

Exercise 3:

(i)

(1)  $pushback(l, x)$  is the same as  $append(l, x)$  operation, which extends the sequence of the data structure by one new element.

(2)  $pushfront(l, x)$  is the same as  $insert(l, 1, x)$  operation, which adds the new element  $x$  in the front of the sequence.

(3)  $popback(l)$  can be expressed as  $getlength(l)$ ,  $getitem(l, x)$  and  $remove(l, x)$ , where  $x$  is the length of the sequence returned from  $getlength(l)$ . It first gets the last element of the sequence, then deletes it from the original array or list.

(4)  $popfront(l)$  can be expressed as  $getitem(l, 1)$  and  $remove(l, 1)$ . It first gets the first element of the sequence, then deletes it from the original array or list.