

1. Identify the M-th maximum number and Nth minimum number in an array and then find the sum of it and difference of it.

Test cases:	output –
{16, 16, 16 16, 16}, M = 0, N = 1	(illegal input)
{0, 0, 0, 0}, M = 1, N = 2	0
{-12, -78, -35, -42, -85}, M = 3 , N = 3	-7
{15, 19, 34, 56, 12}, M = 6 , N = -3	(illegal input)
{85, 45, 65, 75, 95}, M = 5 , N = 2	-20

Program:

```
#include<stdio.h>

int main(){
    int size=0;
    printf("Enter the total no. of elements: ");
    scanf("%d",&size);

    int arr[size];
    printf("Enter the elements: ");
    for (int i = 0; i < size; i++)
        scanf("%d",&arr[i]);

    int n,m;
    printf("Enter the m value: ");
    scanf("%d",&m);
    printf("Enter the n value: ");
    scanf("%d",&n);

    if(m<=0 || n<=0)
        printf("illegal input...!");

    else if(m>size || n<0)
        printf("illegal input...!");

    else{
        int temp=0;
```

```

        for(int i=0;i<size;i++){
            for(int j=0;j<size;j++){
                temp=arr[i];
                arr[i]=arr[j];
                arr[j]=temp;
            }
        }

        printf("Sum: %d\n",arr[size-m]+arr[n-1]);
        printf("Difference: %d",arr[size-m]-arr[n-1]);
    }
}

```

Output:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\mth max and nth min.exe
Enter the total no. of elements: 5
Enter the elements: 1
5
2
9
6
Enter the m value: 1
Enter the n value: 2
Sum: 14
Difference: -4
-----
Process exited after 16.69 seconds with return value 0
Press any key to continue . . .

```

1. **Given an array of integers nums which is sorted in ascending order, and an integer target, write a function to search target in nums. If target exists, then return its index. Otherwise, return -1. integer target. Write a program to search a number in a list using binary search and estimate time complexity**

Program:

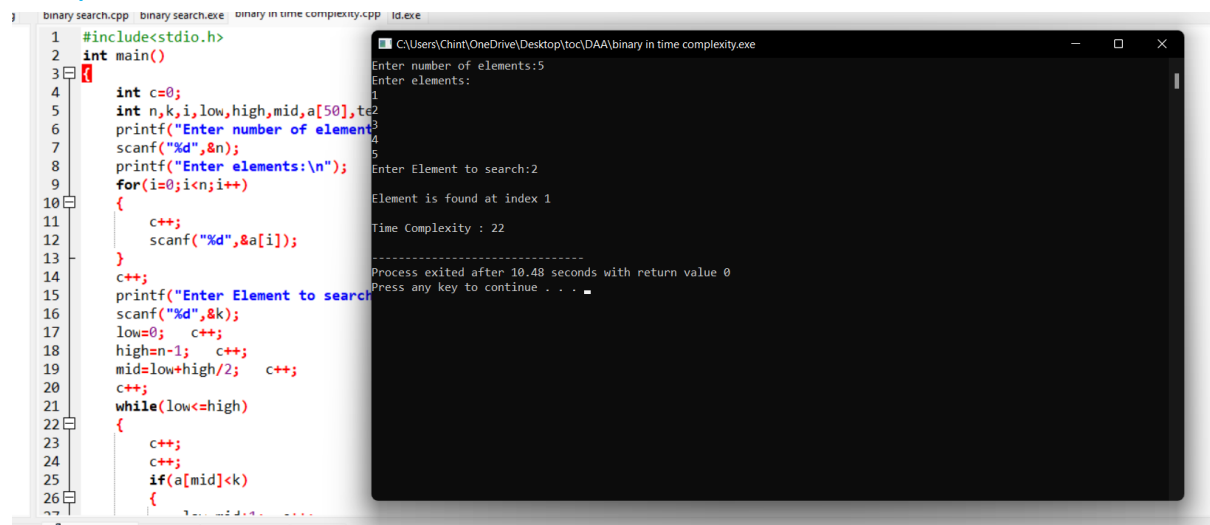
```
#include<stdio.h>
```

