Lab Statement

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Disclaimer

This lab is based on Inheritance concepts. The last lab was meant to give you an idea about how inheritance works. Today's lab is going to be long if you aren't familiar with the concepts.

Introduction

This lab you are going to build a Building this time with different types of rooms. In the previous labs, you have already built stuff such as a house using primitives such as Rectangle, Triangle. Now, you have to adhere to Inheritance concepts in order to tackle the same problem effectively.

There are some main classes such as **Building, Room, Washroom, LivingRoom, BedRoom** and **Bed**. There are some other minor classes as well.

In our problem, a building is made up of many floors and each floor is made up of many rooms. The height of the building changes as new floors are added to the building. There is no restriction placed on the height of the building, but there is a restriction on the number of floors a building can have. In a floor, there can be multiple rooms of different types. All these rooms have the same height and width as the building but the length can vary.

The number of rooms that be added in a floor depends on the amount of free space available on the floor. For instance, if the floor length is 100 and rooms of length 20 and 70 have been added, then a room of length 20 can't be added.

There are 3 types of rooms that can be added to a floor:

- Living Room
- Wash Room
- Bed Room

All these classes extend an abstract class called **Room** which has some common functionality for all room types.

All rooms have 2 types of costs associated with them:

- **Operating Cost**: Cost of operating the room. This might include electricity bill, water bill etc.
- **Build Cost**: Cost of construction of the room.

Class Design

Building Class

The class has fields such as height, width and length. This class also has an public inner class be called as Floor because a class like Floor would not be used by any other class. The building has simple functionality such as adding a floor, computing operating cost and building cost.

Floor Class

The class has fields such as height, width and length. The class has similar functionality as the building, such as adding a room, computing operating cost and build cost.

Room Class

This **abstract** class defines any common functionality that any room might have such as width, length , height , operating and build costs. The **getBill()** function has been made abstract as each type of room might have a different way of bill computation.

LivingRoom Class

The living room has a TV and is associated to a **tvState** boolean variable which tells us if the TV is **ON** or **OFF**. If the **watchTV()** function is called, the TV is switched **ON** if it was **OFF.** Else, the TV remains **ON.** Turning on the TV adds some cost to the **electricityBill** of the room which in turn contributes to the **operatingCost** of the entire floor.

Washroom Class

The washroom is associated with some real life functions such as **flush()**, **handWash()** and **brushTeeth().** All these operations contribute to the **waterBill** of the room which in turn contributes to the **operatingCost** of the entire floor.

Bed Class

This class represents a bed. It has width, length and bed material as properties. The bed has some building cost associated with it but doesn't have any operating cost.

Bedroom Class

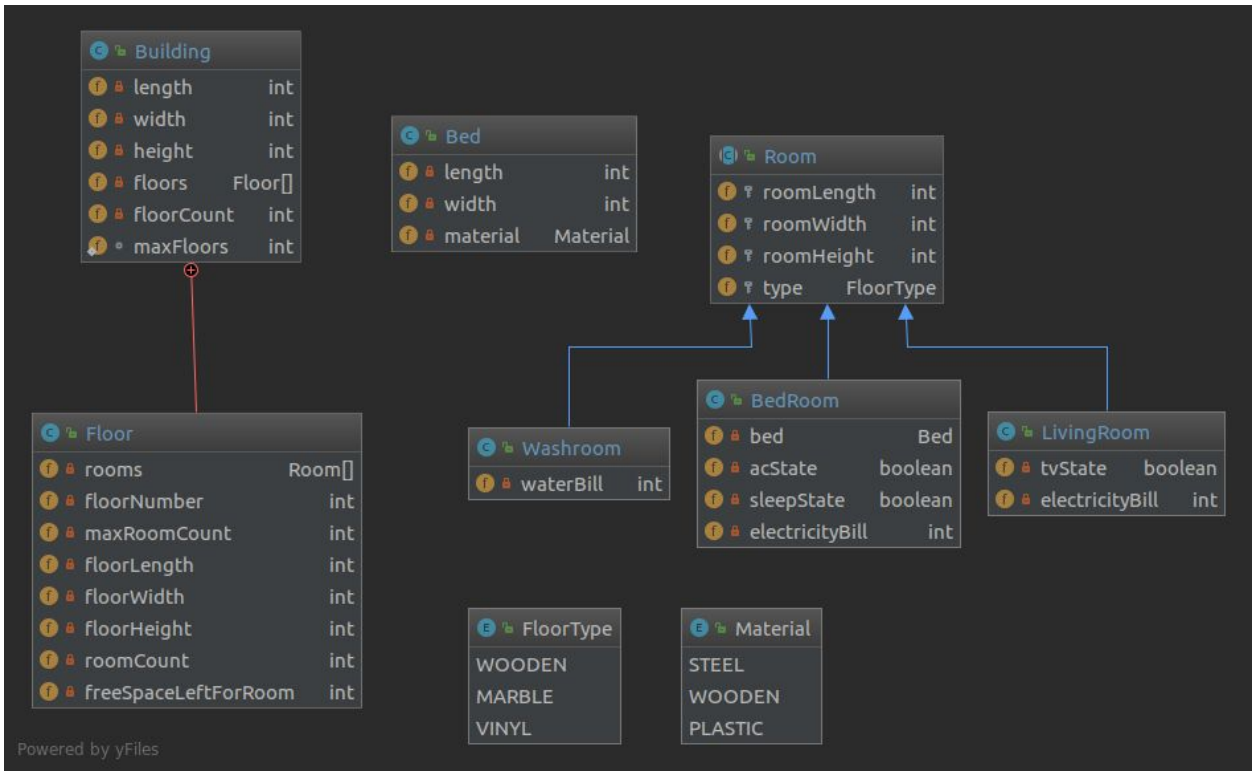
The bedroom has 2 boolean variables that keep track of the room's state.

- sleepState : True if the person is sleeping else it is false.
- acState : True if the AC is switched on, else it is false.

Calling the **acState()** function adds to the electricity bill of the room and contributes to the **operatingCost** of the floor.

FloorType and **Material** are **enums.**

Top Level Package Diagram



Test Cases

Test Case Description	Marks
Working of class **Bed**	1
Working of abstract class **Room**	1
Working of class **Washroom**	1
Working of class **LivingRoom**	1
Working of class **Bedroom**	1
addFloor() and **getFloorCount()** of class Building	1
Constructor and **addRoom()** in class Floor	1
getOperatingCost() and **getCost()** of class Building	2
getSurfaceArea() of all classes defining the method	1

Submission

It is recommended that you start solving the lab in the order of test cases. All the test cases are dependent on the success of the previous test cases.