Project Design Patterns

Design Patterns Assignment

- For this assignment, you will be using some of the design patterns we discussed:
    - Singleton
    - Decorator
    - Factory
    - Observer
- You will use these patterns in creating a Roach Motel. There can be only one Roach Motel. The Roach Motel will be created with an initial capacity (number of rooms).
- When the motel is full, turn on the no vacancy sign. Otherwise the vacancy sign should be shown
- Each of the rooms start out at the base rate but you can add amenities only when a customer checks in. Your customer will be a Roach Colony.
- A Roach Colony has a name, an initial population, and a growth rate.
- The base rate of a regular room is $50 per night.
- The base rate of a deluxe room is $75 per night.
- The base rate of a suite is $100 per night.
- The amenities include:
    - A food bar - add $10 per night
    - A spa - add $20 per night
    - Autorefill of the food bar - add $5 per night
    - Spray resistant shower - add $25 dollars per night
- Roaches like to throw parties. Everytime they invite friends, the number of occupants in the room increase by their growth factor.
- Whenever a RoachColony throws a party, the party is sprayed with insecticide. If the room has an antispray shower, the number of roaches is reduced by 25%. Without the shower, the number of roaches is reduced by 50%.
- When the roaches check out, we calculate the bill as the room rate mulitplied by the numbers of days that the RoachColony has been our guest. Then we make that room available.
- If a RoachColony tries to check in and there are no available rooms, we add them to a waitlist.
- When a room does become vacant, we notify every colony on the list then clear out the list.
- When the colony receives the notification, the colony will display a message that the notification has been received.

Grading Criteria

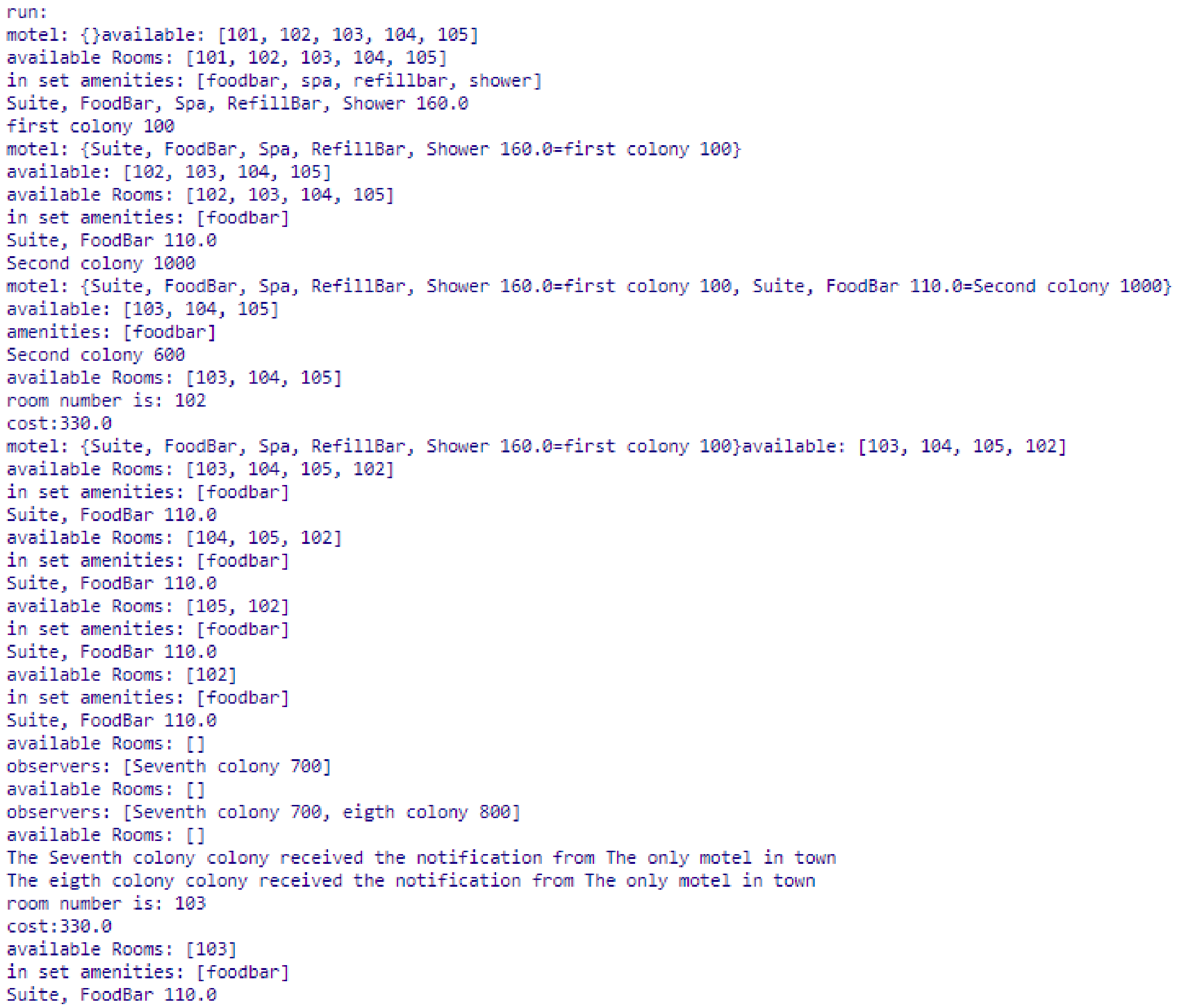
You will be graded on the following components:

