
Written Assignments (40 points)

1.1. HJ isolated constructs vs. Java atomic variables (20 points)

1.1.1. Yes, both the AtomicPRNG.nextSeed() and IsolatedPRNG().nextSeed() share equivalent semantics. This is because the way Atomics work, there will be no data race with seed if nextSeed() is called multiple times in parallel. So, similar to the isolated version, the atomic version of nextSeed() will have seed be updated to the next integer before any other calls of nextSeed() can update seed to the next integer value. Therefore, both currSeed and retVal are able to read and be updated to the most recent seed value without worrying about them being affected by a data race. Therefore, for every IsolatedPRNG execution, we can find an equivalent AtomicPRNG execution that results in the same answer, and for every AtomicPRNG execution, we can find an equivalent IsolatedPRNG execution that results in the same answer.

1.1.2. The while(true) is needed because it ensures that we are able to update seed to an integer value that hasn't been visited by nextSeed() yet (seed will not share the same value of retVal following this while loop). This also ensures that retVal gets assigned the next integer in a similar way that currSeed gets the next integer value given seed has been updated in the isolated version of nextSeed(). If we were to replace while(true) with a loop that only executes once, we would prematurely return retVal because it would at most updated it to the current seed value once and then return, without being able to update to the nextSeedVal, given that seed is updated to said value on line 8.

1.2. Written Assignment: Dining Philosophers Problem (20 points)

1.2.1. This will not result in deadlock because the philosopher to the left of the final philosopher will have both forks, so they can eat, then the one to their left can, then the one to their left, until finally the final philosopher gets to eat. (See snap photo)

1.2.2. Livelock is possible because consider the solution when the first philosopher selects the left and its right neighbor selects their left as well, but to correct for the fact that the philosophers can't eat yet, they both put down the left fork and grab the right. They then put down the right and grab the left. And this continues, hence livelock.