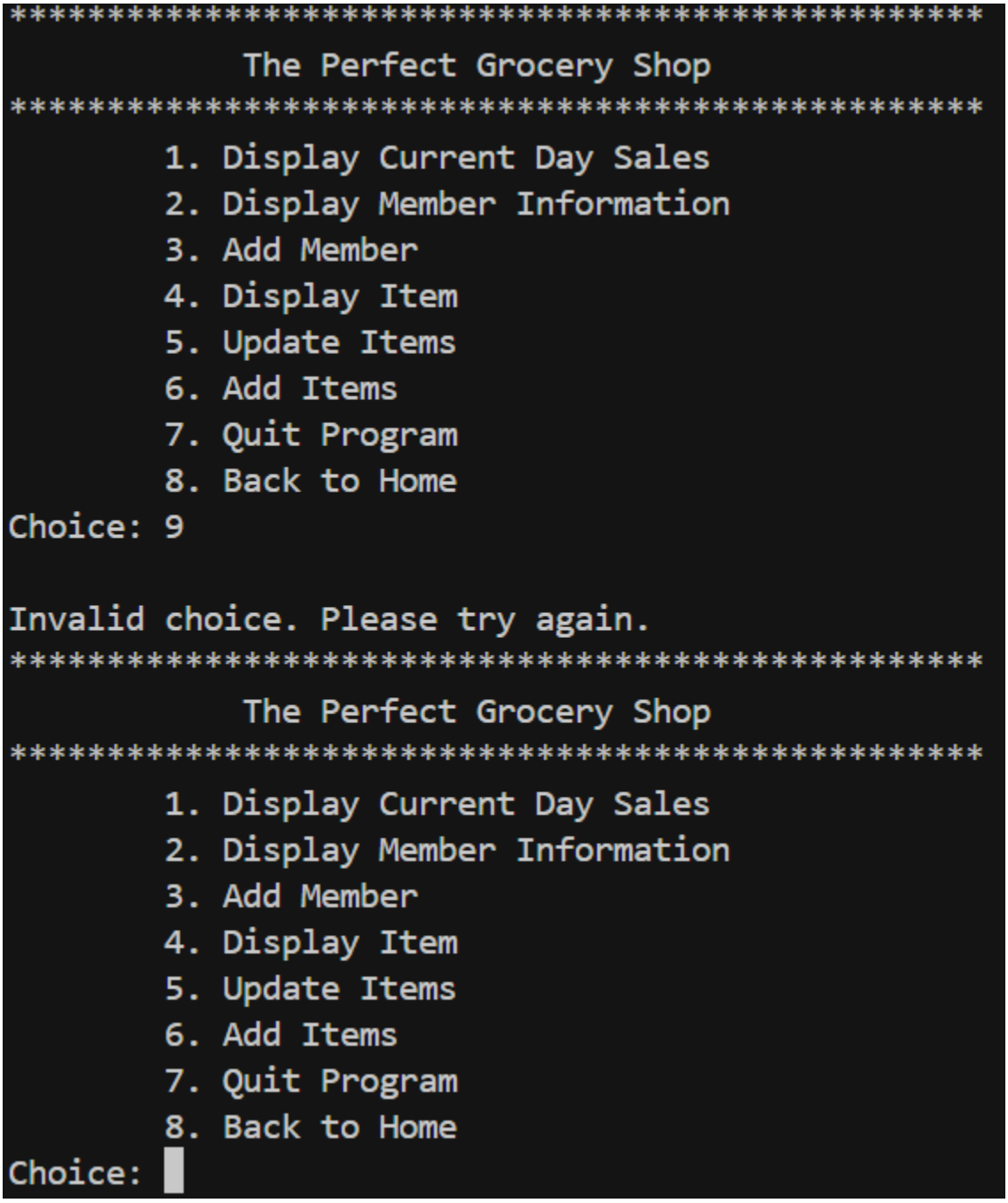
The key difference between members and non-members is the discount feature. Members receive a discount by redeeming their points (100 points = RM1). Additionally, members earn points when they purchase items priced over RM1, with each RM1 spent equating to 1 point earned.

