ADA LAB WEEK 8

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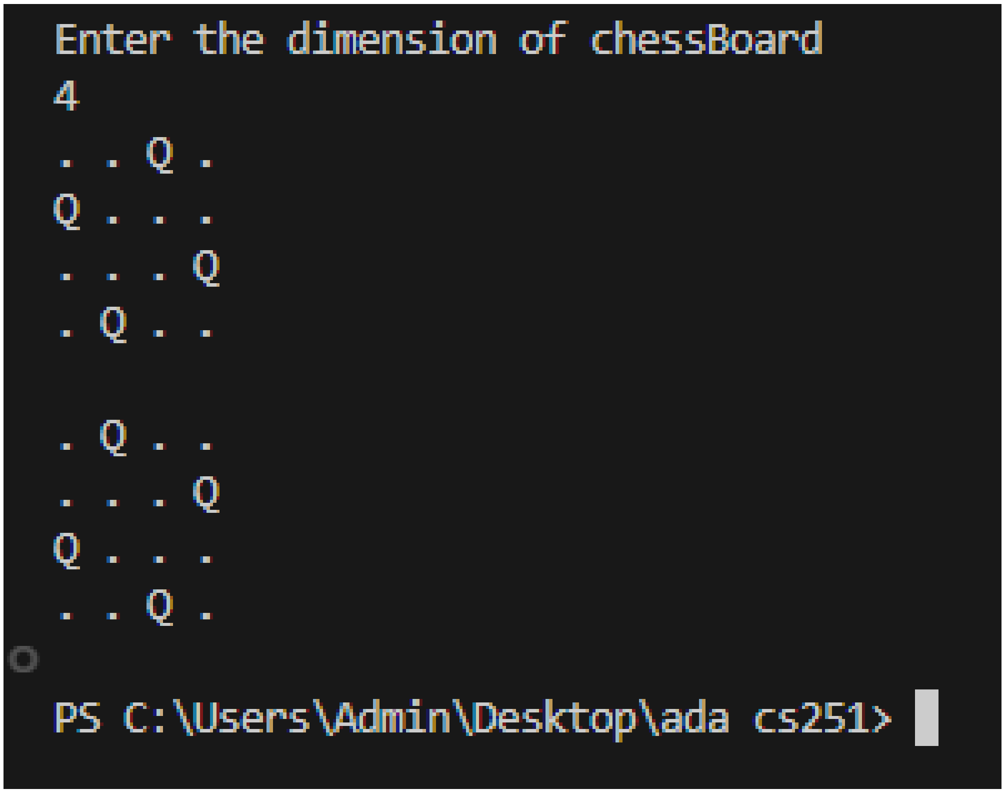
1) N Queens Problem using C

```
#include <stdio.h>
#include <stdlib.h>

void displayBoard(char board[][10], int n) {
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            printf("%c ", board[i][j]);
        }
        printf("\n");
    }
}

int isSafe(int row, int col, char board[][10], int n) {
    int duprow = row;
    int dupcol = col;
    while (col >= 0) {
        if (board[row][col] == 'Q')
            return 0;
        col--;
    }
    row = duprow;
    col = dupcol;
    while (row >= 0 && col >= 0) {
        if (board[row][col] == 'Q')
            return 0;
        row--;
        col--;
    }
    row = duprow;
    col = dupcol;
    while (row < n && col >= 0) {
        if (board[row][col] == 'Q')
            return 0;
        row++;
        col--;
    }
    return 1;
}

void solve(int col, char board[][10], int n) {
    if (col == n) {
        displayBoard(board, n);
        printf("\n"); // For next combination of board
        return;
    }
    for (int row = 0; row < n; row++) {
        if (isSafe(row, col, board, n)) {
            board[row][col] = 'Q';
            solve(col + 1, board, n);
            board[row][col] = '.'; // Backtracking step
        }
    }
}

int main() {
    int n;
    printf("Enter the dimension of chessBoard\n");
    scanf("%d", &n);
    if (n < 4 && n!=1) {
        printf("No solution exists\n");
        exit(0);
    }
    char board[10][10];
    // Initialising board with No queen
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            board[i][j] = '.';
        }
    }
    solve(0, board, n); // 0th col is called
    return 0;
}
```

