# Assignment 1

1. Using the divide and conquer approach, write a program to determine the maximum product subarray from an input array. Observe the following sample input and output.

| Input | Output |
|---|---|
| 4<br>2 3 -2 4 | 6<br>Start index : 0<br>End index : 1 |
| 5<br>-1, -2, -3, 4 2 | 48<br>Start index : 1<br>End Index : 4 |

2. You are responsible for evacuating emergency supplies from a disaster zone. Each supply item has a certain weight and a usefulness value associated with it. There are multiple helicopters available, each with a different capacity to carry these supplies. Items can be divided and loaded fractionally if necessary (i.e., you can split items to load portions of them onto different helicopters).

Your goal is to maximize the total usefulness of the supplies evacuated using the minimum number of helicopters.

| Input | Output |
|---|---|
| Number of supplies: 4<br>Weights: [10, 20, 30, 40]<br>Usefulness: [60, 100, 120, 240]<br>Helicopter capacities: [50, 70, 30] | Maximum usefulness: 520<br>Helicopters used: 2 |
| Number of supplies: 4<br>Weights: [10, 20, 30, 60]<br>Usefulness: [60, 100, 120, 240]<br>Helicopter capacities: [70, 30] | Maximum usefulness: 440<br>Helicopters used: 2 |

3. You are given an array[]. The task is to find the inversion count of a[]. Where two elements a[i] and a[j] form an inversion if a[i] > a[j] and i<j. Modify the mergesort algorithm to solve this problem.

| Input | Output |
|---|---|
| 4<br>{8, 4, 2, 1} | Result: 6<br><br>Explanation: Given array has six inversions:<br>(8,4), (4,2), (8,2), (8,1), (4,1), (2,1) |
| 5<br>{1, 20, 6, 4, 5} | Result: 5<br>Explanation: Given array has five inversions:<br>(20,6), (20,4), (20,5), (6,4), (6,5) |

4. Given a rotated sorted array of distinct integers, your task is to determine the total number of rotations needed to make the array sorted in ascending order.

| Input | Output |
|---|---|
| { 15, 17, 1, 2, 6, 11 } | Result: rotated 2 times |
| { 7, 9, 11, 12, 5 } | Result: rotated 4 times |