```

int main()
{
    int c=0;
    int n,k,i,low,high,mid,a[50],temp;
    printf("Enter number of elements:");
    scanf("%d",&n);
    printf("Enter elements:\n");
    for(i=0;i<n;i++)
    {
        c++;
        scanf("%d",&a[i]);
    }
    c++;
    printf("Enter Element to search:");
    scanf("%d",&k);
    low=0; c++;
    high=n-1; c++;
    mid=low+high/2; c++;
    c++;
    while(low<=high)
    {
        c++;
        c++;
        if(a[mid]<k)
        {
            low=mid+1; c++;
        }
        else if(a[mid]==k)
        {
            printf("\nElement is found at index %d\n",mid);
            break;
        }
        else
        {
            high=mid-1; c++;
        }
        mid=(low+high)/2; c++;
    }
    c++;
    c++;
    if(low>high)
    {
        printf("Element is not found\n");
    }
    printf("\nTime Complexity : %d\n",c);
}

```

Output:



The screenshot shows a C++ IDE with two windows. The left window displays the source code for a binary search program. The right window shows the program's execution output.

```
1 #include<stdio.h>
2 int main()
3 {
4     int c=0;
5     int n,k,i,low,high,mid,a[50],t;
6     printf("Enter number of elements:");
7     scanf("%d",&n);
8     printf("Enter elements:\n");
9     for(i=0;i<n;i++)
10    {
11        c++;
12        scanf("%d",&a[i]);
13    }
14    c++;
15    printf("Enter Element to search:");
16    scanf("%d",&k);
17    low=0; c++;
18    high=n-1; c++;
19    mid=low+high/2; c++;
20    c++;
21    while(low<=high)
22    {
23        c++;
24        c++;
25        if(a[mid]<k)
26        {
27            low=mid+1;
28        }
29        else if(a[mid]>k)
30        {
31            high=mid-1;
32        }
33        else
34        {
35            printf("Element is found at index %d\n",mid);
36            break;
37        }
38    }
39    printf("Time Complexity : %d\n",c);
40    return 0;
41 }
```

Output:

```
Enter number of elements:5
Enter elements:
1
2
3
4
5
Enter Element to search:2
Element is found at index 1
Time Complexity : 22
Process exited after 10.48 seconds with return value 0
Press any key to continue . . .
```

2. Write a program to find the reverse of a given number. Estimate the time complexity for the following inputs

a. 1234 b. 6789456 c. 45a34 d – 5926

Program:

```
#include <stdio.h>

int main() {

    int n, reverse = 0, remainder;