Screen 9 : Manager Menu Page



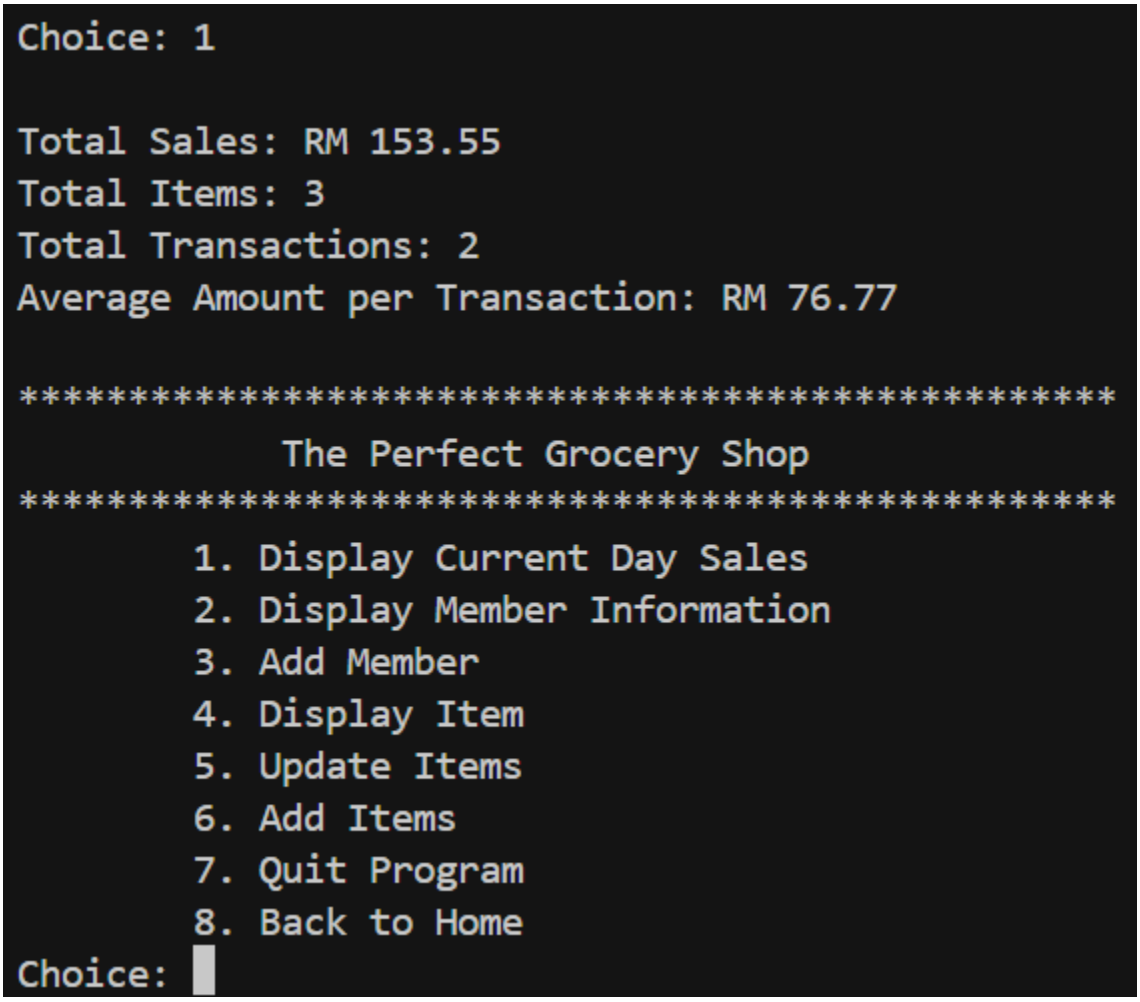
The manager can enter a choice from 1 to 8. If any other number is entered, the system will prompt an error and ask the manager to enter a valid choice again.

Screen 10 : Error Prompt (Manager's Choice Not Found)



