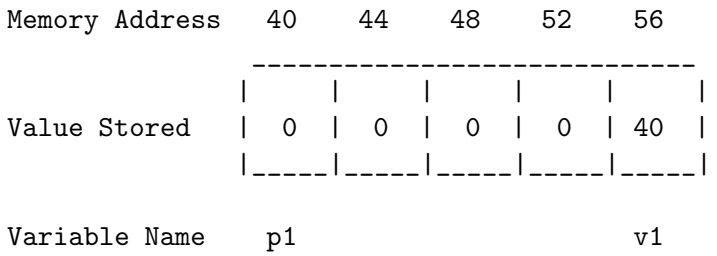
CMPS 223 Sample Midterm

1. Each data structure has certain properties to the data, such as how one can access the data inside the data structure. Give the rules for accessing data for each of the following data structures:
   (a) List
   (b) Stack
   (c) Queue
2. List two of the five stages of the "waterfall" software lifecycle.
3. Give the pseudocode (just the pseudocode, not the actual C++ code) for the singly linked list `search` function that finds the first matching element in the list.
4. With the array-based implementation of the queue, "wrap-around" indices were used to keep track of the front and back of the queue, creating a "circular" array.
   (a) Give the code to increment the back index.
   (b) Why was a circular array used instead of a regular array?
   (c) How is the empty state detected?
5. Give the code for the linked queue `dequeue` function.
6. State how the following list variants differ from the basic linked list.
   (a) Circular list
   (b) Doubly linked list
7. Give the code for the array-based stack `push` function.
8. You have been hired to code the waiting line for a telephone answering system. The system will try to connect the callers to a customer service representative in the order the customers called. If the customer service representative does not answer the phone, the caller is placed back at the front of the waiting line. What data structure or hybrid data structure would you use for this code? Why did you choose this data structure?
9. You have a program with a pointer variable declared `int *p1;` and an integer variable declared `int v1;`. The current state of the variables in memory is:



   State what the following lines of code would do:
   (a) `p1 = &v1;`
   (b) `cout << p1;`
   (c) `cout << *p1;`