School of Science

Further Programming COSC 2391/2401, S1, 2020
Casino Style Dice Game

Assignment Part 1: Console Implementation

	Assessment Type: Individual assignment; no group work. Submit online via Canvas→Assignments→Assignment 1. Marks are awarded for meeting requirements as closely as possible according to section 2 and the supplied rubric. Clarifications/updates may be made via announcements/relevant discussion forums.
	Due date: Due 6:30PM Fri. 17th April 2020. Late submissions are handled as per usual RMIT regulations - 10% deduction (2.5 marks) per day (Saturday and Sunday count as separate days). You are only allowed to have 5 late days maximum unless special consideration has been granted.
	Weighting: 25 marks (25% of your final semester grade)

1. Overview

NOTE: The separately provided Javadoc and commented interface source code is your main specification, this document serves as a starting point. You should also regularly follow the Canvas assignment discussion board for assignment related clarifications and discussion.

This assignment requires you to implement a game engine and console based user interface (logging output only, no user interaction required) for a casino style dice game. The rules are simple, each player places a bet and then rolls two dice before the house rolls against the players .. Highest value (sum of the two dice) wins! A draw is a no contest and the bet is returned to the drawing player.

NOTE: players only play against the house not against each other. Also, do not worry about modelling a real Casino “craps” game with its more complex rules. The focus here is on the implementation of a specification using a simple, highest dice sum wins.

2. Assessment Criteria

This assessment will determine your ability to implement Object-Oriented Java code according to a formal Javadoc specification. In addition to functional correctness (i.e. getting your code to work) you will also be assessed on code quality. Specifically:

- You should aim to provide high cohesion and low coupling.
- You should aim for maximum encapsulation and information hiding.
- You should rigorously avoid code duplication.
- You should comment important sections of your code remembering that clear and readily comprehensible code is preferable to a comment.
- Since this course is concerned with OO design you should avoid the use of Java 8+ lambdas which are a functional programming construct.
- You should CAREFULLY read the instructions and supporting code and documents. This assignment is intended to model the process you would follow writing real industrial code.
- IF IN DOUBT ASK EARLY!

3. Learning Outcomes

This assessment is relevant to the following Learning Outcomes:

CLO1: **Explain** the purpose of OO design and **apply** the following OO concepts in Java code: inheritance, polymorphism, abstract classes, interfaces and generics.

CLO2: **Describe and Document Diagrammatically** the OO design of the Java Collection Framework (JCF) and **apply** this framework in Java code.

CLO4: **Demonstrate Proficiency** using an integrated development environment such as Eclipse for project management, coding and debugging.

4. Assessment details

Note: Please ensure that you have read sections 1-3 of this document before going further.

This assignment requires you to implement a game engine and console based user interface (logging output only, no user interaction required) for a casino style dice game. The rules are simple, each player places a bet and then rolls two dice before the house rolls against the players .. Highest number (sum of the two dice) wins! A draw is a no contest and the bet is returned to the drawing player.

Do not worry about modelling a real Casino "craps" game with its more complex rules. The focus here is on the implementation using a simple, highest dice sum wins.

NOTE1: Player points are not changed by placing a bet, they are only changed after the House has rolled and the win/loss has been determined.

NOTE2: Players are only competing against each other to win more points, but their win loss is determined only by their own and the House's rolled values, not by the other players.

HOW TO GET STARTED:

For this assignment you are provided with a skeleton eclipse project (`DiceGame.zip`) that contains a number of interfaces that you must implement to provide the specified behaviour, as well as a simple client which will help you get started.

The provided *Javadoc* documentation (load `index.html` from `DiceGame/docs/` into a browser to view), and commented interface source code (in the provided packages `model.interfaces` and `view.interfaces`) is your main specification, this document only serves as an overview.

NOTE: You may copy and add to the provided console client code to facilitate more thorough testing. You must however ensure that the original unaltered code can still execute since we will use our own test client to check your code which is strictly based on the provided interfaces (this is the point of having interfaces and a specification after all!)

i.e. DO NOT CHANGE ANY OF THE INTERFACES ETC.

The supplied project also contains code that will validate your interfaces for the main five classes you must write (see implementation specification below), and will warn you if you have failed to implement the required interfaces or have otherwise added any **non-private** methods that break the public interface contract. By default the validator lists all the expected methods as well as your implemented methods so you can use the output of this to find problems if you fail the validation.

You do not need to provide any console input, all your test data can be hard coded as in the provided `SimpleTestClient.java`

Implementation Specifications

Your primary goal is to implement the provided `GameEngine`, `Player`, `GameEngineCallback`, `Die` and `DicePair` interfaces, in classes called `GameEngineImpl`, `SimplePlayer`, `GameEngineCallbackImpl`, `DieImpl` and `DicePairImpl`. You must provide the behaviour specified by the Javadoc comments in the various interfaces and the generated Javadoc `index.html`. The imports in `SimpleTestClient.java` show you which packages these classes should be placed in.

