Fall 2023 CSCI 3400 :: Object-Oriented Design
Assignment 01 :: Recognizing Patterns in Real Life

Alice and her painting world!

Alice is a 5-year-old child who likes to draw geometric shapes. These days, she draws circles, triangles, rectangles, and hexagons. She usually draws on her drawing book using crayons from her crayon set. The drawing book has 50 sheets in it, and the crayon set has 15 different colored crayons. Sometimes she draws shapes with different colors and sizes; she uses three standard sizes, small, medium, and large, for drawing (like a small yellow circle, a large blue triangle, a medium purple hexagon, etc.) She always draws one shape on one sheet. The crayons do not last very long; each crayon can draw 3 large shapes (or equivalently 6 medium shapes or 12 small shapes).

Alice's grandma keeps an eye on her grandchild and would like to remind her of getting rest once she draws at most 3 shapes in one sitting.

Alice's dad would like to know about the status of the crayons and the drawing book so that he can buy her that stuff if things run out. So, Alice's dad wants to get a reminder when only less than 10% of pages remain unused in the drawing book, and only more than 50% of the crayons had less than 25% of their capacities.

We, the enthusiast programmers who have mastered the OOP class and are studying some principles (like SOLID) and patterns (Decorator, Observer-Observable, Factory) in the OOD class, want to simulate the situation in Java. Before we jump into coding, we need to identify the participating entities (classes, interfaces, properties, methods, etc.) for implementing the whole situation. As part of this assignment, let us answer the following questions:

1. Who are good candidates for Classes? Name each class as close to the problem it addresses as possible.
2. Who are good candidates for Interfaces? Name each of the interfaces as close to the problem description as possible. Why do you think that the identified entity should be an interface?
3. Identify any inheritance relationship between the classes (if exists).

4. Do you identify any class that composes other class(es)? If so, name who composes whom.
5. Do you see the case for a decorator pattern in the scene? If so, which class is a candidate for that pattern? Give an example.
6. Do you see the case for an observer pattern in the scenario? Which class(es) contribute to the Observer-Observable pattern? Justify your statement briefly.
7. Do you see the case for a factory pattern in the scenario? Which class contributes to the factory pattern? Justify your statement briefly.
8. Draw UML diagram(s) to express the relationships between different entities (classes, interfaces) stated in this scenario.

*** Each question carries 5 points, making the assignment worth 40 points in total. Partially correct answers will get partial credits.

*** Submit the file named as **csci3400assignment01Lastname.(txt/pdf/doc)**. The Lastname should be replaced by your last name (or your teammate's last name).