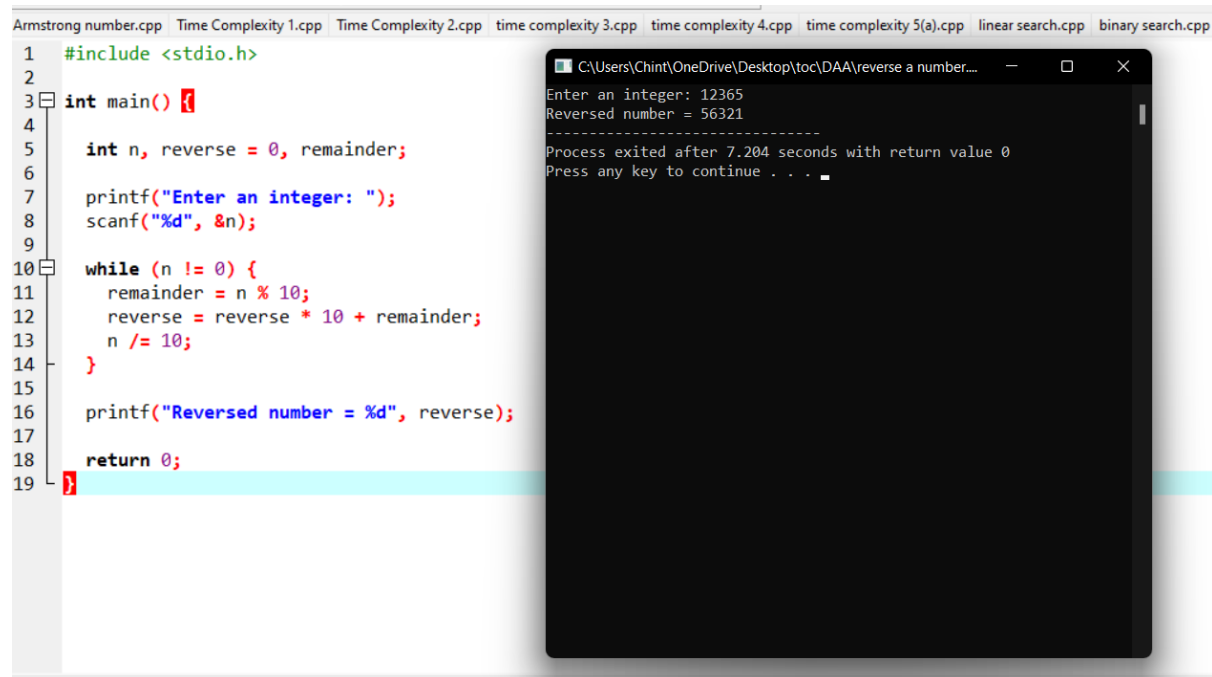
    printf("Enter an integer: ");
    scanf("%d", &n);

    while (n != 0) {
        remainder = n % 10;
        reverse = reverse * 10 + remainder;
        n /= 10;
    }

    printf("Reversed number = %d", reverse);

    return 0;
}
```

Output:



The screenshot shows a C++ IDE with a file explorer at the top listing various files like 'Armstrong number.cpp', 'Time Complexity 1.cpp', etc. The main editor displays a C++ program to reverse a number. The program includes `<stdio.h>`, defines `main()`, declares `int n, reverse = 0, remainder;`, prompts the user to enter an integer, and uses a `while` loop to reverse the digits. The output window shows the user entering '12365' and the program outputting 'Reversed number = 56321'.

```
1 #include <stdio.h>
2
3 int main() {
4
5     int n, reverse = 0, remainder;
6
7     printf("Enter an integer: ");
8     scanf("%d", &n);
9
10    while (n != 0) {
11        remainder = n % 10;
12        reverse = reverse * 10 + remainder;
13        n /= 10;
14    }
15
16    printf("Reversed number = %d", reverse);
17
18    return 0;
19 }
```

Output window content:

```
Enter an integer: 12365
Reversed number = 56321
-----
Process exited after 7.204 seconds with return value 0
Press any key to continue . . .
```

3. Write a program to perform sum of subsets problem using backtracking and estimate time complexity. Identify the test cases.

A. Set (s) = (6, 2, 8, 1, 5) sum is 9

B.. Set (s) = (6, -4, 7, -1, 5, 2, 8, 1,) sum is

10

Program:

```
#include <stdio.h>
#define TRUE 1
#define FALSE 0
int inc[50], w[50], sum, n, count=0;
void sumset(int i, int wt, int total);
int promising(int i, int wt, int total) {
    return(((wt+total)>=sum)&&((wt==sum)||((wt+w[i+1])<=sum)));
}
int main() {
    int i, j, n, temp, total=0;
    printf("\n Enter how many numbers:\n");
    scanf("%d", &n);
    printf("\n Enter %d numbers to th set:\n", n);
    for (i=0; i<n; i++) {
        scanf("%d", &w[i]);
        total+=w[i];
    }
}
```