- Does the program do what is required
- Is it properly documented
- Is it fully tested
- As always, remember to create a default constructor and override the toString() method for all classes.
- Is it properly designed
- Does it follow the design patterns
- Were the design patterns used properly

Sample Tester and Output

Following is a small tester and its output. This sample does not test everything -- it is just meant as a proof of concept. Your tester will cover everything in greater detail.

```
RoachMotel rm = RoachMotel.getInstance();
rm.createRooms();
System.out.println(rm);
RoachColony rc1 = new  RoachColony("first colony",100,200);
ArrayList amenities = new ArrayList();
amenities.add("foodbar");
amenities.add("spa");
amenities.add("refillbar");
amenities.add("shower");
MotelRoom r1 = rm.checkIn(rc1,"Suite",amenities);
System.out.println(rc1);
System.out.println(rm);
RoachColony rc2 = new RoachColony("Second colony",1000,0.2);
ArrayList amenities2 = new ArrayList();
amenities2.add("foodbar");
MotelRoom r2 = rm.checkIn(rc2,"Deluxe",amenities2);
System.out.println(rc2);
System.out.println(rm);
rc2.party();
System.out.println(rc2);
Double cost = rm.checkOut(r2,3);
System.out.println("cost:" + cost);
System.out.println(rm);
RoachColony rc3 = new RoachColony("third colony",300,0.3);
MotelRoom r3 = rm.checkIn(rc3,"Regular",amenities2);
RoachColony rc4 = new RoachColony("fourth colony",400,0.4);
MotelRoom r4 = rm.checkIn(rc4,"Regular",amenities2);
RoachColony rc5 = new RoachColony("fifth colony",500,0.5);
MotelRoom r5 = rm.checkIn(rc5,"Deluxe",amenities2);
RoachColony rc6 = new RoachColony("sixth colony",600,0.6);
MotelRoom r6 = rm.checkIn(rc6,"Deluxe",amenities2);
RoachColony rc7 = new RoachColony("Seventh colony",700,0.7);
MotelRoom r7 = rm.checkIn(rc7,"Suite",amenities2);
RoachColony rc8 = new RoachColony("eigth colony",800,0.8);
MotelRoom r8 = rm.checkIn(rc8,"Suite",amenities2);
RoachColony rc9 = new RoachColony("ninth colony",900,0.9);
cost = rm.checkOut(r3,3);
System.out.println("cost:" + cost);
MotelRoom r9 = rm.checkIn(rc9,"Regular",amenities2);
```



```
run:
motel: {}available: [101, 102, 103, 104, 105]
available Rooms: [101, 102, 103, 104, 105]
in set amenities: [foodbar, spa, refillbar, shower]
Suite, FoodBar, Spa, RefillBar, Shower 160.0
first colony 100
motel: {Suite, FoodBar, Spa, RefillBar, Shower 160.0=first colony 100}
available: [102, 103, 104, 105]
available Rooms: [102, 103, 104, 105]
in set amenities: [foodbar]
Suite, FoodBar 110.0
Second colony 1000
motel: {Suite, FoodBar, Spa, RefillBar, Shower 160.0=first colony 100, Suite, FoodBar 110.0=Second colony 1000}
available: [103, 104, 105]
amenities: [foodbar]
Second colony 600
available Rooms: [103, 104, 105]
room number is: 102
cost:330.0
motel: {Suite, FoodBar, Spa, RefillBar, Shower 160.0=first colony 100}available: [103, 104, 105, 102]
available Rooms: [103, 104, 105, 102]
in set amenities: [foodbar]
Suite, FoodBar 110.0
available Rooms: [104, 105, 102]
in set amenities: [foodbar]
Suite, FoodBar 110.0
available Rooms: [105, 102]
in set amenities: [foodbar]
Suite, FoodBar 110.0
available Rooms: [102]
in set amenities: [foodbar]
Suite, FoodBar 110.0
available Rooms: []
observers: [Seventh colony 700]
available Rooms: []
observers: [Seventh colony 700, eigth colony 800]
available Rooms: []
The Seventh colony colony received the notification from The only motel in town
The eigth colony colony received the notification from The only motel in town
room number is: 103
cost:330.0
available Rooms: [103]
in set amenities: [foodbar]
Suite, FoodBar 110.0
```