Due Date: 29.12.2022 23:59

CENG211 – Programming Fundamentals

Homework #4

In this homework you are expected to implement a "**Market Shipment Simulation**" and simulate it in Java. You should fulfill the concepts of:

- Exception Handling
- Generics
- Collections
- Object Oriented Design

In the simulation, you are expected to produce market items and ship them gain an income. The steps of the simulation are as follows:

- Items are produced one by one
- Boxes and Containers are produced
- Produced items are placed to a box according to their properties
- Boxes are loaded to a container
- Containers are shipped and a profit is made

Every step that will be simulated should be read from a csv file called **commands.csv.** Please note that, given csv file is an example; different csv files can be used for evaluation.

The commands are as follows:

Produce a countable item:
1, item code, volume (lt), item serial number
Produce an uncountable item:
1, item code, mass (kg), volume (lt), item serial number
Produce a box that holds countable items:
1, box code, number of items, volume (lt), box serial number
Produce a box that holds uncountable items:
1, box code, mass (kg), volume (lt), box serial number
Produce a container:
1, container code, volume (lt), container serial number
Load:
2, serial number of a loading item or box, serial number of a holder
Ship:
3, serial number of a container
Show total unearned revenue (from the unshipped items):
4, 1
Show total revenue:
4, 2

- Every market item is either countable or uncountable. The list of the items are as follows:
    - Box of milk Countable Item Code: M1
    - Box of water Countable Item Code: W1
    - Box of oil Countable Item Code: O1
    - Sugar Uncountable Item Code: S1
    - Flour Uncountable Item Code: F1
    - Pasta Uncountable Item Code: P1
    - Rice Uncountable Item Code: R1

- Countable items are boxed according to their number and volume in a Number Box with a box code B1. A Number Box can hold X number of items and has Y liter of volume.

- Uncountable items are boxed according to their mass and volume in a Mass Box with a box code B2. A Mass Box can hold X kilogram of items and has Y liter of volume.

- Boxes are loaded according to their volumes to a Container with a container code C1. A Container has X liter of volume.

- At the beginning of the simulation, company has 0₺. Every produced item, box, or container has a cost of production. After a production, revenue calculated, and the revenue can have a negative value. If a container is shipped, revenue is calculated according to the items inside of that container with items prices.
    - Box of milk Cost: 5₺ (for 1 liter) Price: 11₺ (for 1 liter)
    - Box of water Cost: 1₺ (for 1 liter) Price: 3₺ (for 1 liter)
    - Box of oil Cost: 20₺ (for 1 liter) Price: 45₺ (for 1 liter)
    - Sugar Cost: 13₺ (for 1 kilogram) Price: 25₺ (for 1 liter)
    - Flour Cost: 5₺ (for 1 kilogram) Price: 12₺ (for 1 liter)
    - Pasta Cost: 12₺ (for 1 kilogram) Price: 28₺ (for 1 liter)
    - Rice Cost: 16₺ (for 1 kilogram) Price: 32₺ (for 1 liter)
    - Number Box Cost: 2₺ (for 1 liter)
    - Mass Box Cost: 3₺ (for 1 liter)
    - Container Cost: 1₺ (for 1 liter)

- There are rules for the flow of the simulation:
    - An item, a box, or a container cannot be produced with the same serial number
    - An uncountable item cannot be placed to a Number Box
    - A countable item cannot be placed to a Mass Box
    - A Number Box cannot hold items more than its capacity (number of items, volume)
    - A Mass Box cannot hold items more than its capacity (mass, volume)
    - A Container cannot hold boxes more than its capacity (volume)
    - Items cannot be placed to a container directly
    - If a box loaded to container, items cannot be placed to that box
    - Boxed item cannot be boxed again
    - Shipped boxes or containers cannot be used again

- You should throw exceptions for rule violations. Each exception should be defined by you and each of them should have an exception code (for example, existing serial number code can be 5). Preferably, you should extend your exception classes from your rule exception super class.

- Please note that, exception should be handled. Program must not be terminated because of an exception. You should print out the rule violations.

Expected Output Sample:

1 liter of box of milk has been produced with the serial number M001 Revenue: -5₺

2 kilograms of sugar has been produced with the serial number S001 Revenue: -18₺

30 liters of number box has been produced with capacity of 10 with the serial number B101 Revenue: -78₺

20 liters of mass box has been produced with capacity of 15kg with the serial number B201 Revenue: -138₺

100 liters of container has been produced with the serial number C001 Revenue: -238₺

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Item with the serial number P003 cannot be produced (EX: 5 existing serial number) Revenue: -2463₺

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Item M001 has been placed to the box B101

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Box B101 has been placed to the container C001

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Container C001 has been shipped Revenue: 4563₺

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Unearned revenue: 2673₺

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Total revenue: 16783₺

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2 liters of box of oil has been produced with the serial number O007 Revenue: 18452₺

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Important Notes:

1. You can use standard **java.io** packages to read files. Do NOT use other 3rd party libraries.
2. You should use relative paths (e.g., `Files/sample.csv`) instead of absolute paths (e.g., `C:\\user\\eclipse-workspace\\MyProject\\Files\\sample.csv`).
3. To support **Turkish characters,** you may need to change your project's text file encoding to UTF8: Right click on your project (in package explorer) → Properties → Text file encoding → Other → UTF8 → Apply.
4. You are expected to write clean, readable, and tester-friendly code. Please try to maximize reusability and prevent from redundancy in your methods.

Assignment Rules:

1. In this lecture's homework, there are 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 **can be executed** in Eclipse.
4. Submit your homework through Cloud-LMS.
5. Your exported Java Project should have the following naming format with your assigned group ID (which will be announced on MS Teams) as the given below:

   G05_CENG211_HW4

   Also, the zip folder that your project in should have the same name

   G05_CENG211_HW4.zip
6. Please beware that if you do not follow the assignment rules for exporting and naming conventions, you will lose points.
7. 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.