```

        count++;
        printf("\n Input the sum value to create sub set:\n");
        scanf("%d",&sum);
        for (i=0;i<=n;i++)
            for (j=0;j<n-1;j++)
                if(w[j]>w[j+1]) {
                    temp=w[j];
                    w[j]=w[j+1];
                    w[j+1]=temp;
                }
        count++;
        printf("\n The given %d numbers in ascending order:\n",n);
        for (i=0;i<n;i++)
            printf("%d \t",w[i]);
        count++;
        if((total<sum))
            printf("\n Subset construction is not possible"); else {
                for (i=0;i<n;i++)
                    inc[i]=0;
                printf("\n The solution using backtracking is:\n");
                sumset(-1,0,total);
            }
        count++;
    }
}

void sumset(int i,int wt,int total) {
    int j;
    if(promising(i,wt,total)) {
        if(wt==sum) {
            printf("\n{\t");
            for (j=0;j<=i;j++)
                if(inc[j])
                    printf("%d\t",w[j]);
            printf("}\n");
        } else {
            inc[i+1]=TRUE;
            sumset(i+1,wt+w[i+1],total-w[i+1]);
            inc[i+1]=FALSE;
            sumset(i+1,wt,total-w[i+1]);
        }
    }
}

printf(" time complexity is%d\n",count);
}

```

Output:

[illegible]

- 5. Write a program to check the given is Armstrong or not.**

The k-digit number N is an Armstrong number if and only if the k-th power of each digit sums to N.

Given a positive integer N, return true if and only if it is an Armstrong number.

Input : 153

Input : 419

Output : True

Output : False

Program:

1. `#include<stdio.h>`
2. `int main()`
3. `{`
4. `int n,r,sum=0,temp;`
5. `printf("enter the number=");`

```

6. scanf("%d",&n);
7. temp=n;
8. while(n>0)
9. {
10. r=n%10;
11. sum=sum+(r*r*r);
12. n=n/10;
13. }
14. if(temp==sum)
15. printf("armstrong number ");
16. else
17. printf("not armstrong number");
18. return 0;
19. }

```

Output:

```

Armstrong number.cpp
1  #include<stdio.h>
2  int main()
3  {
4  int n,r,sum=0,temp;
5  printf("enter the number=");
6  scanf("%d",&n);
7  temp=n;
8  while(n>0)
9  {
10 r=n%10;
11 sum=sum+(r*r*r);
12 n=n/10;
13 }
14 if(temp==sum)
15 printf("armstrong number ");
16 else
17 printf("not armstrong number");
18 return 0;
19 }

```

```

Select C:\Users\Chint\OneDrive\Desktop\toC\DAA\Armstrong number.exe
enter the number=153
armstrong number
-----
Process exited after 25.71 seconds with return value 0
Press any key to continue . . .

```

6. **Write a C program to perform Strassen's Matrix Multiplication for the 2*2 matrix elements.**

And Estimate time complexity.

A Matrix= (3, 5,-4, 7) B Matrix – (9,-2, 4, 8)

Program:

```

#include<stdio.h>
int main(){
int a[2][2], b[2][2], c[2][2], i, j, count=0;

```



```

int m1, m2, m3, m4 , m5, m6, m7;
printf("Enter the 4 elements of first matrix:");
count++;
for(i = 0;i < 2; i++)
{
count++;
for(j = 0;j < 2; j++)
{
count++;
scanf("%d", &a[i][j]);
}
}
count++;
count++;

printf("Enter the 4 elements of second matrix: ");
for(i = 0; i < 2; i++)
{
count++;
for(j = 0;j < 2; j++)
{
count++;
scanf("%d", &b[i][j]);
}
}
count++;
count++;

printf("\nThe first matrix is\n");
for(i = 0; i < 2; i++){
count++;
printf("\n");
for(j = 0; j < 2; j++){
count++;
printf("%d\t", a[i][j]);
}
}
count++;
count++;

printf("\nThe second matrix is\n");
for(i = 0;i < 2; i++){
count++;
printf("\n");
for(j = 0;j < 2; j++){
count++;
printf("%d\t", b[i][j]);
}
}
count++;
count++;

```

