Loop Invariants

4. Give a useful loop invariant of each loop. Indicate the places in the code where the invariant holds.

   (a) For this problem, assume that $A[0] \ldots A[n-1]$ is an array of integers, where n is a positive integer.

```
int i = 0;
int j = 0;

while(j < n-1){

  if(A[j] < A[i]) i = j;
  j++;

  }
```

   (b) For this problem, assume that $A[0] \ldots A[n-1]$ is a sorted array of integers, where n is a positive integer, and that B is an integer.

```
int lo = 0;
int hi = n;

while(lo < hi){

  int mid = (lo+hi)/2; // truncated division, as in C++
  if(A[mid] < B) lo = mid+1;
  else hi = mid;

  }

if (           ) cout << "Yes" << endl;  // I need to insert a condition here!
else cout << "No" << endl;
```

   It should be clear to you what the purpose of this code is. What do you think the condition of the if statement should be?

(c) For this problem, assume that $X[0] \ldots X[n-1]$ is an array of real numbers, where n is a positive integer.

```
real sumPositive = 0;
int i = 0;

while (i < n){

   if (X[i] > 0)
    sumPositive += X[i];

   i++;

  }

cout << sumPositive << endl;
```