**JUSTIFICATION OF DATA STRUCTURES**

The first thing why comes in mind when one discusses about an object is the attribute which represents it. An object can be represented or described by adjectives such as weight, price, colour, shape etc.

In the case of the Art collector the attributes which describes the art objects possessed by the owner are the number, description and price.

The objects are stored in four secure warehouses, located in four different parts of the country. As warehouses can be identified as objects, the attributes which represents them in this case are the name and the total capacity.

A way to represent the objects, which are, art objects and warehouses in Python is the use of the data structures, Classes.

**CLASSES**

A class is a blueprint created for an object. This defines a set of attributes that will characterize any object that is instantiated from this class. An object is an instance of a class. This is the realized version of the class, where the class is manifested in the program

**Warehouse Class**

The attributes of the warehouse class are the name, capacity and a list which will contains the items of the warehouses.

Why list?

Lists are a collection of arbitrary objects, somewhat similar to array in many other programming languages but more flexible. List are ordered, contains any data types, can be accessed and sorted by index and most importantly are mutable which authorizes future manipulation to its elements.

Warehouse methods

The warehouse class also contains a set a methods which allow the user modify the values of an instance of the class. For instance whenever an item object is added to the warehouse list, the insurance of the warehouse is changed by using the method to decrement the remaining insurance.

Warehouse Objects

As the Art objects are stored in 4 different warehouses, 4 warehouses objects are created each with a name representing them and a total capacity.

These objects are then made global using the global keyboard.

An advantage of using global variables is the ability to change their state without being passed as a function parameter.

**Item Class**

Whenever a new art object is added, an instance of the item class is created.

The instance of the item class then represents the state of the item which is added to be added to warehouse.

The state of the item is the number, description and price.

The item is appended to the list of the appropriate warehouse and the insurance of the warehouse is decreased by the item price.

**SEARCHING AN ITEM**

As items have to located and manipulated, a searching function is provided to the Art collector.

The algorithm used to search items in this program is **Interpolation search.**

Why not linear search?

Linear means proportional to number of items. As the warehouses contains a large amount of items, the time taken to find an item at the bottom would be as much as the number of items in the warehouses.

The time complexity of a linear search in fact is O(n), for this reason a searching algorithm such as linear such is avoided.

Interpolation Search

Interpolation search is an improved variant of binary search. This search algorithm works on the probing position of the required value.

The difference between the binary and the interpolation sort is that the binary search always splits the list in half and inspects the middle element.

For instance if a list contains items with numbers 100,200,300..,1000 and the value being search is 900, binary searched would split the list at 500,split at 800,split at 900 and would find the searched value.

Interpolation search would however calculate the probable position (index 900) and would immediately find the value. The time complexity of interpolation search is O (log (logn)) whereas binary search is O (log n).

**SORTING A WAREHOUSE**

In order for items to be organized, sorting algorithms are used in the program. The main algorithm used is Merge Sort.

Bubble sort

This sorting algorithm is comparison-based algorithm in which each pair of adjacent elements is compared, and the elements are swapped if they are not in order. This algorithm is not suitable for warehouses with large number of items as its average and worst case complexity are of Ο(n2).For this reason bubble sort is avoided.

Merge-sort

Merge-sort breaks the warehouses into 2 halves, it then merges the items sorting them. This means the time complexity in all cases (best, average, and worst) is O (nlogn) as it takes linear time to merge the warehouse items.