Memory Allocation

* Within the context of dynamic memory allocation, define memory leaks. Explain how they occur.
  + Memory leaks are when a program doesn’t properly free memory that is no longer needed. This can cause the program to continue to allocate new chunks of memory when it could “re-use” memory that had been freed in the past.
* Within the context of dynamic memory allocation describe the relative advantages and disadvantages of garbage collection, and explicit malloc/free.
  + Garbage Collection
    - Faster, but you’re relying on algorithms to not mess up
  + Explicit
    - Slow, but explicit, so if it messes up, debugging is much easier.
* Compare and contrast mark-sweep and reference-count methods of garbage collection.
  + Mark-Sweep
    - Starting from the root set, traverse all pointers via depth / breadth first search
    - Free everything that is not marked
      * Slower, but more complete, so less chance to leak.
  + Reference-Count
    - Each allocated chunk has reference count that shows how many locations refer to this one
      * While faster, there is the chance that it doesn’t make those locations refer to something else.
* Define fragmentation and describe how and why it occurs.
* Given a fixed size buffer, arranged in a boundary-tag paradigm for dynamic memory allocation and an ordered list of allocation and deallocation requests show the behavior of the allocation processes using each of the following heuristics.
  + first fit
    - Choose first block that can satisfy request
  + best fit
    - Search the whole least on each allocation (time consuming)
    - Chose the smallest black that can satisfy request
    - Can stop search is exact match is found.
  + worst fit
    - Choose the largest block (most left over space)