

Vending Machines

Introduction

It's the year 2021, and you have graduated from EWU. Your first real job is with Coca-Cola, who is trying to spearhead the vending machine market by developing specialized vending machines for university campuses. The first models will be placed in the CSE and EEE department of the varsity, and are catered specifically to Tech students. Since you have experience with the student body, you have been tasked with writing the software. However, Coke wants to make sure that their product will be an overwhelming success. For that reason, you will first write a simulator for the machine to test the functionality.

Problem Description

You will be writing classes that represent various parts of a vending machine. You will need to write two files: `VendingMachine.java` and `VendingItem.java`. A simple driver class `VendingWorld.java` has been provided, and it will allow you to interact with your simulation. Specific instructions for each file are given in later sections.

Solution Description

`VendingItem.java`

Your `VendingItem` class should have the following fields, methods, and constructors:

- **`private String name`**. This field is the name of an item, and should be set in the constructor.
- **`private double price`**. This field is the price of an item, and should be set in the constructor.
- **`private String type`**. This field is the type of an item, and should be set in the constructor.
- **`VendingItem(String name, String type, double price)`**. This is the constructor for the class, and it takes the name and price as its parameter.
- **`public double getPrice()`**. This method is just a simple getter method for the price. Price has no setter because it does not make sense for an object's price to change at runtime.
- **`public String toString()`**. This method returns a `String` representation of a `VendingItem` for use in your simulation. The `String` should look like: `"(name): $xx.xx"` where `(name)` is the name of the `VendingItem` and `xx.xx` is its price.

`VendingMachine.java`

This class represents the vending machine itself and is the bulk of the assignment. It has the following fields, methods, and constructors although you can add extra variables if you want.

- **`private static double totalSales`**. Your boss wants a way to measure the success of this venture, so this field will keep track of the total sales across vending machines (CSE Department + EEE Department). It should be initialized to 0 and properly updated every time a sale that makes money is made. More on this later.
- **`private int totalItems`**. Your boss wants a way to measure the number of items in a vending machine, so this field will keep track of the number of items in a vending machine. It should be initialized to 10 and properly updated every time a sale that makes money is made.
- **`private VendingItem[] shelf`**. This 1D array of `VendingItems` represents how the items are arranged in the vending machine. `shelf[i]` represents the *i*th position where position 0 (`shelf[0]`) is the item at the front and each subsequent position represents the item behind it. The shelf should be initialized to have 10 positions.
- **`public VendingMachine()`**. This is the single no-arg constructor for `VendingMachines`. You should initialize your fields and call `restock()` here so that your vending machine is ready to use as soon as someone initializes it.

- **public void stock(VendingItem item).** This method is used to stock your vending machine with a specific item. You should also be careful about overflowing the vending machine while implementing this method, e.g. the capacity of your vending machine is 10. Let's say the vending machine currently holds 10 items. If you proceed to add an item to the vending machine, this should return an error.

- **public void stock(VendingItem[] item).** This method is used to stock your vending machine with multiple items at once.

You should also be careful about overflowing the vending machine while implementing this method, e.g. the capacity of your vending machine is 10 and the vending machine currently holds 8 items. If you proceed to add 4 items you can add only first 2 items, the next 2 items would be rejected.

- **public VendingItem vend(int code).** This method is used to dispense an item from the vending machine. It takes in a parameter code which represents the position of the selected item. You must dispense the item from the proper position and move the items behind it so that there is always (if possible) an item in the 0 position. This method should also take care of checking the code for validity before dispensing anything and should print an error statement and return null if something goes wrong. e.g. the vending machine can hold at most 10 items at a time, so if anyone passes 23 as a parameter, it should return null.

It should also print an error statement and return null if there is no item in the position that the user selected.

Finally, this method should update the totalSales field as needed. Be careful not to update totalSales if something went wrong

- **public void restock().** This method has been implemented for you.

```
public void restock(){
    shelf[0] = new VendingItem("Lays", "c", 1.50);
    shelf[1] = new VendingItem("Doritos", "c", 1.50);
    shelf[2] = new VendingItem("Coke", "d", 2.50);
    shelf[3] = new VendingItem("Rubiks Cube", "s", 30);
    shelf[4] = new VendingItem("Pie", "p", 3.14);
    shelf[5] = new VendingItem("Clicker", "s", 55.55);
    shelf[6] = new VendingItem("Cheetos", "c", 1.25);
    shelf[7] = new VendingItem("Cold Pizza", "p", 0.99);
    shelf[8] = new VendingItem("Graphing Calculator", "s", 120);
    shelf[9] = new VendingItem("Ramen", "n", 3.15);
}
```

- **public static double getTotalSales().** This method is a getter for the totalSales field. It is static because totalSales is a static variable and keeps track of sales across all vending machines.

- **public int getTotalItems().** This method should return the total number of VendingItems in the vending machine.

- **public double getTotalValue().** This method should return the combined total value of all the VendingItems in the vending machine.

NOTE: Although the method is named get...(), it is not a getter method and requires some logic.

- **public String.getItems(int val):** This method returns the names of those items which have less price than parameter val.

- **public String.getItems(String t):** This method returns the names of those items which are of type parameter t.

- **public VendingItem getCheapestItem(String t):** This method returns the cheapest item of type parameter t.

- **public String toString().** This method returns the names of the items in the shelf separated by a comma.

