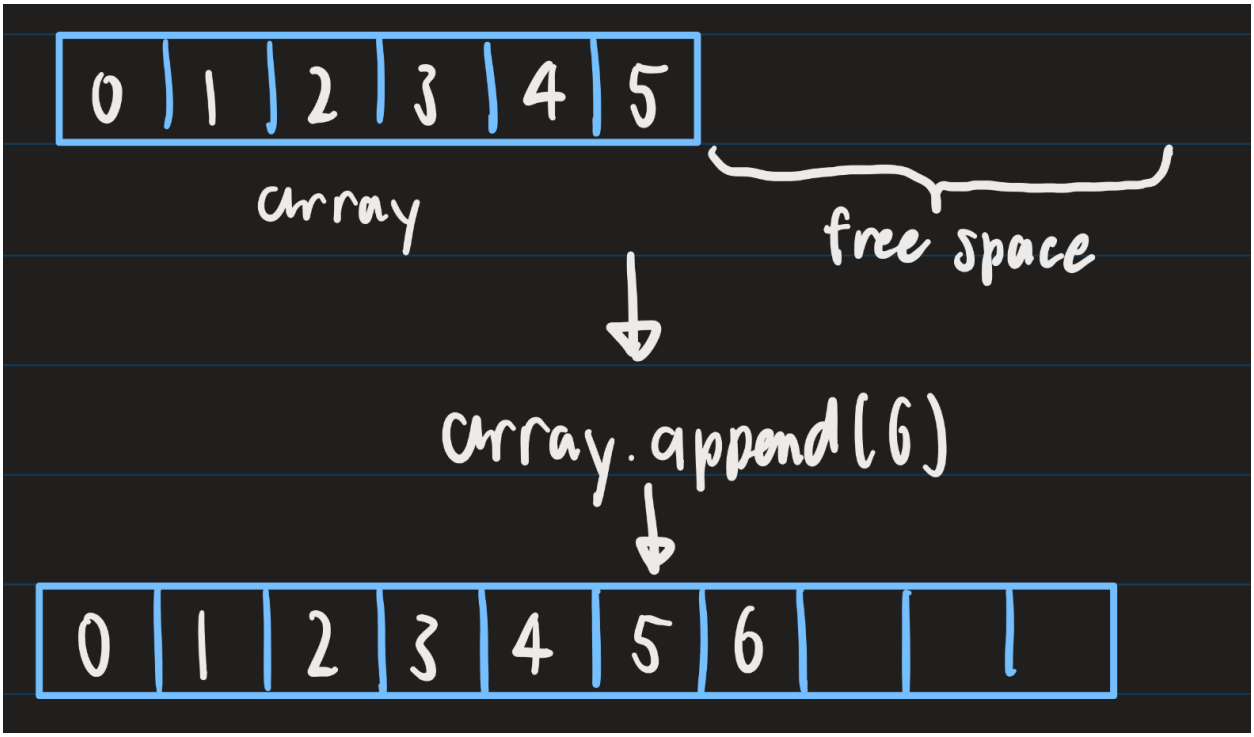
Lab 4 Exercise 2

1. Explain the difference between an array size and capacity.

   Array size is the number of elements currently in the array. Array capacity is the maximum number of elements the array can hold.

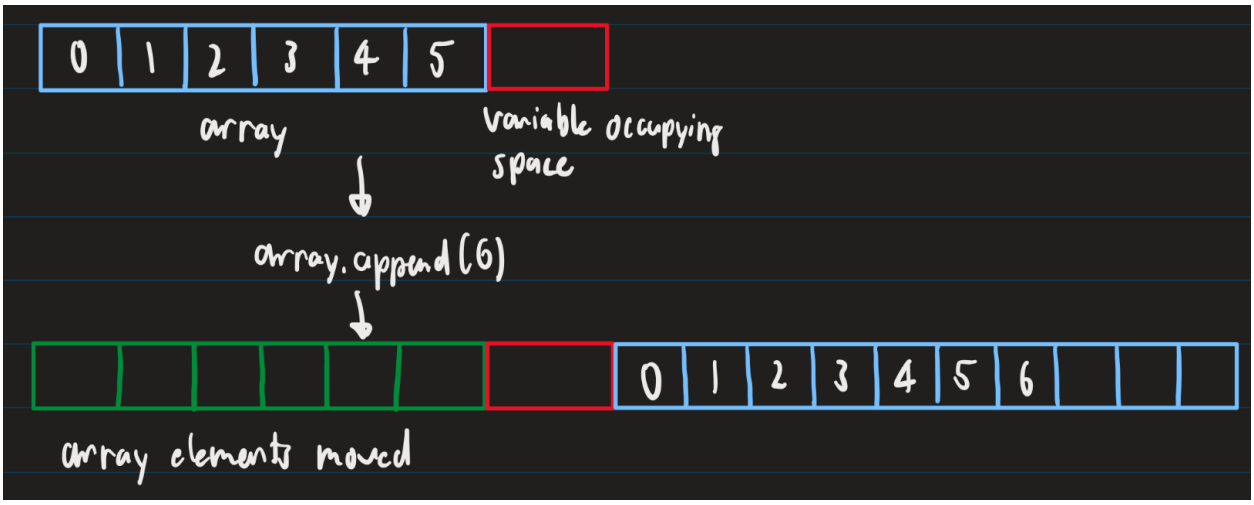
2. What happens when an array needs to grow beyond its current capacity? Explain and produce a diagram showing the memory layout before and after expansion.
   a. First, consider the case where there is space in memory after the end of the array.

      If there is space in memory after the end of the array, memory will be allocated after the array so that the array capacity grows.



   b. Then, consider the case where the memory after the end of the array is occupied by another variable. What happens in this case?

      If the memory after the end of the array is occupied by another variable, Python looks for enough space in memory to move all of the array elements and grow the array.



3. Discuss one or more techniques real-world array implementations use to amortize the cost of array expansion.

   Arrays are usually grown by a certain factor to allow many insertions to occur without needing to reallocate memory as often. This means that bigger arrays will expand more than smaller arrays because it is assumed that bigger arrays will be appended to more often.