Fully Documented Version of the Algorithm arrayMax

A (reasonably) fully documented version of the algorithm arrayMax — including the precondition and postcondition for the problem being solved, loop invariant and bound function for the while loop in this algorithm, and various other assertions that help to document a proof of the correctness of this algorithm, is as follows.

// Precondition: An integer array A, with some positive length n, is given as input.
// Postcondition: The largest element in the set
// {A[0], A[1], ..., A[n - 1]}
// is returned as output.
integer arrayMax ( integer[] A ) {
    // Assertion: A is an input integer array with some positive length n.
    1. if (A.length == 1) {
        // Assertion: A is an input integer array with length n = 1.
        2. return A[0]
        // Assertion:
        // 1. A is an input integer array with length n = 1.
        // 2. The largest element in the set
        // {A[0], A[1], ..., A[n - 1] = {A[0]}
        // has been returned as output.
    } else {
        // Assertion: A is an integer array with length n ≥ 2.
        3. integer i := 0
        4. integer maxSoFar := A[0]
        // Loop Invariant:
        // 1. A is an input integer array with some length n such that n ≥ 2.
        // 2. i is an integer variable such that 0 ≤ i ≤ n - 1.
        // 3. maxSoFar is an integer variable such that
        // maxSoFar = max(A[0], A[1], ..., A[i]).
        // Bound Function: n - i, that is, A.length - i
while (i < A.length - 1) {
  // Assertion:
  // 1. The loop invariant for this while loop is satisfied.
  // 2. 0 ≤ i ≤ A.length - 2
  i := i + 1
  if (maxSoFar < A[i]) {
    maxSoFar := A[i]
  }
}

return maxSoFar

// Assertion:
// 1. A is an input integer array with some length n such that n ≥ 2.
// 2. The largest element in the set
//     \{A[0], A[1], \ldots, A[n - 1]\}
//     has been returned as output.

// Assertion:
// 1. A is an input integer array with some positive length n.
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