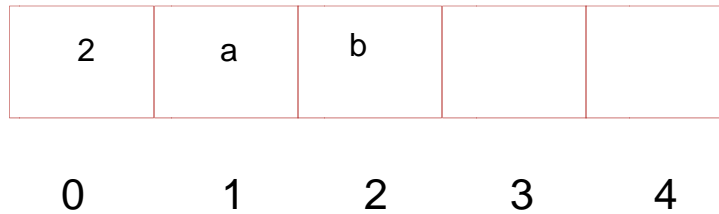
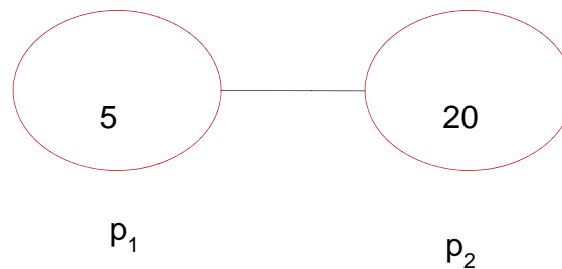


**Tutorial 5**

1. An new element  $e$  is inserted at rank 0 into the following Vector ADT. What is the resultant Vector after the insertion?



2. Consider the following list ADT:



Show the output after performing the following operation

**`insertBefore(p2,6)`**

3. Write an algorithm to implement the method *insertBefore*( $p,e$ ) (which insert a new node with data value  $e$  before the node at position  $p$ ) of the LIST ADT, assuming that the LIST ADT is implemented using a doubly linked list.
4. Write an algorithm for an array-based implementation of the vector ADT that achieves  $O(1)$  time for replacing an element at rank  $r$  with a new element  $k$  and return the old element.
5. A priority queue is implemented using an array. An item is inserted by putting it at the end of the array. Write an algorithm to delete an item with the highest priority.

6. Draw the 11-item hash table resulting from hashing the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16 and 5, using the hash function  $h(i) = (2i + 5) \bmod 11$  and assume that collisions are handled by chaining.
  
7. Draw the 11-item hash table resulting from hashing the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16 and 5, using the hash function  $h(i) = (2i + 5) \bmod 11$  and assume that collisions are handled by linear probing.
  
8. Draw the 7-item hash table resulting from hashing the keys 19, 26, 13, 48, 17 using the hash function  $h(x) = x \bmod 7$ . Assume that collisions are handled by double hashing using a second hash function  $d(x) = 5 - (x \bmod 5)$ .