Bug 4 Investigation

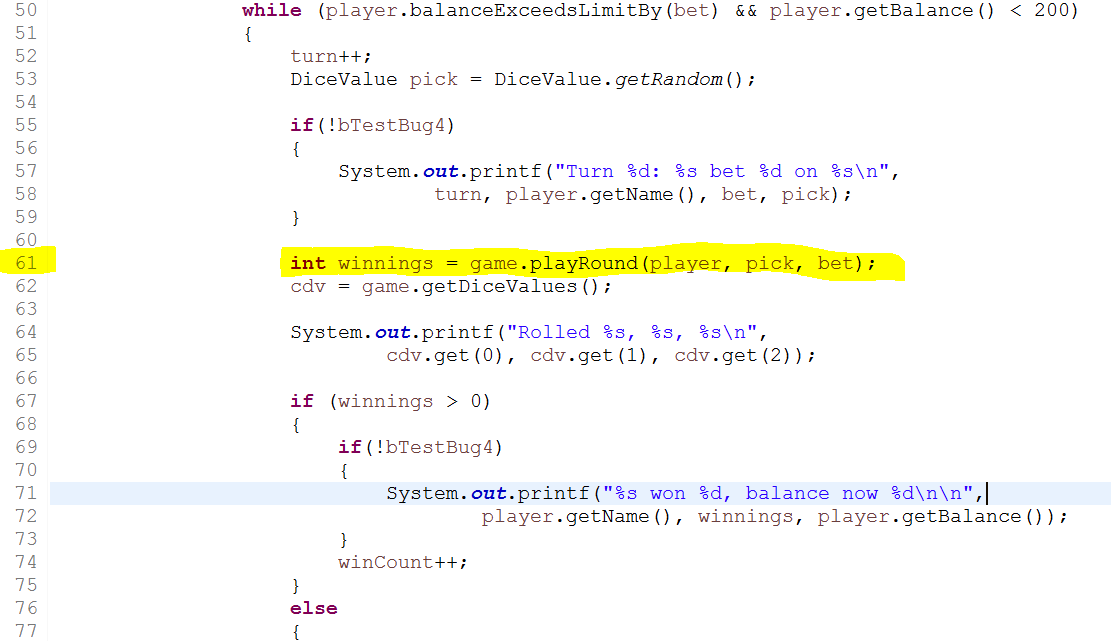
# Description

All rolls are identical in every game of each run through of Main. For example, it could be CROWN, CLUB, HEART repeated for every roll for every game. However, when the run is repeated, this roll can change. For example, in the next run it could be HEART, DIAMOND, DIAMOND repeated on every roll of every game.

