Due Date: 19.04.2023, 23:55

CENG 112 - Data Structures

Homework 1: Garbage Recycling Application

This homework will cover the topics given below:

- Bag ADT
- File I/O
- Generics
- Arrays

Please read the whole document carefully.

In this homework, you are expected to implement a "Garbage Recycling Application" in Java. In this application, there are six types of garbage: plastic, paper, glass, fabric, metal, and organic. For each garbage type, there is a relevant recycling bin. Also, there is a trash can which is a container of garbage.

Trash can is parsed from "garbage.txt". The format of each line in the "garbage.txt" is "***garbage name, garbage type, amount***". For instance, if there is the line "***mineral water bottle, glass, 7***", it means that there is garbage called "mineral water bottle", which is of type "glass". **Note that you should add 7 garbage objects to the trash can for "*mineral water bottle, glass, 7*".** Also, note that, if there is an uncountable type of garbage (such as apple peel) with an amount, say 6, you can assume that it is 6 units (or belongs to 6 apples) and create 6 "apple peel" objects to add to the trash can.

This application separates garbage from the *Trash Can* and transfers it to the relevant recycling bin such as plastic or paper. The *Trash Can* has a size of 450. The sizes of recycling bins are determined randomly from 5, 10, and 15. When the sizes of the recycling bins are determined, garbage enough to fill the recycling bins is added (for each garbage type). For example, if the size of the organic recycling bin is 5, "3 banana peel and 2 potato peel" OR "1 banana peel, 1 potato peel, 1 orange peel, 1 apple peel, and 1 kiwi peel" could be added to the recycling bin. After adding garbage into the recycling bins according to the garbage type, **you should update** the trash can (also the "garbage.txt").

Your program **shouldn't** take user inputs. The **output** of your program will be:

The Trash Can: size and content.
Plastic Recycling Bin: size and content.
….
Organic Recycling Bin: size and content.
The Trash Can: *updated* content.

In this homework, your code must have the interface, class, and method implementations given below. The bullets (I), (C), and (M) stand for interface, class, and method respectively. **Make sure that you not only implement the given interfaces, classes, and methods but also use them (especially methods). For each necessary operation of the homework, there is at least one method you can use. Also, remember to control data structures for their availability such as if a bag is full or not.**

I. IBag

- **M. public boolean add(T newItem);**
- **M. public boolean isEmpty();**
- **M. public boolean isFull();**
- **M. public T removeByIndex(int index);**
- **M. public T remove();**
- **M. public T remove(T item);**
- **M. public int getItemCount();**
- **M. public int getIndexOf(T item);**
- **M. public boolean contains(T item);**
- **M. public void displayItems();**
- **M. public void dump(); // removes all the items from the bag**
- **M. public boolean transferTo(Bag<I> targetBag, T item);**

C. GarbageRecyclingApp

- **M. public static void main(String[] args);**

C. FileIO

- **M. public IBag<Garbage> readTrashCan();**
- **M. public boolean updateTrashCan();**

C. Garbage

- **M. public String toString();**
- **M. public boolean equals(Object obj);**

C. TrashCan implements IBag

- **M. public boolean separate(T item);**

C. PlasticRecycleBin implements IBag
C. PaperRecycleBin implements IBag
C. GlassRecycleBin implements IBag
C. FabricRecycleBin implements IBag
C. MetalRecycleBin implements IBag
C. OrganicRecycleBin implements IBag

- This is a 2-person group assignment. However, inter-group collaboration is not allowed!
- All assignments are subject to plagiarism detection and the suspected solutions (derived from or inspired by the solution of other groups) will be graded as zero.
- It is not allowed to use Java Collections Framework.
- Your code should be easy to read and test: **Keep your code clean**. **Avoid duplication and redundancy. Follow Java Naming Conventions**. Use ***relative paths*** instead of absolute ones. 🔗

Submission Rules

All submissions must:

- be performed via **Microsoft Teams** by only one of the group members,
- be exported as an Eclipse Project and saved in ZIP format,
- include all necessary data files (if any TXT, CSV, JSON, etc.) in the right directory,
- follow a specific naming convention such that CENG112_HW2_*groupID*.

Eclipse Project: CENG112_HW1_*G05*
Exported Archive File: CENG112_HW1_*G05*.zip

Submissions that do not comply with the rules above are penalized.