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**Compilers, Spring 2024**

**Quiz 8: Garbage Collection**

Name: Id:

1. In Java 7, Oracle announces a new state-of-the-art garbage collector G1 (Garbage First) as its next-generation collector (although G1 is still in its experimental stage).

The basic idea of G1 can be illustrated using the following figure: first, the Java heap is divided into K equal sub-heaps, and Oracle calls each sub-heap a *region*). So, if the size of each region is *R*, and the Java heap size is *S*, then the number of regions is *S/R*.

1st

2nd

3rd

Kth

Second, G1 maintains, for each region, the size of allocated heap space (thus, G1 knows the available space left in each region).

For object allocation, G1 will find out an appropriate region (one with largest free space?) and performs allocation in that region.

For garbage collection, G1 will find out a region with most garbage in it and does collection in that region. For instance, if G1 collects the above heap, it will collect the 1st region (it contains 2 garbage cells).

Sun announced the development plan of G1 in 2004, however, today's G1 is still in experimental stage (9 years later!). As a result, it seems that the development of G1 has been very difficult.

Please give some reasons, you think, why the development of G1 is so difficult.