Data Structures

Assignment 3

Write a C++ program to simulate students walking about campus adding and removing items from their backpacks.

Write three classes: Item, Backpack, and Student. For all of them, write appropriate constructors and use software development principles involving encapsulation (so write accessors and mutators instead of exposing the implementation, etc.) Write all the functions listed below but be aware this is not an exhaustive specification. You may write any additional helper functions you need for your design.

An Item should have a name, a weight, and 4-5 qualities of your choosing (size, type, is_glass, might_explode, etc.). Write a to_string() method to capture the item and its qualities.

A Backpack should have a capacity and contents. Write contents as a 10-element array of Item pointers. The add() method should use one of these pointers to dynamically allocate memory to put a new Item onto the heap. If there are already 10 elements in the array, or if the weight of the Item would exceed the capacity of the Backpack, then add() should not add the item. The remove() method should take in an item name and deallocate the memory associated with it. Write a destructor that will deallocate all the memory. Write a to_string() function that returns the contents of the Backpack.

A Student should have a name, 3-4 other attributes as you see fit, and a Backpack. A Student should be able to add() and remove() items from their Backpack as well as give() an Item to another Student. Write a copy constructor for Student that can create a new Student as a copy of an existing Student. The to_string() method for Student should give the name, a couple attributes, and the contents of the Backpack.

Write driver code in main() that demonstrates all the functions in action.