Inter-Process / Inter-Thread Communication

Part A: Write a program, in C or Java, that will implement the following:

1) The program will create **array[N],** an array of N integers (N will be given as input by the user, say N=100).

2) array[N] will be filled in with random integers, all randomly selected in the space [-100, 100].

3) The program will then create 4 threads (or child processes, depending on the implementation you choose), each of which will do the following:

   ○ The 1st thread (or 1st child process) will calculate: T1 = the sum T1 of the N elements.

   ○ The 2nd thread (or 2nd child process) will calculate: T2 = the product of the N elements.

   ○ The 3rd thread (or 3rd child process) will select a random number in the space [-1000,1000]: T3 = random (X): X ϵ [-1000, 1000].

   ○ The 4th thread (or 4th child process) will rank the 3 previous threads in decreasing order, depending on the result values of T1, T2, T3. E.g. if T1 = 1200, T2 = -53521 and T3 = 850, then the order is: T1, T3, T2.

Part B: Based on the program you implemented above, write a modified version of it that will do the following:

1) When each of T1 and T2 threads/processes start their execution, they will each randomly select half of the elements in the table, and change them with new random numbers in the space [-100,100]. Thus each array element may be changed 0 (if neither T1 nor T2 selects its), 1 time (if one thread selects it) or 2 times (both T1 and T2 select it).

2) After each thread (or process) changes the array it will calculate again either the sum (T1 will do this) or the product (T2 will do this) of the modified array.

3) Notice that if no synchronization is used, then it is possibly that T1 and T2 will run in parallel and thus each thread (or process) computes the final result based on different values. To avoid this, you must use some method of mutual exclusion. For example, use semaphores in C or synchronized methods in Java.

Instructions:

• It is possible to work together as a joint team project. The examination at the end will be per person however.

• You can either write a different program per part or one program for both parts A and B.

• You will deliver a zip file containing the code (exported project) and a word file with a short description of your solution.