Assignment 2 Problem 1: Divide & Conquer

1. Since for each a[i] where i is in [1 … n], . And since a[i] is a primitive type integer, therefore,

For , the runtime should be

Focus on P, in each iteration, P is multiplied by a primitive type integer, therefore, each time P increases, , and . Since P is multiplied by n-1 times, and originally, , the final value

Therefore, the total running time for the algorithm should be

1. The algorithm did the following thing:

The algorithm firstly separates the array a into two equal length part and recursively call itself on each part. And apply on the returning value of the two parts. And the base case of the recursion is if the length of a is 1, then apply on that entry.

The pseudo code is as follow:

The base case of the recursion is O(1), and for each recursive call it’s obviously that

Note: from part a) we have already show that which also applies to the number of bits for returning values of each parts.

Applying Master Theorem with , we have

, and