algorithmica
re-engineering it talent

Top-20 Training Program
(Basic Thinking)

Apply basic commonsense/math/data structures to solve the following problems.

Problem1: Count Zeroes

Given an array that contains some number of contiguous zeroes at the start, followed by some arbitrary integers other than zero. Write an efficient function that returns the number of zeroes in the given array.

Function Prototype:

```
int countZeroes(int []a, int n)
```

Example

Input: 0 0 0 0 0 3 2 8 11 10 15 22

Output: 5

Problem2: Polynomial Evaluation

Given a real number x, and a sequence of real numbers c0, c1, …cn, Write an efficient function to find out the value of following polynomial of degree 'n':

$p^n(x) = c_n x^n + c_{n-1} x^{n-1} + \ldots + c_2 x^2 + c_1 x + c_0$

Function Prototype:

```
double EvalPolynom(int[ ] coef, int x, int n)
```

Problem3: Find Any Duplicate Number

a) Given an array of N integers in which each element is between 1 and N-1, write an efficient function to determine the any duplicated integer. You may destroy the array. What are the time and space complexities of your solution?

Function Prototype:

```
int FindDuplicate(int[ ]a)
```

b) Write an efficient function to solve the above problem if the given array is read only. What are the time and space complexities of your solution?

Problem4: Merge Arrays

Given an array of size M+N in which first M numbers are sorted in non-decreasing order and last N slots are empty. Also given an another array of size N which is sorted in non-decreasing order. Write an efficient function to merge these two arrays without using any extra space so that the array of M+N size is sorted.

Function Prototype:

```
void Merge(int[ ] a1, int[ ] a2, int m, int n) // array a1 is of size m+n
```