Name: Prathamesh Lonkar
BNumber: B00 811 727

Homework 3.

Q1) ~~Inserti~~ Insertion Sort.

A = [10, 7, 3, 8, 1, 9, 0].

10 → 7 3 8 1 9 0

~~10 10 7 7~~.

7 → 10 → 3 8 1 9 0.

3 7 10 → 8 1 9 0

3 → 7 → 8 → 10 → 1 9 0

1 3 7 8 10 → 9 0.

1 → 3 → 7 → 8 → 9 → 10 → 0.

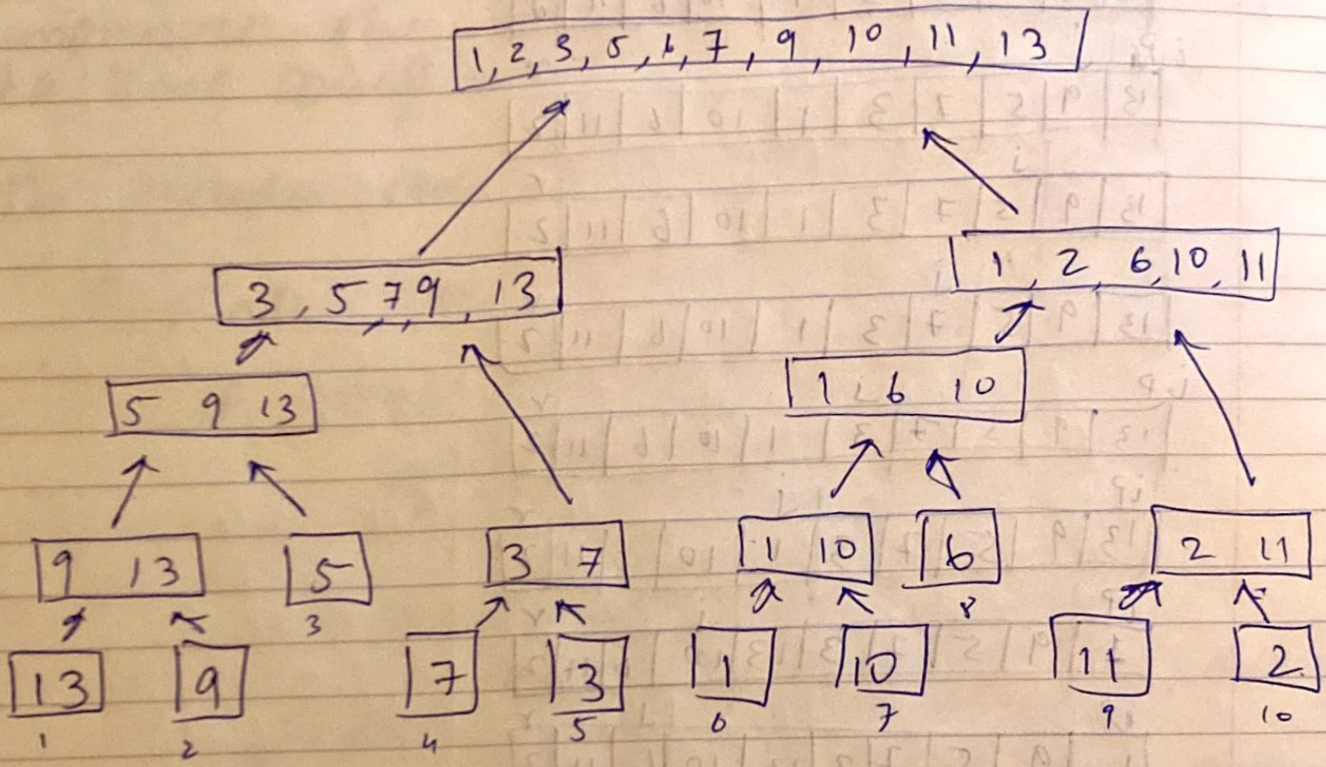
Final state:

0	1	3	7	8	9	10.

Ans

Q2) Merge Sort Stages

A = [13, 9, 5, 7, 3, 1, 10, 6, 11, 2]



Q3) Use strassen's method to compute the product of the following two matrices.

Step 1 $A = \begin{bmatrix} 2, 3 \\ \cancel{8}4, 5 \end{bmatrix}$ & Let this represent as $\begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$

$B = \begin{bmatrix} 5 & ,6 \\ 1 & 3 \end{bmatrix}$. Let this be represented as $\begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix}$

Step 2

$S_1 = B_{12} - B_{22} = 6 - 3 = 3.$

$S_2 = A_{11} + A_{12} = 2+3 = 5.$

$S_3 = A_{21} + A_{22} = 4+5 = 9$

$S_4 = B_{21} - B_{11} = 1-5 = -4.$

$S_5 = A_{11} + A_{22} = 2+5 = 7.$

$S_6 = B_{11} + B_{22} = 5+3 = 8$

$S_7 = A_{12} \cancel{+} - A_{22} = 3-5 = -2$

$S_8 = B_{21} + B_{22} = 1+3 = 4$

$S_9 = A_{11} - A_{21} = 2-4 = -2.$

$S_{10} = B_{11} + B_{12} = 5+6 = 11$

Step 3.

