

More Classes

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1 Assignment 1

Our first assignment will reinforce the difference between static and non-static variables and methods. This one is the easiest.

Create a class `Room`. We will use `Room` objects to record the number of people in a building. A room is defined by the number of people it holds, but in addition, we also want to know the total number of people in all `Rooms`. That's something that is shared among all the `Rooms`, so that's a `static` variable. The class has the attributes:

- `numberInRoom` – the number of people in a room
- `totalNumber` – the total number of people in all rooms. Since this is shared among all instances of `Room` it is a `static` variable. Make it `private` too.

The class has the following methods:

- `addOneToRoom` – adds a person to the room and also increases the value of `totalNumber` (right? you've added one person to the room, so not only does the number of people in **this** room increase, so does the total number of people from every room).
- `removeOneFromRoom` – removes a person from the room, ensuring that `numberInRoom` does not go below zero, and decreases the value of `totalNumber` as needed.
- `getNumber` – returns the number of people in this `Room`.
- `getTotal` – a static method that returns the total number of people in all `Room` objects.

Create a few `Room` classes and confirm they work.

2 Exercise 2

Create a `ComplexNumber` class to represent a complex number. A complex number is a number that's of the form $a+bi$, where a and b are real numbers ($a, b \in \mathbb{R}$), but $i = \sqrt{-1}$, also called the imaginary unit.¹ Check Wikipedia if you need a refresher.

The fields for a `ComplexNumber` should be a and b . Create a constructor that initializes values for both a and b . **You do not need a variable to represent i , the imaginary unit.**

Create instance methods `add`, `subtract`, `multiply`, and `divide`. Each of these methods will take in *one* other `ComplexNumber` and performs the stated operation to produce a new `ComplexNumber`.

For example, the `add` method should look like this:

```
public ComplexNumber add(ComplexNumber other) {
```

Demo by creating some complex numbers and testing them out.

3 Inconsistent Naming Scheme 3

Create a class called `TicTacToe` to represent a game of tic-tac-toe. Represent the state of the game board with a 2D `char` array (3 rows and columns) and a variable to tell who's turn it is.

Methods:

- Add a move, which marks a square with 'X' or 'O'
- Display the board
- Tell whose turn it is
- Detect if there is a winner
- Tell the user(s) who the winner is
- Restart the game

Write a main method for the class that will allow two players to play a game of tic-tac-toe.

¹This is a bit of a misnomer, as it implies it doesn't exist.

4 Grading

The first two problems are worth 25 points each. Tic-tac-toe is worth 50 points.