Hello everyone,

The Bag abstract data type (ADT) is a type of multiset in Java, meaning that it offers the Set functionality of storing elements without any specific order, but unlike a Set, the Bag can contain duplicate elements (GeeksforGeeks, 2018). Any implementation of the Bag ADT will provide methods for adding and removing elements, checking whether an element exists, checking the size of the Bag or if it is empty, displaying bag contents, and getting the frequency of a particular element (Colorado State University Global, 2024). These behaviors of this ADT make it particularly suited for applications where it is important to keep track of the frequency of elements and order does not matter. The Bag benefits from this lack of complexity, allowing users to focus on the number of occurrences for each element and not be concerned with ordering elements in a particular way or keeping track of other aspects of the data. These characteristics distinguish the Bag from both the Set and the List, making it a useful alternative in certain scenarios.

One example of a problem that the Bag ADT would be useful for is experimentally determining the probability of random events. Let’s say that we wanted to determine the relative frequency of flight delays for each destination at an airport. We could use a Bag with the elements being the destinations of each flight that gets delayed. Then, we would be able to get the frequency of delays for each destination, which could be used to calculate the percentage of delays that each destination accounts for. We might find that more popular destinations have delays more often than less popular ones. To extend this analysis, we might use another Bag to keep track of the number of flights for each destination so that we could normalize the results. This would reveal the percentage of delayed flights for each destination regardless of the quantity of flights for that destination. Using the Bag ADT to answer these questions is good practice because we need to allow for duplicates, but the order of events is unimportant. Thus, using a Set would not accommodate our needs, and using a List would add unnecessary complexity to the problem.

Reference:

Colorado State University Global. (2024). *Module 1: Introduction to the Abstract Data Types and Bags*. Instructure. <https://csuglobal.instructure.com/courses/100750/pages/module-1-overview?module_item_id=5178267>

GeeksforGeeks. (2018, May 18). *Multiset Interface | Guava | Java*. <https://www.geeksforgeeks.org/multiset-interface-guava-java/>