CS1114 Structures Problem Set

September 27, 2023

Instructions:

- You should work together in groups in class to solve these problems (if we have time!).
- Every student, however, must submit his or her own submission for credit.
- Questions do not necessarily appear in order of difficulty
- Each solution should be thoroughly **designed**, following each step of the design recipe in detail.

1. **Stockroom**

   You are in charge of a store's inventory/stock. Each item needs to have a name, a price, a quantity available and a SKU. Write a function to calculate the store's total investment in this item (total price of entire quantity of this item.) Write a second function to print a price tag for this item, with its name, SKU, and price.

2. **Track Scores**

   Your are in charge of maintaining the records for competitors in a track meet. Write a function to compare two athletes and—if they compete in the same event—return the name of the one with the faster time. If they do not compete in the same event, throw an error that says "cannot make meaningless comparison".

3. **HR**

   You are modeling an applicant tracking system. Each application has an applicant name, a position, and a status. A status can be one of "received", "under review", "contacted", "interviewed" or "hired". Write a function to update the application status through to the next stage. Once a person is hired, they cannot be moved forward any further, so that is an error. Write another function, reject, to move that application to one other status, "reject".

4. **Hotelier**

   You are a hotelier, and you need to model a room. Create a structure to represent a hotel room with fields for room number, occupancy status, and cleaning status. Write a function to book a room only if it's not already occupied and is cleaned. Otherwise, return the room unchanged.

5. **Brokerage**

   You are a forex desk at a brokerage firm. Each currency you model has a name and an exchange rate to the USD. Clients come to you with amount of money in one currency, and they want to change it into another currency. You change it for them to the second currency at the going exchange rate, taking 2% of the value of the input currency. Model this scenario.

6. **Address Label Printer**

   Represent an address, with fields for the street name, number, city, state (2-letter abbreviation), and zip code. Write a function to print a formatted address label.

   Example Output:

   ```
   "123 Main St Springfield, IL 62704"
   ```

   Write a second function to determine if a given address is in Maine.

7. **Person with Address**

   Create a structure to represent a person, with fields for the person's name and an address structure (from problem 1). Write a function to update a person's address.

8. **2D Point and Coordinate Systems**

   Write a function to translate a point from rectangular to polar coordinates. Write a function to translate a point from polar to rectangular coordinates.

9. **Vehicle with Engine Structure**

Create a structure to represent an engine, with fields for the horsepower and fuel efficiency. Create another structure to represent a vehicle, with fields for the make, model, year, and an engine structure. Write a function to calculate the fuel consumption of the vehicle over a given distance.