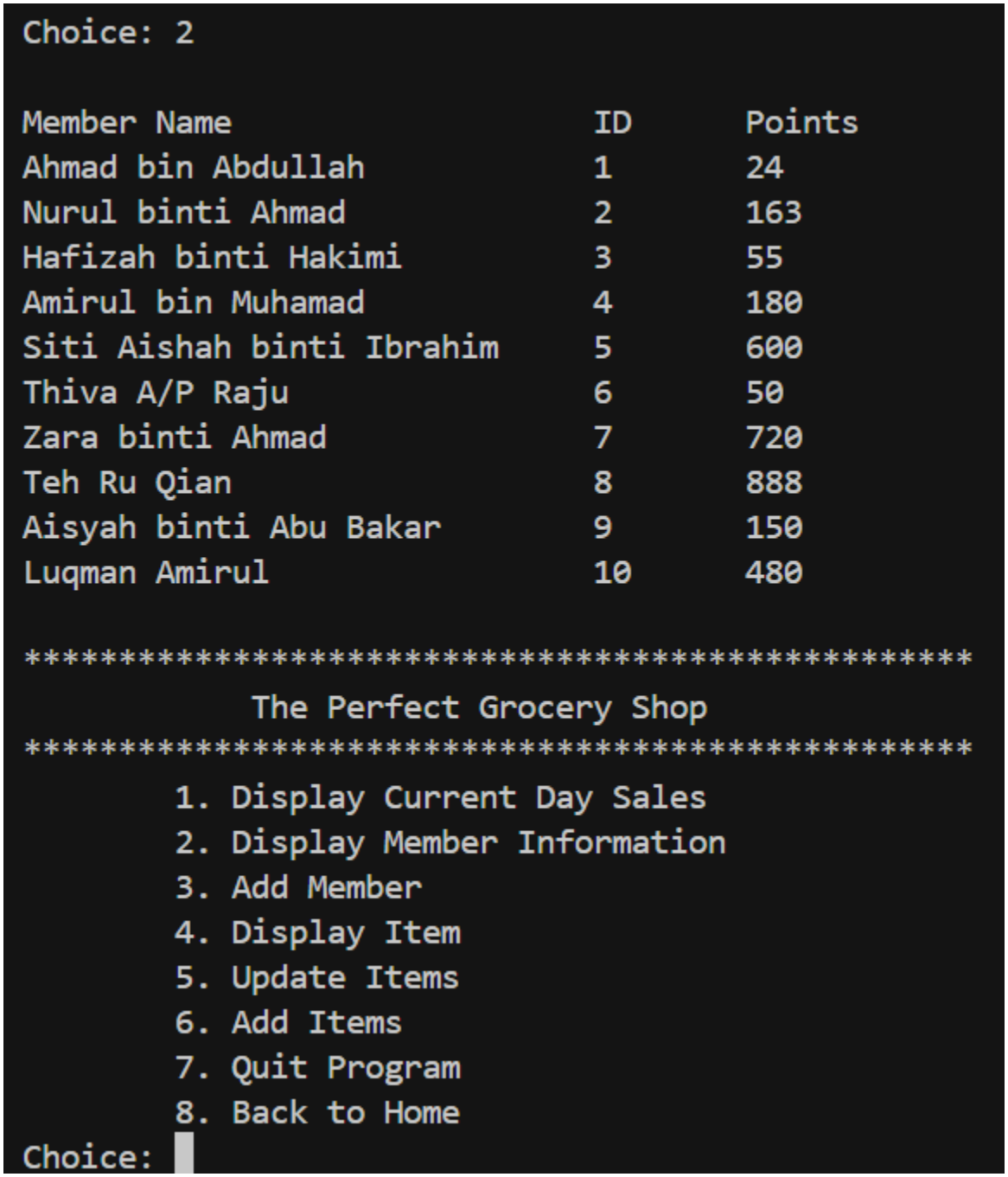
When the manager enters a number such as ‘9’ that isn’t listed, the system will display an error message: “Invalid choice. Please try again.” It will then present the menu list again, allowing the manager to enter their choice once more.

Screen 11 : Display Current Sales Page



The total sales, number of items sold, total transactions, and average amount per transaction are automatically calculated and displayed on this screen. Afterward, the manager menu page is shown again, allowing the manager to make another selection.

Screen 12 : Display Member Information



The screen displays the names, IDs, and points of all members.

Screen 13 : Add member

```
Choice: 3

Enter the name of the new member:
```

The manager can add members to the list. To begin, enter the member's name.

```
Enter the name of the new member: ABC

**************************************************
            The Perfect Grocery Shop
**************************************************
        1. Display Current Day Sales
        2. Display Member Information
        3. Add Member
        4. Display Item
        5. Update Items
        6. Add Items
        7. Quit Program
        8. Back to Home
Choice: 2

Member Name                 ID      Points
Ahmad bin Abdullah          1       24
Nurul binti Ahmad           2       163
Hafizah binti Hakimi        3       55
Amirul bin Muhamad          4       180
Siti Aishah binti Ibrahim   5       600
Thiva A/P Raju              6       50
Zara binti Ahmad            7       720
Teh Ru Qian                 8       888
Aisyah binti Abu Bakar      9       150
Luqman Amirul               10      480
ABC                         11      0
```

After entering the member's name, it will be automatically added to the list. The manager can then enter '2' to check the list of members.

