

Consider an array A whose elements are all either “black” or “white”. The following algorithm rearranges the elements of A so that every black appears before every white.

```
1:  $j = 0$ 
2:  $i = 0$ 
3: while  $i < \text{len}(A)$  do
4:   if  $A[i] == \text{“black”}$  then
5:      $A[i], A[j] = A[j], A[i]$ 
6:      $j = j + 1$ 
7:   end if
8:    $i = i + 1$ 
9: end while
```

1. Write down preconditions and postconditions for this algorithm, based on the description above.
2. Prove that the algorithm is partially correct– this will involve finding a suitable loop invariant.
3. Prove that the algorithm terminates.