

## Question 2 by Dan Nguyen (z5206032)

An array,  $A$ , of size  $n$  has only positive integers i.e.  $A[i] > 0$  for  $i \in \mathbb{Z}$ . An integer,  $m$ , is also given where  $m \leq n$ .

The *beauty* of an array is the least occurrence of any array element in the range 1 to  $m$  inclusive.

Consider the index,  $i$ , which has the range from 1 to  $n$  inclusive. This index will be used to iterate over  $A$ .

An index,  $i$ , is *fulfilling* if a subarray of  $A$  i.e.  $A[1..i]$  has strictly greater beauty than  $A[1..i-1]$ .

Let there be an array,  $B$ , of size  $n$  and zero-initialised.  $B$  will be used to keep track of the number of occurrences of elements of  $A$ .

For each  $i$  in  $A$ , keep a running minimum of occurrences. If the running minimum gets incremented, index  $i$  is *fulfilling*. This has the expected time-complexity of  $O(n)$ .