Screen 14 : Display Item

```
Choice: 4

Code Description                    Price  Quantity
1001 MASAMU WHEAT BREAD              4.90         2
1002 UTM GINGER                      7.90         8
1003 STARBILO PENCIL 12PSC          16.90        90
1004 PANARONA STAND FAN            129.90        25
1005 DUCK LADY MILK 6PSC             8.95        36
1006 MOONQUICK ORANG JUICE 100       9.99        34
1007 MONKEY OAT KRUNCH ASSORTE      10.50         3
1008 PARKER LUXURY                 259.90         2

**************************************************
            The Perfect Grocery Shop
**************************************************
        1. Display Current Day Sales
        2. Display Member Information
        3. Add Member
        4. Display Item
        5. Update Items
        6. Add Items
        7. Quit Program
        8. Back to Home
Choice:
```

This screen displays the item code, description, latest price, and quantity available in the store for each item.

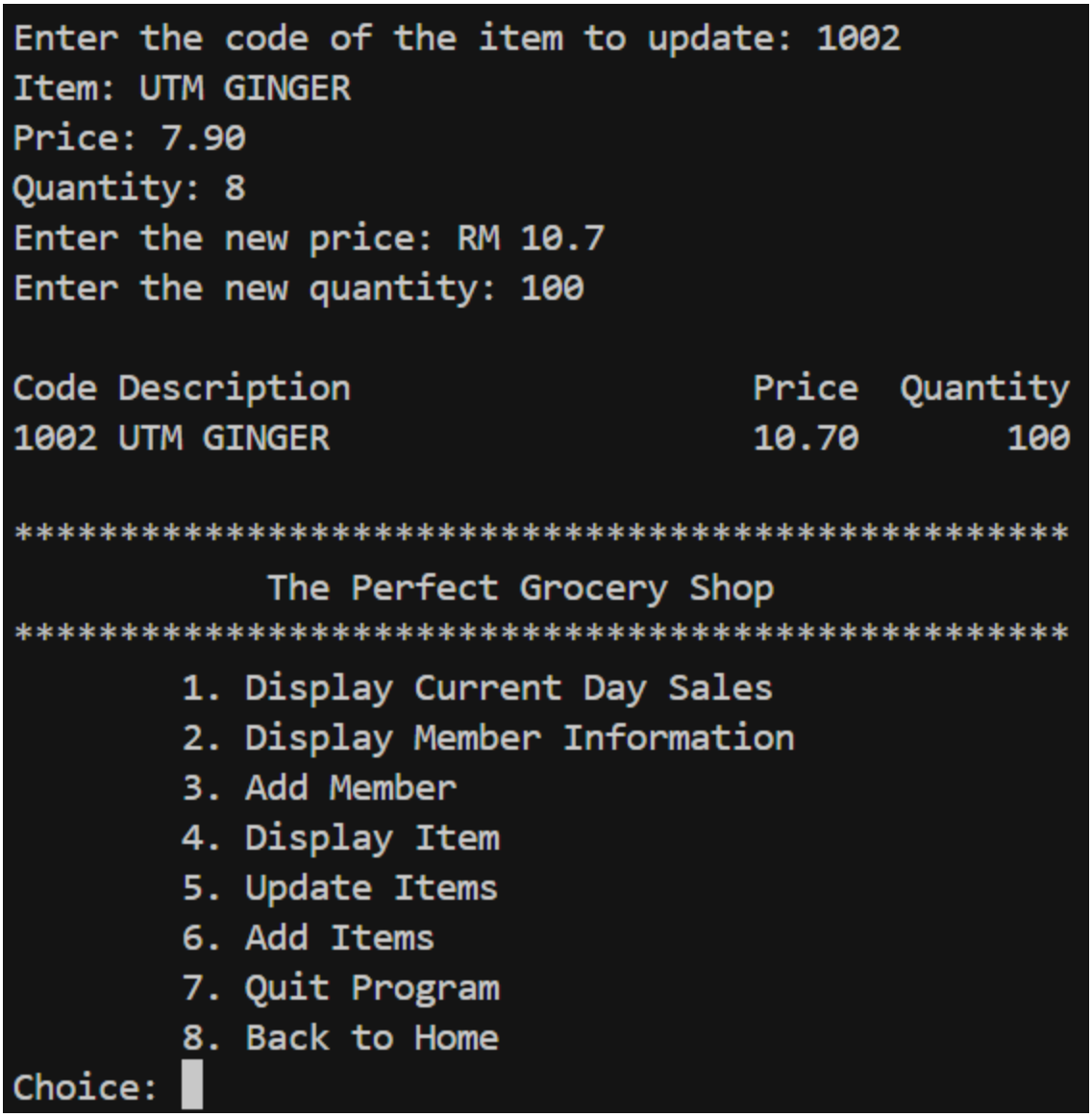
Screen 15 : Update Items

```
Choice: 5

Enter the code of the item to update:
```

First, enter the code of the item.