Output:



```
Enter the dimension of chessBoard
4
. . Q .
Q . . .
. . . Q
. Q . .

. Q . .
. . . Q
Q . . .
. . Q .

PS C:\Users\Admin\Desktop\ada cs251>
```

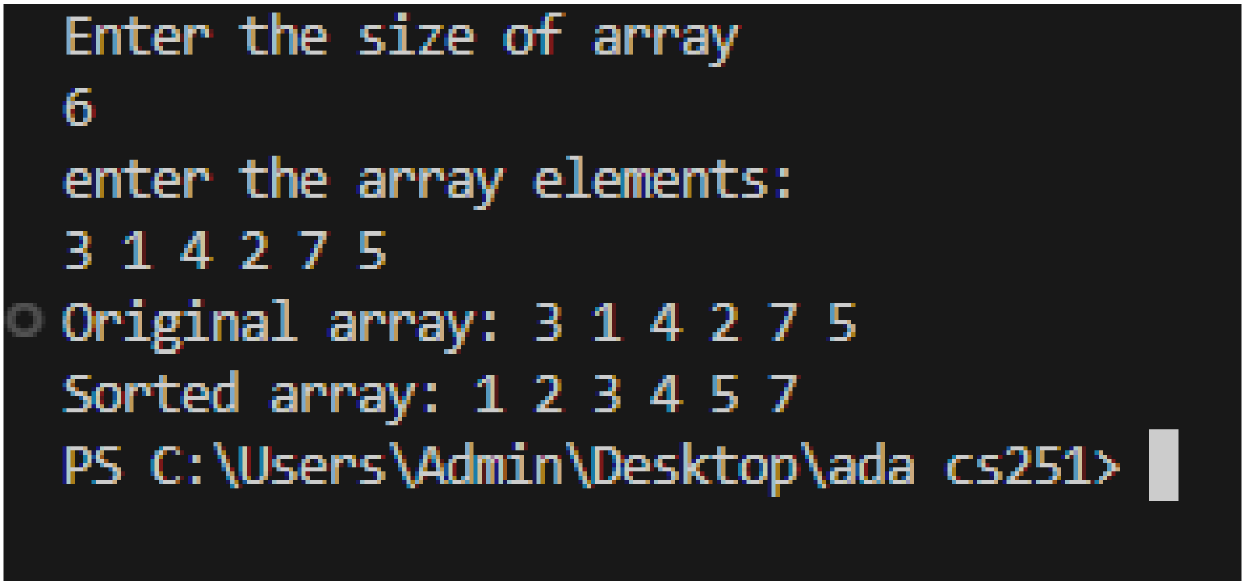
2) Heap Sorting Technique using C

```
#include <stdio.h>
#include <time.h>
void swap(int *a, int *b)
{
    int temp = *a;
    *a = *b;
    *b = temp;
}

void heapify(int a[], int n, int i)
{
    int largest = i;
    int l = 2 * i + 1;
    int r = 2 * i + 2;

    if (l < n && a[l] > a[largest])
    {
        largest = l;
    }
    if (r < n && a[r] > a[largest])
    {
        largest = r;
    }

    if (largest != i)
    {
        swap(&a[i], &a[largest]);
        heapify(a, n, largest);
    }
}

void heapSort(int a[], int n)
```

```
{
    for (int i = n / 2 - 1; i >= 0; i--)
    {
        heapify(a, n, i);
    }

    for (int i = n - 1; i > 0; i--)
    {
        swap(&a[0], &a[i]);
        heapify(a, i, 0);
    }
}

int main()
{
    int a[10001];
    printf("Enter the size of array\n");
    int n;
    scanf("%d", &n);
    printf("enter the array elements:\n");
    for (int i = 0; i < n; i++)
    {
        scanf("%d", &a[i]);
    }
    printf("Original array: ");
    for (int i = 0; i < n; i++)
    {
        printf("%d ", a[i]);
    }
    printf("\n");
    heapSort(a, n);
    printf("Sorted array: ");
```

```
 for (int i = 0; i < n; i++)
  {
     printf("%d ", a[i]);
  }
  printf("\n");
  return 0;
}
```

Output:



```
Enter the size of array
6
enter the array elements:
3 1 4 2 7 5
Original array: 3 1 4 2 7 5
Sorted array: 1 2 3 4 5 7
PS C:\Users\Admin\Desktop\ada cs251>
```