SYSC 2004
Winter 2018
Lab 8

Objectives

1. Abstract Classes
2. Interfaces

Provided: JUnit test files for Player.java and all the Square (sub)classes

Submission Requirements: (Exact names are required by the submit program)

- **Without a submission you will not get a mark**
  GoSquare.java, GoToJailSquare.java, IncomeTaxSquare.java, Player.java, PropertySquare.java, Square.java

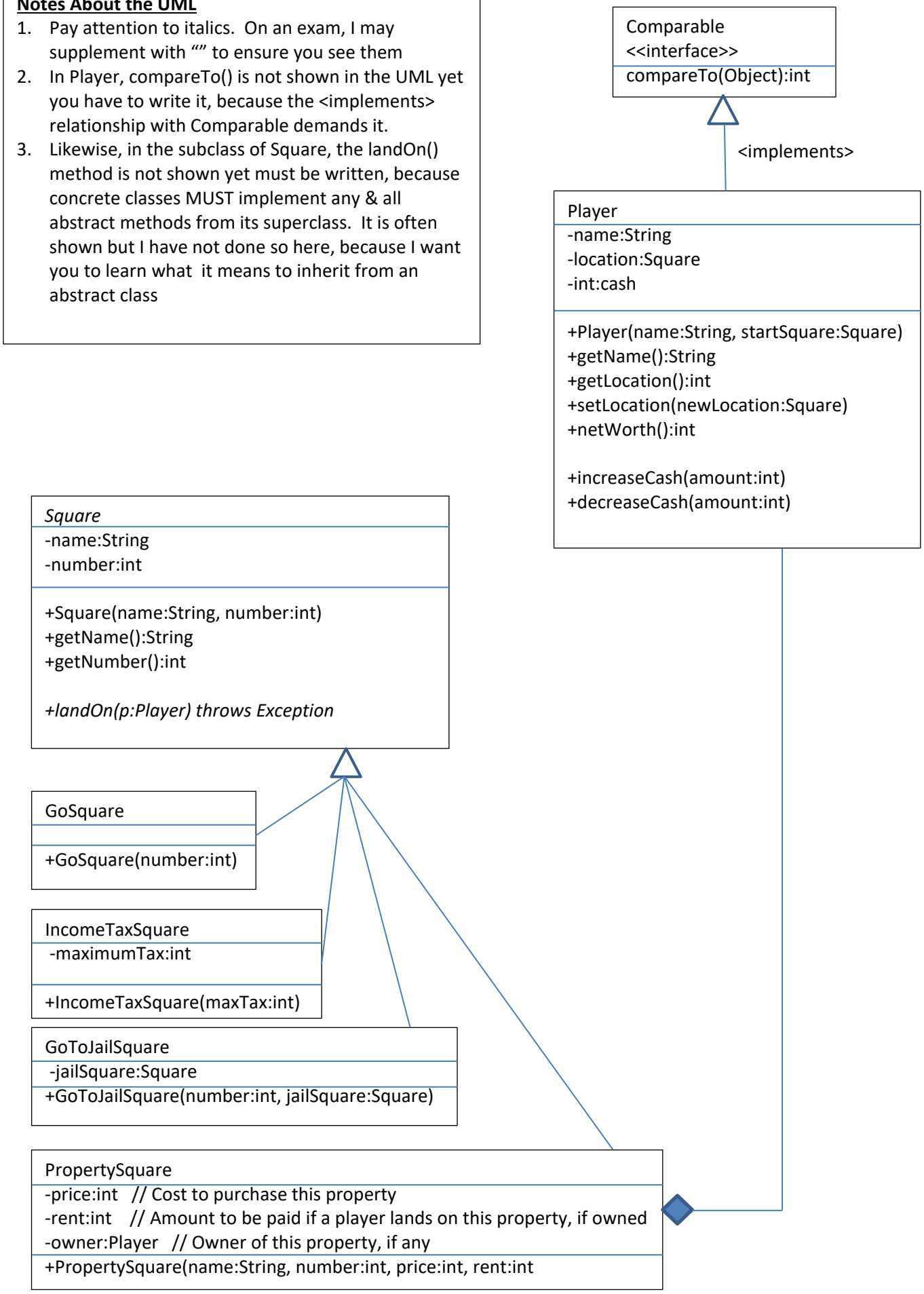
Background

We are going to build (part of) a Monopoly game. If your childhood has not included board games such as Monopoly, here's a couple of links.