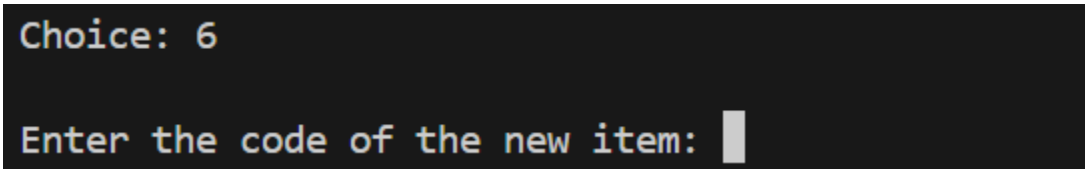
```
Enter the code of the item to update: 1002
Item: UTM GINGER
Price: 7.90
Quantity: 8
Enter the new price: RM
```

It will display the current item's description, price, and quantity. The manager can then enter the new price and quantity for the item.



Afterward, it will display the updated price and quantity for the item based on the entered code.

Screen 16 : Add Item

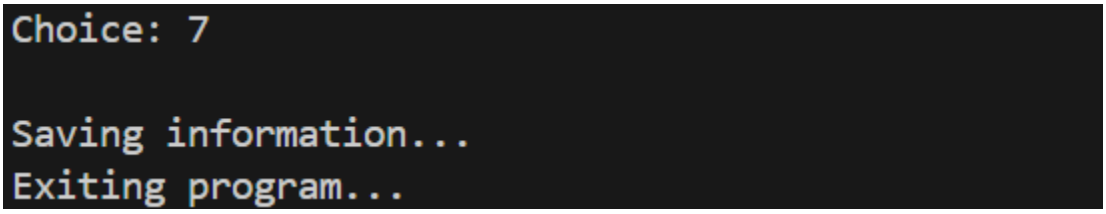


Enter the code, description, price and quantity for the new item.

```
Enter the code of the new item: 2006
Enter the description of the new item: Adadis Shoes
Enter the price of the new item: RM 100
Enter the quantity of the new item: 4

**************************************************
            The Perfect Grocery Shop
**************************************************
        1. Display Current Day Sales
        2. Display Member Information
        3. Add Member
        4. Display Item
        5. Update Items
        6. Add Items
        7. Quit Program
        8. Back to Home
Choice: 4

Code Description                    Price  Quantity
1001 MASAMU WHEAT BREAD              4.90         2
1002 UTM GINGER                     10.70       100
1003 STARBILO PENCIL 12PSC          16.90        90
1004 PANARONA STAND FAN            129.90        25
1005 DUCK LADY MILK 6PSC             8.95        36
1006 MOONQUICK ORANG JUICE 100       9.99        34
1007 MONKEY OAT KRUNCH ASSORTE      10.50         3
1008 PARKER LUXURY                 259.90         2
2006 Adadis Shoes                  100.00         4
```

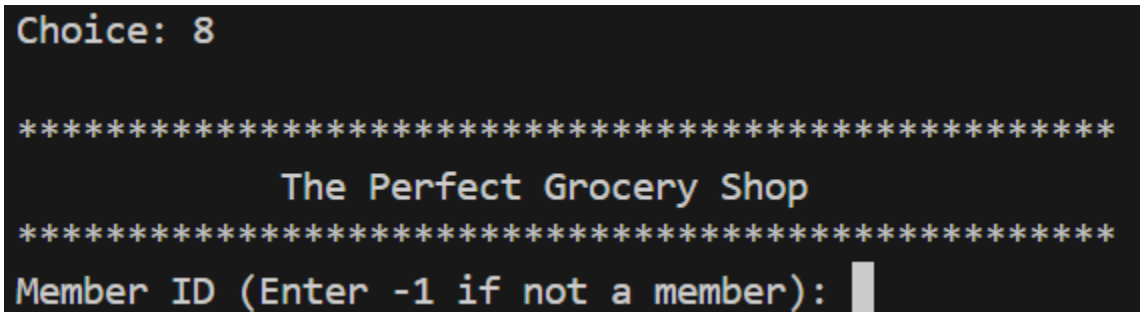
After that, the item will be added to the list of items. Manager can enter '4' to check the updated list.

Screen 17 : Quit Program



When the manager wants to quit the program, the system will save all the updated information into files and then exit the program.

Screen 18 : Back To Home Page



The home page can be accessed again when the manager enters ‘8’.