AP Computer Science A@Beijing National Day School

Problem Set 14: `Discount Bill`

Due date: Monday, March 18, 2019
Instructor: Mr. Alwin Tareen
Total Points: 15

Task Overview

- Place an information box at the beginning of your `Java` program, **which includes your name**. This formally confers your ownership of the code.
- Implement a program that keeps track of the products being purchased at a grocery store, and computes discounts for preferred customers.

Background

- Grocery stores often establish loyalty programs for their customers. When a customer is a member of one of these programs, they can present their loyalty card at the cash register to receive monetary discounts on their various purchases.
- Generally, customers are pleased with the lower prices they receive as a result of these discounts, so they are willing to put up with the small amount of extra effort that is entailed by presenting their loyalty card whenever they are shopping at a particular store.
- However, if a customer is not a member of a store's particular loyalty program, then they are not entitled to any of the discounts, and they must pay full price for any products that they purchase.
- Grocery stores have several business incentives that emerge from these loyalty programs. These programs encourage customers to continue shopping at their store, rather than one of their competitor's stores. Loyalty programs also enable merchants to track the individual item purchases of their customers. These merchants can then process all of the transaction data, and draw inferences about their customers' purchasing habits. In doing so, they can encourage their customers to buy more of their favourite products.

Specification

The Information Box Which Includes Your Name [5 points]

- **You are responsible** for typing your own name into the `Author` field, where it says: `YOUR NAME HERE`. Include both your English and Pinyin names.
- If the `Author` field is left blank, or if it contains **someone else's name**, then these 5 points will not be awarded to you.

Computing Discounts on a Grocery Bill [10 points]

- Write a `Java` program in the file `DiscountBill.java` that computes discounts for customers who are members of the store's loyalty program. In other words, they are preferred customers.
- You will write your solution in a class called `public class DiscountBill extends GroceryBill`. You will implement several methods in this class, so write your code in the places indicated by: `YOUR CODE HERE`.
- The `GroceryBill` class is a superclass of `DiscountBill`, and it keeps track of the various products that are purchased at the grocery store. It has been provided for you.

The `GroceryBill` class has the following properties:

- Instance variable:
  - `private ArrayList<Product> basket;`
    This data structure stores the various items that a customer has purchased. Each item takes the form of a `Product` data type, which will be described later.
- Constructor:
  - `public GroceryBill()`
    This is a default constructor, as it has no parameters. It is responsible for initializing the `basket` ArrayList.
- Accessor methods:
  - `public double getTotal()`
    This method returns the total cost of the products which are contained in the `basket` ArrayList.
  - `public String createReceipt()`
    This method displays a listing of all the prices of the products which are contained in the `basket` ArrayList.
  - `public ArrayList<Product> getBasket()`
    This method returns a reference to the `basket` ArrayList. This method will be useful when developing the various methods in the `DiscountBill` class.
- Mutator methods:
  - `public void purchase(Product p)`
    This method takes the parameter `p` which has a `Product` data type, and adds it to the `basket` ArrayList.
- Note that the `GroceryBill` class does not have the ability to apply discounts to the various products. Every product that is placed in the `basket` ArrayList is charged full price.
- Each of the items that are available for purchase have the data type `Product`. For example, a `candy` product might have a price of `1.00`, with a discount of `25%` for preferred customers. This means that preferred customers only pay `0.75` for the `candy` product. Note that some products have a discount value of `0.0`. The `Product` class has been provided for you.

The `Product` class has the following properties:

- Accessor methods:
  - `public double getPrice()`
    This method returns the price of this product.
  - `public double getDiscount()`
    This methods returns the discount associated with this product.
- Your task in this assignment is to create a class called `DiscountBill` that extends the `GroceryBill` class, to compute discounts for preferred customers. The constructor for the `DiscountBill` class takes in a `boolean` parameter which determines whether or not the particular customer receives these discounts.

- The `DiscountBill` class should override the `getTotal()` method from the `GroceryBill` class, such that it reports the discounted total for preferred customers. For example, if a preferred customer purchases `$80.00` in products, and they are entitled to `$20.00` in discounts, then the `getTotal()` method should report `$60.00` as a result.
- Furthermore, you need to implement methods which keep track of the following:
  - How many items receive a non-zero discount.
  - The overall discount in terms of the total amount.
  - The overall discount in terms of a percentage of the total bill.

The `DiscountBill` class has the following properties:

- Instance variable:
  - `private boolean preferred;`
    This indicates whether or not a customer is a member of the grocery store's loyalty program.
- Constructor:
  - `public DiscountBill(boolean p)`
    This initializes the `preferred` data type with either a `true` or `false` value.
- Accessor methods(you need to implement these):
  - `public int getDiscountCount()`
    This method returns the number of products that were discounted.
  - `public double getDiscountAmount()`
    This method returns the total discount for all of the products in the customer's `basket`.
  - `public double getDiscountPercent()`
    This method returns the total discount as a percent of the otherwise non-discounted cost of the products in the customer's `basket`.
  - `public double getTotal()`
    This method reports the discounted total cost of the products for preferred customers, as well as the non-discounted total for non-preferred customers.
- Note that if the shopper is **not** a preferred customer, then the `DiscountBill` class behaves as if there is a total discount of `0.0`, and no products have been discounted.

Testing

- In order to run the `JUnit` test bench, simply click on the `Run Tests` button. If you are missing this button, then right-click on the module `DiscountBillJUnitTest` and select `All Tests`. Then, you should see a `BlueJ: Test Results` window appear.
- If your `JUnit` test is successful, you should see a green bar appear. Also, each of the specific testing functions should have a green checkmark in front of them. If your test is unsuccessful, then a red bar will appear, and you will need to correct the errors.

Submission

- Submit your Java program by uploading it to the Web-CAT automated grading platform. Click on the following link:
  http://ec2-54-65-207-33.ap-northeast-1.compute.amazonaws.com:8080/Web-CAT/WebObjects/Web-CAT.woa