More specifically, you must provide appropriate *constructors* (these can be determined from `SimpleTestClient.java` and are also documented in the relevant interfaces) and method implementations (from the five interfaces) in order to ensure that your solution can be complied and tested ***without modifying*** the provided `SimpleTestClient.java`[1] (although you can and should extend this class to thoroughly test your code). A sample output trace (`OutputTrace.pdf`) is provided to help you write correct behaviour in the `GameEngineImpl` which in turn calls the `GameEngineCallbackImpl` class to perform the actual logging. You should follow the exact output format since it is clearly specified, and this facilitates automated testing.

Your client code (`SimpleTestClient.java` and any extended derivatives) should be separate from, and use, your `GameEngineImpl` implementation via the `GameEngine` interface. Furthermore, your client should NOT call methods on any of the other interfaces/classes since these are designed to be called directly from the `GameEngineImpl`[2]

The main implementation classes `GameEngineImpl` and `GameEngineCallbackImpl` are described in more detail below. The `SimplePlayer`, `DicePairImpl` and `DieImpl` are relatively straightforward data classes and should not need further explanation for their implementation (beyond the comments provided in the respective interfaces/javadoc).

GameEngineImpl class

This is where the main game functionality is contained. All methods from the client are called through this class (see footnote 1). Methods in the supporting classes should only be called from `GameEngineImpl`.

The main feature of this class that is likely different to previous code you have written is that the `GameEngineImpl` does not provide any output of its own (i.e. it SHOULD HAVE NO `println()` or `log()` statements other than for debugging and these should be commented or removed prior to submission). Instead it calls appropriate methods on the `GameEngineCallback` as it runs (see below) which is where all output is logged to the console for assignment 1.

This provides a good level of isolation and will allow you to use your `GameEngineImpl` unchanged in assignment 2 when we add a graphical AWT/Swing use interface!

NOTE: Your `GameEngineImpl` must maintain a collection of `Players` AND a collection of `GameEngineCallbacks`. When a callback method should be invoked the same method must be called on **each callback class in the collection**. This can be done using a loop to iterate through all callbacks in the `GameEngineCallback` collection. It is important that **each callback receives the same data**. There is no need to distinguish between them (i.e. they are all the same and not player specific). `SimpleTestClient.java` gives an example for two players and shows it is trivial to add more (simply increase the array size by adding to the initialiser).

[1] A common mistake is to change the imports (sometimes accidentally!) Therefore, you MUST NOT change the imports and must place the class implementations in the expected package so that we can test your code with our own testing client.

[2] This is because we will be testing your code with our own client by calling the specified `GameEngine` methods. We will not call methods on any other classes and therefore if your `GameEngineImpl` code expected other methods to be called from the client (rather than calling them itself) it won't work!

GameEngineCallbackImpl class

The main purpose of this class is to support the user interface (view) which in Assignment 1 consists of simple console/logging output. Therefore, all this class needs to do is log data to the console from the parameters passed to its methods. Apart from implementing the logging (we recommend `String.format()` here) the main thing is to make sure you call the right method at the right time! (see below). You should also as much as possible make use the of the overidden `toString()` methods you will implement in `SimplePlayer`, `DieImpl` and `DicePairImpl` since this will simplify the logging!

The only class that will call the `GameEngineCallbackImpl` methods is the `GameEngineImpl` class. For example, as either the `rollPlayer(…)` or `rollHouse(…)` method is executing in a loop it will call the `playerDieUpate(…)` or `houseDieUpdate(…)` method on the `GameEngineCallbackImpl` (via the `GameEngineCallback` interface). Details of the exact flow and where `GameEngineCallback` methods should be called are provided in the `GameEngine` source code and associated Javadoc.

IMPORTANT: The main thing to watch out for (i.e. "gotcha") is that this class should not manage any game state or implement any game-based functionality which instead belongs in the `GameEngineImpl`. The core test here is that we should be able to replace your `GameEngineCallbackImpl` with our own (which obviously knows nothing about your implementation) and your `GameEngineImpl` code should still work. This is a true test of encapsulation and programming using interfaces (i.e. to a specification) and is one of the main objectives of this assignment!

IF YOU DO NOT FOLLOW THE NOTE ABOVE YOUR CODE WILL NOT EXECUTE PROPERLY WITH OUR TEST HARNESS AND YOU WILL LOSE MARKS! PLEASE DON'T GET CAUGHT OUT .. IF IN DOUBT ASK, WE ARE HAPPY TO HELP :)

IMPLEMENTATION TIPS

Before you start coding make sure you have thoroughly read this overview document and carefully inspected the supplied Java code and Javadoc documentation. It might take a bit of work but the more carefully you read before beginning coding the better prepared you will be!

