

Lab Assignment 3

Solve the problems with the most efficient solutions.

1. Given an unsorted integer array, find a pair with the given sum in it.

Input:

```
nums = [8, 7, 2, 5, 3, 1]
target = 10
```

Output:

```
Pair found (8, 2)
or
Pair found (7, 3)
```

Input:

```
nums = [5, 2, 6, 8, 1, 9]
target = 12
```

Output: Pair not found

2. Given an unsorted integer array containing both positive and negative numbers, find a pair with maximum product in it.

Input:

If we have an array say arr = [1, 7, 4, 2, 8, 6, 3, 9, 5]

Then in this array first two bigger numbers are 9 and 8.

So, product is $9 \times 8 = 72$ which is maximum product

3. Given an array where all its elements are sorted except two swapped elements, sort it in linear time. Assume there are no duplicates in the array.

Input: A[] = [3, 8, 6, 7, 5, 9] or [3, 5, 6, 9, 8, 7] or [3, 5, 7, 6, 8, 9]

Output: A[] = [3, 5, 6, 7, 8, 9]

4. Given a binary array of 0's and 1's. Segregate all 0's followed by 1.

```
Input array    = [0, 1, 0, 1, 0, 0, 1, 1, 1, 0]
Output array   = [0, 0, 0, 0, 0, 1, 1, 1, 1, 1]
```

5. Write a program to implement inversion count.

Given the Input (non-negative integers): A = {10, 1, 2, 4, 13, 9, 5}

The number of inversions that are possible are as follows:

{ (10, 1), (10, 2), (10, 4), (10, 9), (10, 5), (13, 9), (13, 5), (9, 5) }

Total count of inversions are: 8

6. An array contains N numbers, and you want to determine whether two of the numbers sum to a given number K . For example, if the input is 8, 4, 1, 6 and K is 10, the answer is yes (4 and 6). A number may be used twice.
- Give an $O(n^2)$ algorithm to solve this problem.
 - Give an $O(n \log n)$ algorithm to solve this problem.

(Hint: first sort the array and then solve the problem in linear time).