Running and Testing

`VendingWorld.java` has been provided for you. It creates several instances of `VendingMachine`, and allows the user to interact with them. You can run the main method to start a simulation, and test from there.

```
public class VendingWorld {
    public static void main(String[] args) {
        VendingMachine cseVendingMachine = new VendingMachine();
        VendingMachine eeeVendingMachine = new VendingMachine();
        System.out.println(cseVendingMachine);
        System.out.println(VendingMachine.getTotalSales());
        System.out.println(cseVendingMachine.getTotalItems());
        System.out.println(cseVendingMachine.getTotalValue());
        System.out.println();

        VendingItem boughtItem = cseVendingMachine.vend(0);
        System.out.println(boughtItem);
        System.out.println(cseVendingMachine);
        System.out.println(VendingMachine.getTotalSales());
        System.out.println(cseVendingMachine.getTotalItems());
        System.out.println(cseVendingMachine.getTotalValue());
        System.out.println();

        boughtItem = cseVendingMachine.vend(3);
        System.out.println(boughtItem);
        System.out.println(cseVendingMachine);
        System.out.println(VendingMachine.getTotalSales());
        System.out.println(cseVendingMachine.getTotalItems());
        System.out.println(cseVendingMachine.getTotalValue());
        System.out.println();

        boughtItem = cseVendingMachine.vend(6);
        System.out.println(boughtItem);
        System.out.println(cseVendingMachine);
        System.out.println(VendingMachine.getTotalSales());
        System.out.println(cseVendingMachine.getTotalItems());
        System.out.println(cseVendingMachine.getTotalValue());
        System.out.println();

        //case for vend method when code position does not contain any item
        boughtItem = cseVendingMachine.vend(9);
        System.out.println(boughtItem);
        System.out.println(cseVendingMachine);
        System.out.println(VendingMachine.getTotalSales());
        System.out.println(cseVendingMachine.getTotalItems());
        System.out.println(cseVendingMachine.getTotalValue());
        System.out.println();

        //case for vend method when code position is invalid >=10
        boughtItem = cseVendingMachine.vend(20);
        System.out.println(boughtItem);
        System.out.println(cseVendingMachine);
        System.out.println(VendingMachine.getTotalSales());
        System.out.println(cseVendingMachine.getTotalItems());
        System.out.println(cseVendingMachine.getTotalValue());
        System.out.println();
    }
}
```

```

//check if getTotalSales() works correctly
boughtItem = eeeVendingMachine.vend(0);
System.out.println(boughtItem);
System.out.println(eeeVendingMachine);
System.out.println(VendingMachine.getTotalSales());
System.out.println(eeeVendingMachine.getTotalItems());
System.out.println(eeeVendingMachine.getTotalValue());
System.out.println();

//check if Stock(VendingItem item) works correctly
VendingItem item1 = new VendingItem("Pepsi", "d", 1.45);
cseVendingMachine.stock(item1);
System.out.println(cseVendingMachine);
System.out.println(VendingMachine.getTotalSales());
System.out.println(cseVendingMachine.getTotalItems());
System.out.println(cseVendingMachine.getTotalValue());
System.out.println();

//check if Stock(VendingItem[] item) works correctly
VendingItem item2 = new VendingItem("Fanta", "d", 1.15);
VendingItem item3 = new VendingItem("Cadbury", "p", 0.46);
VendingItem item4 = new VendingItem("Bournville", "p", 0.65);
VendingItem[] items = {item2, item3, item4};
cseVendingMachine.stock(items);
System.out.println(cseVendingMachine);
System.out.println(VendingMachine.getTotalSales());
System.out.println(cseVendingMachine.getTotalItems());
System.out.println(cseVendingMachine.getTotalValue());
System.out.println();

//check if.getItems(int val) works correctly
cseVendingMachine.getItems(1);
System.out.println();

//check if.getItems(String t) works correctly
cseVendingMachine.getItems("d");
System.out.println();

//check if.getItems(String t) works correctly
VendingItem cheapestItem = cseVendingMachine.getCheapestItem("d");
System.out.println(cheapestItem);

```

```

    }
}

```

Output of the tester

Lays, Doritos, Coke, Rubiks Cube, Pie, Clicker, Cheetos, Cold Pizza, Graphing Calculator, Ramen
0.0
10
219.58

Lays: 1.5

Doritos, Coke, Rubiks Cube, Pie, Clicker, Cheetos, Cold Pizza, Graphing Calculator, Ramen
1.5
9
218.08

Pie: 3.14

Doritos, Coke, Rubiks Cube, Clicker, Cheetos, Cold Pizza, Graphing Calculator, Ramen
4.64
8
214.94

Graphing Calculator: 120.0

Doritos, Coke, Rubiks Cube, Clicker, Cheetos, Cold Pizza, Ramen
124.64
7
94.94

null

Doritos, Coke, Rubiks Cube, Clicker, Cheetos, Cold Pizza, Ramen
124.64
7
94.94

null

Doritos, Coke, Rubiks Cube, Clicker, Cheetos, Cold Pizza, Ramen
124.64
7
94.94

Lays: 1.5

Doritos, Coke, Rubiks Cube, Pie, Clicker, Cheetos, Cold Pizza, Graphing Calculator, Ramen,
126.14
9
218.08

Items Added: Pepsi: 1.45

Doritos, Coke, Rubiks Cube, Clicker, Cheetos, Cold Pizza, Ramen, Pepsi
126.14
8
96.44

Items Added: Fanta: 1.15, Cadbery: 0.46

Doritos, Coke, Rubiks Cube, Clicker, Cheetos, Cold Pizza, Ramen, Pepsi, Fanta, Cadbery
126.14
10
98.05

Cold Pizza, Cadbery

Coke, Pepsi, Fanta

Fanta: 1.15