

CENG211 – Programming Fundamentals

Homework #3

In this homework you are expected to implement a “**Business Application**” in Java. You should fulfill the concepts of:

- Abstract Data Types
- Generics
- Collections
- Exception Handling

In the Business Application, you are expected to build a business that manages the production and shipment of some goods.

There are ingredients to produce and there are products that are result of this production process. Ingredients are milk, cream, cacao, and yeast; products are boxed milk, chocolate, and yogurt. Milk will be used to produce boxed milk; milk, cream, and cacao will be used to produce chocolate; and milk and yeast will be used to produce yogurt. The amounts (as volume) will be as below:

- 1000 L of milk -> 1000 L of Boxed Milk(each milk product is 1 L)
- 500 L of milk, 200 L of cream, and 300 L of cacao -> 800 L of Chocolate(each chocolate product is 0.5 L)
- 1500 L of milk, and 100 L of yeast -> 1400 L of Yogurt(each yogurt product is 2 L)

There are three facilities in this business:

- First one is Warehouse. Here, ingredients are stored. When the ingredient are lacking, you can buy new ingredients and store here.
- Second one is Factory. Here, ingredients will be used to produce products.
- Third one is Distribution Center. Here, products are stored. You can sell products here.

Among these three facilities, ingredients and products should be shipped with different types of containers:

- Dry Storage Container -> boxed milk, chocolate, and yogurt
- Open Top Container -> yeast, cacao
- Tank Container -> milk, cream

Every container can take 1000 L of item. There is only one container for each type. Containers are for only shipping, they cannot be used to store items.

In the facilities, items also should be stored. If an item is an uncountable item, it should be stored in the Storage Tanks which can take 10000 L of item. If an item is a countable item, it should be stored in the Storage Areas which can also take 10000 L of item. (Items should be stored separately)

Uncountable items are milk, cream, cacao, and yeast; countable items are boxed milk, chocolate, and yogurt.

When an uncountable item is tried to store in a Dry Storage Container, an `ItemNotCountableException` should be thrown.

When a countable item is tried to store in a Tank Container or in an Open Top Container, an `ItemNotUncountableException` should be thrown.

Uncountable items cannot be stored together because they will be mixed. When different uncountable items are tried to be stored in a Tank Container or in an Open Top Container, a `DifferentUncountableItemsException` should be thrown.

For containers, items should be gathered in last in first out order. For storage areas, items should be gathered in first in first out order.

For this business, you should calculate the profit and show the calculated value after each operation.

- 1 L of milk costs 0.25 TL
- 1 L of cream costs 0.30 TL
- 1 L of cacao costs 1 TL
- 1 L of yeast costs 5 TL
- One container spends 100 TL to ship between two facilities (Not a round trip, just going).
- 1 L of boxed milk costs 1 TL
- 1 L of chocolate costs 4 TL
- 1 L of yogurt costs 2 TL

Assume company has 10000 TL at the beginning.

This business process should work according to user's choices:

- User can choose to transport a product or an ingredient from a facility to another. You don't have to choose amount for this operation but the container. Amount will be as much as a container can take. At the beginning containers will be at the factory. You should be careful about containers' positions. If a container is transferred from warehouse to factory, it should be transferred back to warehouse again, to ship another item. Similarly, if a container is transferred from factory to distribution center, it should be transferred back to factory again, to ship another item.
- User can buy ingredients to store in the warehouse. User will choose the amount at this operation.
- User can sell products from distribution center. At this operation, user will choose the amount.
- User can choose to produce a product with given amounts above (amounts will be fixed for one production process).
- User can see how much products or ingredients are there in a facility i.e. Factory, Warehouse and Distribution Center.

Important Notes:

1. You are expected to write clean, readable, and tester-friendly code (e.g. make the selections with numbers). Please try to maximize reusability and prevent from redundancy in your methods.
2. You are expected to create all necessary interfaces and exceptions.
3. You should create an instance for each countable item.

4. You can set to null items that are used in production or that are sold.

Assignment Rules:

1. In this lecture's homework, there is no cheating allowed. If any cheating has been detected, they will be **graded as 0** and there will be no further discussion on this.
2. You are expected to submit your homework in groups. Therefore, **only one of you** will be sufficient to submit your homework.
3. Make sure you export your homework as an **Eclipse project**. You can use other IDEs as well, however, you must test if it supported by Eclipse.
4. Submit your homework through **CMS**.
5. Name and export your Java Project with your assigned **group ID** (which will be announced on CMS) as the given format below:

G25_CENG211_HW3.zip

6. Please be informed that your submissions may be anonymously used in software testing and maintenance research studies. Your names and student IDs will be replaced with non-identifying strings. If you do not want your submissions to be used in research studies, please inform the instructor (Dr. Tuglular) via e-mail.

