**Step 1: Replication**

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| **Bug Number 3** | | Odds in the game do not appear to be correct. | | |
| **Bug Description** | | Crown and Anchor games have an approximate 8% bias to the house. So the win : (win+lose) ratio should approximately equal 0.42. This does not appear to be the case. | | |
| **Reproduction Test Description:** | | Run simulation, find instance where player wins on one match and compare balance to previous balance. | | |
| **Pre-conditions** | | N/A | | |
| **Post-conditions** | | N/A | | |
|  | **TEST STEP** | | **EXPECTED TEST RESULTS** | |
|  | Run the simulation (execute Main.main()). | | Simulation starts & prints output of simulation (100 games and stats) to console. |  |
|  | Scroll to end (end of simulation) of output in console. | | Output ends with stats on the overall simulation – with the last line showing the win count, lose count and win+lose ratio. |  |
|  | Evaluate the win+lose ratio | |  |  |
|  | Re-run the simulation several times, noting the dice values rolled in the last round – and the win+lose ratio – for each run | | There appears a relatively high occurrence of win+lose ratios of 0.60+ (may have to rerun the simulation many times).  There is also perhaps a correlation between the values rolled in the last round and the ratio – when there are no duplicate values the ratio appears high ~ 0.60, but when there are 2 dice with the same values the ratio is approximately normal ~ 0.40.  Regardless, the ratio always appears to be one of a limited set of significantly differing values whenever the simulation is run – e.g. ~0.40 or ~0.60… |  |

**Step 2: Simplification**

Note – rather than jumping to conclusions, here I decided to just quickly test 2 different aspects – first consistency of the win ratio across games, and then the distribution of the values rolled

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| **Automated Test 1** | TestBug3  hundredRunsOfHundredThousandRounds\_ratioShouldBeCorrectAndConsistent() |
| **Test Description** | Given many games with many rounds, when we evaluate the win ration then the ratio should be approximately correct AND the ration should be consistent across the games. |
| **Test Output** | The test fails as the win ratio is still significantly higher than expected (but is consistent). |

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| **Automated Test 2** | TestBug3  threeHundredThousandRounds\_ratioDiceValuesHouldBeEqual() |
| **Test Description** | Given many dice rolls, when we count the rolls of each symbol, each symbol should have been rolled and the rolls should be approximately evenly distributed across each symbol. |
| **Test Output** | The test fails as one of the symbols is never rolled (see bottom part of screenshot) |