$P_1 = A_{11} S_1 = \cancel{8}\, 2 \times 3 = 6$

$P_2 = S_2 B_{22} = 5 \times 3 = 15$

$P_3 = S_3 B_{11} = 9 \times 5 = 45$

$P_4 = A_{22} S_4 = 5 \times -4 = -20$

$P_5 = S_5 S_6 = 7 \times 8 = 56$

$P_6 = S_7 S_8 = -2 \times 4 = -8$

$P_7 = S_9 S_{10} = -2 \times 11 = -22.$

Step 4. Computing desired product

$C_{11} = P_5 + P_4 - P_2 + P_6$
$= 56 \cancel{+} -20 - 15 - 8$
$= 13$

$C_{12} = P_1 + P_2$
$= 6 + 15$
$= 21$

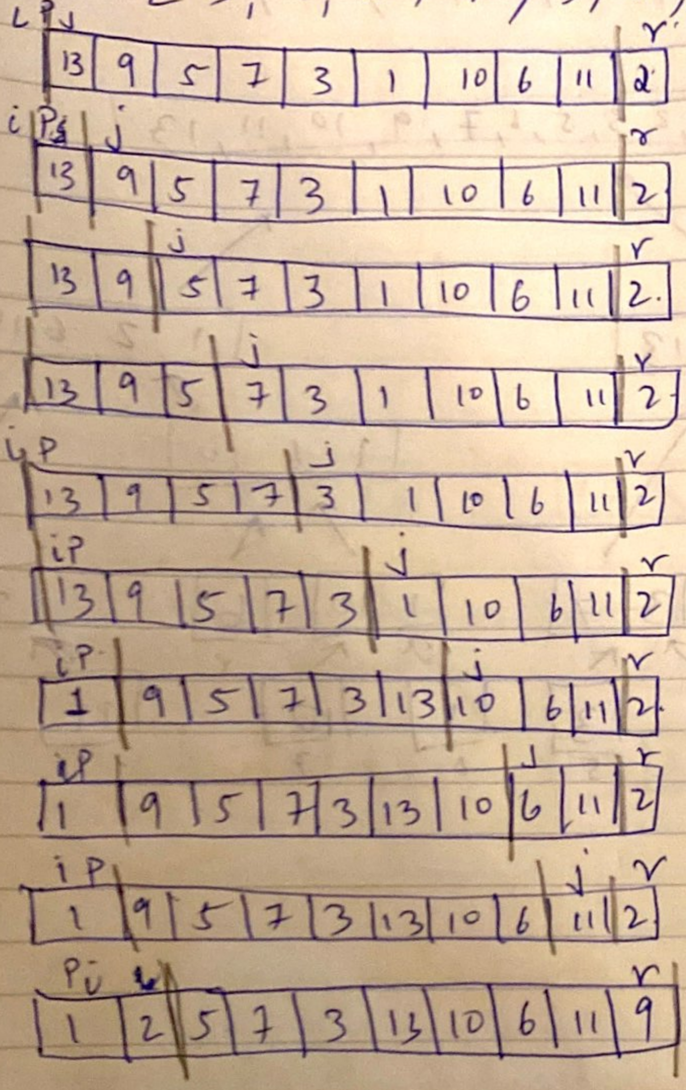
$C_{21} = P_3 + P_4$
$= 45 - 20 = 25$

$C_{22} = P_5 + P_1 - P_3 - P_7$
$= 56 + 6 - 45 + 22$
$= 39.$

$C = \begin{bmatrix} 13 & 21 \\ 25 & 39. \end{bmatrix}$

Ans

Q4) Partition function in quick sort array:
A = [13, 9, 5, 7, 3, 1, 10, 6, 11, 2].



13	9	5	7	3	1	10	6	11	2
13	9	5	7	3	1	10	6	11	2
13	9	5	7	3	1	10	6	11	2.
13	9	5	7	3	1	10	6	11	2
13	9	5	7	3	1	10	6	11	2
13	9	5	7	3	1	10	6	11	2
1	9	5	7	3	13	10	6	11	2
1	9	5	7	3	13	10	6	11	2
1	9	5	7	3	13	10	6	11	2
1	2	5	7	3	13	10	6	11	9

Q5) Let us consider that the ~~is~~ list is sorted in asunding order. Then ~~our~~ we will use the recursive binary search to implement the ~~function~~ problem as it has ~~&~~ a time complexity of O(lg n).

The pseudo code is as follows.

```
FindInden ( ~~Fst~~ A[], start, ~~a~~array size-1)

        if arraysize > strt {
                calculate mid
                if ~~Array~~[mid] == mid+1
                        then return mid.
                else if array[mid] > mid+1.
                        return Find Indes (A, start, mid-1)
                elseif array[mid] < mid+1
                        return Find Inden (A, mid+1, arrsize-1)
        else return -1;
```

- In our algorithm ~~it~~ we are finding the middle element after each recursion hence it we find Array[mid] means that our algorithm will return the found value else it will return ~~a~~ -1.
- ~~If we at~~ d we will keep on recursively dividing untill the start or end of array and if we do not get the correct value then we will return false or -1
- Hence our algorithm is correct.

Q6.) Given :

Loaded die : with probability ~~A~~ of obtain a particuly face is inversly proportional to the numbe ~~of~~ on that face.

Hence ~~prob~~ probability of getting

1 → 1^{-1} = 1

2 → 2^{-1} = $\frac{1}{2}$

3 → 3^{-1} = $\frac{1}{3}$

4 → 4^{-1} = 1/4

5 → 5^{-1} = 1/5

6 → 6^{-1} = 1/6.

Probability ~~the~~ of getting numbe higer than 3 is

$\frac{1}{4} + \frac{1}{5} + \frac{1}{6} = \frac{74}{120}$ Ans