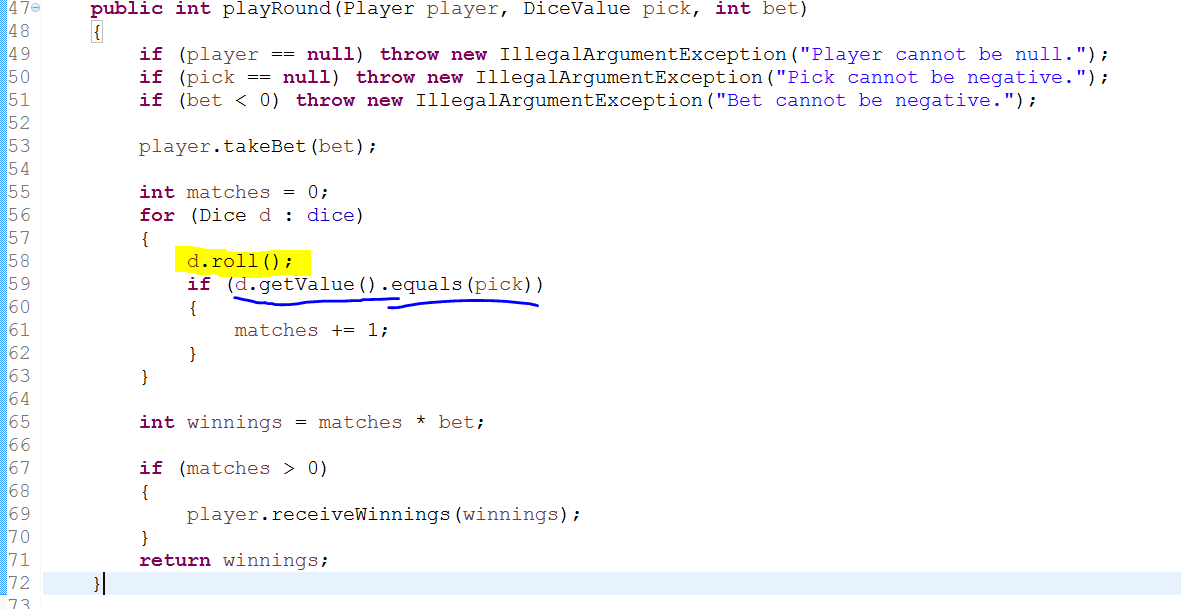
# Static Review

The method that should generate a new **DiceValue** to compare against the pick is **Dice**’s **roll**. This occurs in **Main**’s **main** method, in **Game**’s **playRound** method here:

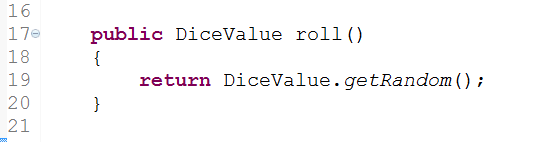
Main’s **main**: (highlighted in yellow)



Game’s **playRound**: (highlighted in yellow)



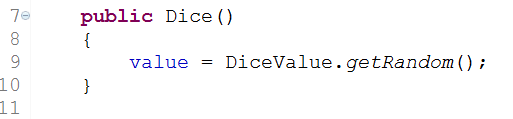
Dice’s **roll**:



We notice the following things:

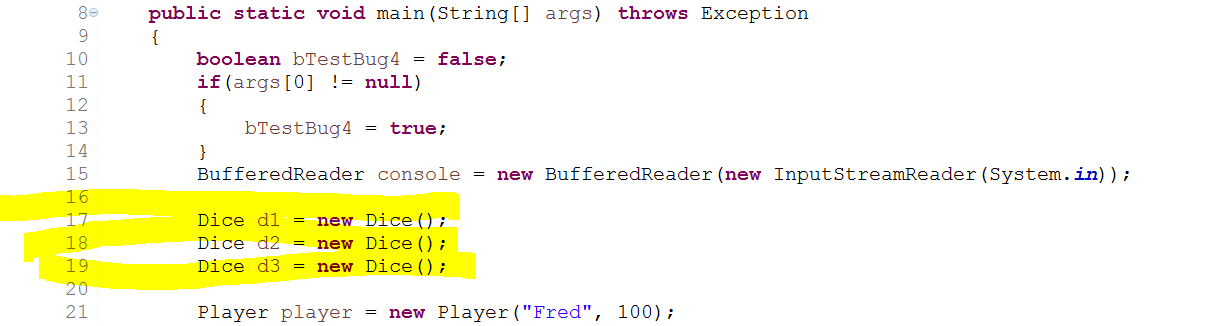
1. The **Dice** class has an instance variable **value** of type **DiceValue.**
2. It is this value that is getting compared against the pick (underlined in blue in **Game**’s **playRound** method, pictured above).
3. The roll method in **Dice** does not change the instance variable **value** (it returns a **DiceValue** object which is not captured – in **playRound** in **Game** it is called like a method with a void return).

If we look at the constructor of **Dice**:



We notice some additional things:

1. **DiceValue**’s **getRandom** is being called rather than the more natural **roll** method (given it is the same class). Although this shouldn’t matter because all **roll** does is call **getRandom**, and return exactly what **getRandom** returns.
2. The variable **value** is set from the return value of **getRandom**.
3. Nowhere else in the class **Dice** is **value** set in any way.
4. Conclusion from 5 and 6: **value** is invariant over the life of the instance.
5. If we look at the whole game loop in Main’s main we notice that here is the only place that new Dice are created:



From this we can guess that all Dice used in each run of the program are the same three objects. This will be tested to be sure (see *Testing Conclusions* later in this document).

1. From 2, 7 and 8 (8 subject to testing as described later in this document) we can see why the rolls are always the same:
   * The **value** is invariant
   * The same **Dice** are used in every **Game** (therefore using the same invariant **value**)
   * It is the **value** that is displayed by the program as a roll
2. From 9: Obviously the roll will be identical every **Game**!

Therefore, our hypotheses are the following:

1. **Dice** are created only once per run of the program, and then reused for each **Game**.
2. The **value** is invariant over the life of any instance of **Dice**.
3. The **value** of the **Dice** is what is used as each roll & compared to the pick to determine if the player wins or not.

# Hypothesis testing