1. Start by importing the supplied Java project `DiceGame.zip`. It will not compile yet, but this is normal and to be expected.
2. The first step is to get the code to compile by writing a minimal implementation of the required classes. Most of the methods can be left blank at this stage, the idea is to satisfy all the dependencies in `SimpleTestClient.java` that are preventing successful compilation. Eclipse can help automate much of this with the right click *Source* ... context menu but it is a good idea to write the classes by hand to make sure you are confident of the relationship between classes and the interfaces that they implement. It will also help familiarise you with the class/method names and their purpose. We have already provided a partial implementation of `GameEngineCallbackImpl` showing the use of the Java logging framework but you will need to complete it by implementing the missing methods.
3. When writing the `SimplePlayer` class you will need a 3 argument constructor for the code to compile. You could leave this blank at this stage but might as well implement it by saving the parameters as instance variables/fields. In fact, you might as well implement the methods while you are there since they are straightforward.
   HINT: In my (Caspar's) solution most of the methods of `SimplePlayer` are only one or two lines, except for `setBet()` which is a few more lines since it requires some additional validation/logic. `DieImpl` and `DicePairImpl` also require attention to the constructors so do thoroughly check the Javadoc spec.
4. Once the code can compile you are ready to start implementing the `GameEngineImpl`. You can start with the simple methods like `addPlayer()`, `addGameEngineCallback()` etc.
5. The `rollPlayer()/rollHouse()` methods involve the most code but even this is fairly small if well structured. In fact, this assignment doesn't require a lot of lines of code, it is about understanding concepts and putting the pieces together to make it work!
6. When implementing `rollPlayer()/rollHouse()` the main focus is on correctly calling the appropriate methods on the `GameEngineCallBackImpl` (via the `GameEngineCallback` interface). You can ignore the delay for now and use temporary log/println statements and the debugger to help you compare against the `OutputTrace.pdf`.
   NOTE: These two roll methods should be able to share most of their implementation so using private helper methods to avoid code duplication is the trick here!

7. Once you get this far you have the basic structure underway so you can finish by implementing the logic for updating bets (`applyWinLoss()` in the `GameEngineImpl`). Again, use the log output of the client and `OutputTrace.pdf` to check for correctness.
8. Finally add in the intermediate/update *logging* calls into the `GameEngineImpl` and implement the delay in the roll methods and you are pretty much done!
9. Copy `SimpleTestClient` (you can call it `MyTestClient` for example) and update it with some more through testing code, debug as necessary to fix any issues and you are done :)

5. Referencing and third party code exclusion

- You are free to refer to textbooks or notes and discuss the design issues (and associated general solutions) with your fellow students or on Canvas; however, the assignment should be your OWN INDIVIDUAL WORK and is NOT a group assignment.
- You may also use other references, but since you will only be assessed on your own work you should NOT use any third-party packages or code (i.e. not written by you) in your work.

6. Submission format

The source code for this assignment (i.e. complete compiled **Eclipse project**[3]) should be submitted as a .zip file by the due date. You should use the Eclipse option export->general->archive to create the zip file for submission.

IMPORTANT: SUBMISSIONS OF A DICE GAME OR CRAPS GAME OR ANY OTHER GAME WHICH DOES NOT IN ANY WAY ADHERE TO THE SPECIFICATION AND PROVIDED CODE WILL RECEIVE A **ZERO MARK**

7. Academic integrity and plagiarism (standard RMIT warning)

NOTE: Any discussion of referencing below in the standard RMIT policy is generic and superseded by the third-party code exclusion in section 5.

Academic integrity is about honest presentation of your academic work. It means acknowledging the work of others while developing your own insights, knowledge and ideas. You should take extreme care that you have:

- Acknowledged words, data, diagrams, models, frameworks and/or ideas of others you have quoted (i.e. directly copied), summarised, paraphrased, discussed or mentioned in your assessment through the appropriate referencing methods,
- Provided a reference list of the publication details so your reader can locate the source if necessary. This includes material taken from Internet sites.

If you do not acknowledge the sources of your material, you may be accused of plagiarism because you have passed off the work and ideas of another person without appropriate referencing, as if they were your own.
RMIT University treats plagiarism as a very serious offence constituting misconduct. Plagiarism covers a variety of inappropriate behaviours, including:

- Failure to properly document a source
- Copyright material from the internet or databases
- Collusion between students

For further information on our policies and procedures, please refer to the University website.

8. Assessment declaration

When you submit work electronically, you agree to the assessment declaration.

[3] You can develop your system using any IDE but will have to create an Eclipse project using your source code files for submission purposes.