- Images of the board: https://goo.gl/images/DE5HjH
- Rules of the game: https://www.hasbro.com/common/instruct/monins.pdf Please attention to the Go Square, Buying Property, Paying Rent and Jail.

Notes About the UML

1. Pay attention to italics. On an exam, I may supplement with "" to ensure you see them
2. In Player, compareTo() is not shown in the UML yet you have to write it, because the <implements> relationship with Comparable demands it.
3. Likewise, in the subclass of Square, the landOn() method is not shown yet must be written, because concrete classes MUST implement any & all abstract methods from its superclass. It is often shown but I have not done so here, because I want you to learn what it means to inherit from an abstract class



All parts must be completed to be considered for a Satisfactory mark for the lab

Part 1 : The Player Class

1. You are given most of the implementation of the Player class (as well as its JUnit test). You must simply implement the `Comparable` Interface
    - In the class declaration, add " `implements Comparable`"
    - Within the class implementation, add the skeleton code for the `compareTo`() method
    - Look at the notes and/or do a web-search for the API of the `Comparable` interface. Study the return values that are expected from this method
    - Use the player's `netWorth` as the measure of comparison. **One player is greater than the other if its `networth` is greater than the `other`'s `netWorth`.**
2. Run your code against the provided JUnit class

Part 2 : The Square Abstract Class

1. Using the UML design, implement the very small Square class.
2. It is an abstract class; consequently, we cannot instantiate it. There is no JUnit test to run.[1]

Part 3 : The Easy Square Concrete SubClasses

1. Implement the `GoSquare` **sub**class. (Don't forget the `extends`)
    - The `landOn`() method should set the `location` of the `player` to `this` `square`, and increase the `player's cash` by 200 dollars
    - Special Instruction (with a special learning objective): Even though, in Part 2, you (should have) advertised an Exception for Square's abstract method landOn(), do **NOT advertise an Exception in the GoSquare's landOn() method.**
        - Refer to the lecture notes on Exception, to the slides titled "Inheritance & Throwing": A subclass may throw the same – or less – exceptions than its parent class.
    - Run the `GoSquareTest`
2. Implement the `IncomeTaxSquare` subclass.
    - Its constructor should set the maximumTax to 200 dollars
    - The `landOn`() method should set the `location` of the `player` to `this` `square`, and decrease the `player's cash` by 10% of the `player's netWorth` (up to `maximumTax`).
        - **As in the GoSquare class, do not advertise an Exception on landOn().**
    - Run the `IncomeTaxSquareTest`
3. Implement the `GoToJailSquare` subclass
    - This square is a little different: When a `player` lands on `GoToJail`, they are immediately (re-)directed to the `Jail` square.

[1] Actually, there is one. Look at it and find out how you can test an Abstract class.

- **As in the GoSquare class, do not advertise an Exception on landOn().**
- Run the `GoToJailSquareTest`

Part 4 : The Property Concrete SubClasses

The `Property` subclass is a wee bit more involved because a property may have an owner to which a player must pay rent if they land on the property.

1. Create an initial version of the `PropertySquare` subclass.
    - Its constructor should initialise all instance variables, including the `owner` which should be set to null (because by default a square is not owned)
    - In this initial version, the `landOn`() method should initially simply set the `location` of the `player` to `this square`
    - Run the `PropertySquareTest` . It should fail, but at least you are on your way.
2. Go back and fully implement the `PropertySquare::landOn()` method
    - **Tip**: If you don't know Monopoly, you can reverse-engineer the rules by reading the JUnit test code.
    - If a `square` has no owner, the `player` must buy the `square`, if they have enough `cash`.
        - In the `PropertySquare` itself, the `owner` must be updated.
    - If the `square` already has an `owner`, the given `player` must pay rent for landing on this square. Rent is paid **from** the `player` **to** the owner of **this** `square`. If a `player` has insufficient cash to pay the required rent, all possible rent is paid to the owner **and an `exception` is thrown** to announce that the given `player` is now out of the game.
    - Run the `PropertySquareTest` until all tests pass