

## Disclosure

You will submit your file to an assignment that is given through MS Teams. Your filename should be **Quiz02\_{yourStudentNumber}.java**. You will 75 minutes to implement, then you will be given extra 5 minutes to finalize the upload process.

## Objective

We would like you to determine the necessary components yourself, and design according to the requirements that you have detected. You may write any methods, attributes, or classes that you think would be necessary to complete the quiz. This quiz is mainly about abstract classes, interfaces, generics, data structures (Stacks, Queues), and sets and maps. Think about different ways of using these concepts in this quiz.

*Hint: My recommendation to you is to first detect classes, and quickly just define them without delving into detail. Then, try to determine the functionality of each class (methods), but don't try to implement them right away. Following this, figure out its attributes. You have creative freedom, as long as it makes sense given the specifications you will do just fine.*

## Specifications

In our electronics manufacturing facility, the production process revolves around creating high-quality GPUs and CPUs. This facility has two identical production lines, each customized for the manufacturing of a different product.

At the heart of this facility, products are characterized based on their model names and initial durability. Additionally, each type of product have attributes such as VRAM size and a quality score for GPUs, while CPUs are characterized by their operating frequency. At the moment, only GPUs are testable for quality assurance purposes, but we are looking forward to expanding our testing capabilities to include CPUs in the near future. The facility is managed by a hierarchy of employees, each with specific roles and responsibilities, ensuring production and quality assurance processes run smoothly. Each of our employees are easily distinguishable by their name tags.

Engineers play a pivotal role in enhancing the durability of the products assigned to the production lines they work on. Our engineers have varying levels of experience, which directly impacts their effectiveness in improving product durability. Each of our production lines is overseen by a chief engineer, who are responsible for hiring new talent and deciding when to part ways with engineers. In the production lines, each engineer works on the provided product to improve its durability.

Quality assurance specialists are responsible for testing these products, evaluating their durability, and assigning a quality score to each of them. They utilize a table of target durabilities for each model name to tailor their testing methods. If necessary, they can add new models to their table or update the existing target durabilities to meet the market standards. Products that meet the required quality threshold are stored back in the facility's warehouse, while those that do not are sent back to a queue of product orders. This ensures that only the best products reach the market.

In this facility, orders are taken from customers who provide model names for the products. For each product type, we maintain tables with model names and their corresponding specifications. These tables guide the production lines in manufacturing the correct products. When an order is received, we consult these tables to ensure that each product is assigned to the correct production line. If the model name corresponds to a GPU, the order is sent to the GPU production line, and if it corresponds to a CPU, it is sent to the CPU production line. This process ensures that every product is built according to its specific model requirements.

The process of evaluating the quality of products in the facility involves a careful assessment by a quality assurance specialist. Initially, a product is taken from the pending orders. If the product is suitable for testing, the specialist examines it to determine its quality, focusing on its durability. If the quality is found to be below a certain threshold, the product is sent back for further improvements. Otherwise, the product is recorded as ready for shipment and added to the facility's inventory, linked to its model name.

The process of analyzing the facility's product inventory involves two steps. First, the facility creates a new mapping by reversing the relationship between products and their model names. This means that instead of linking a product to its model name, the system now links model names to a collection of products. This new mapping allows for easy analysis of how many products correspond to each model name.

In the second step, the facility identifies the most popular product model. By examining the reversed mapping, it counts the number of products associated with each model name. The model with the highest count is determined to be the most popular. This analysis helps the facility understand production trends and customer preferences, ensuring they can meet demand effectively.