```

m1= (a[0][0] + a[1][1]) * (b[0][0] + b[1][1]);
count++;
m2= (a[1][0] + a[1][1]) * b[0][0];
count++;
m3= a[0][0] * (b[0][1] - b[1][1]);
count++;
m4= a[1][1] * (b[1][0] - b[0][0]);
count++;
m5= (a[0][0] + a[0][1]) * b[1][1];
count++;
m6= (a[1][0] - a[0][0]) * (b[0][0]+b[0][1]);
count++;
m7= (a[0][1] - a[1][1]) * (b[1][0]+b[1][1]);
count++;

c[0][0] = m1 + m4- m5 + m7;
count++;
c[0][1] = m3 + m5;
count++;
c[1][0] = m2 + m4;
count++;
c[1][1] = m1 - m2 + m3 + m6;
count++;

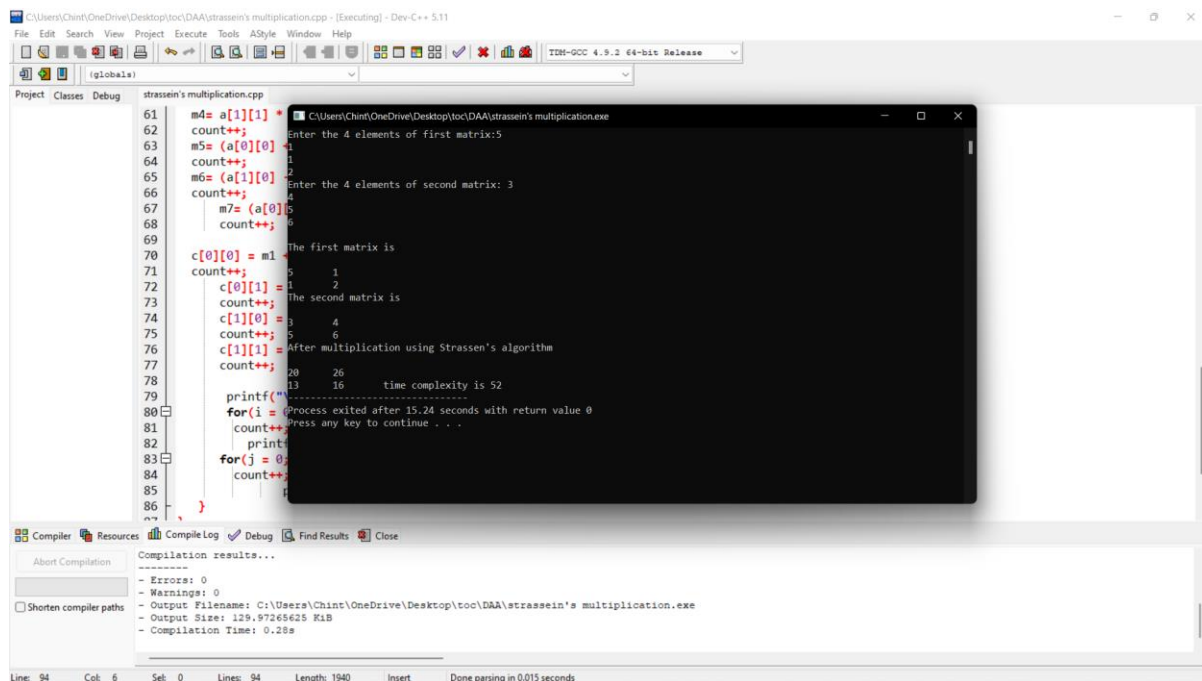
printf("\nAfter multiplication using Strassen's algorithm \n");
for(i = 0; i < 2 ; i++){
    count++;
    printf("\n");
    for(j = 0;j < 2; j++){
        count++;
        printf("%d\t", c[i][j]);
    }
}
count++;
count++;

printf(" time complexity is %d",count);

return 0;
}
}

```

Output:



```
61 m4= a[1][1] *
62 count++;
63 m5= (a[0][0]
64 count++;
65 m6= (a[1][0]
66 count++;
67 m7= (a[0]
68 count++;
69
70 c[0][0] = m1
71 count++;
72 c[0][1] =
73 count++;
74 c[1][0] =
75 count++;
76 c[1][1] =
77 count++;
78
79
80 printf("
81 for(i =
82 count++;
83 for(j = 0;
84 count++;
85
86 }
```

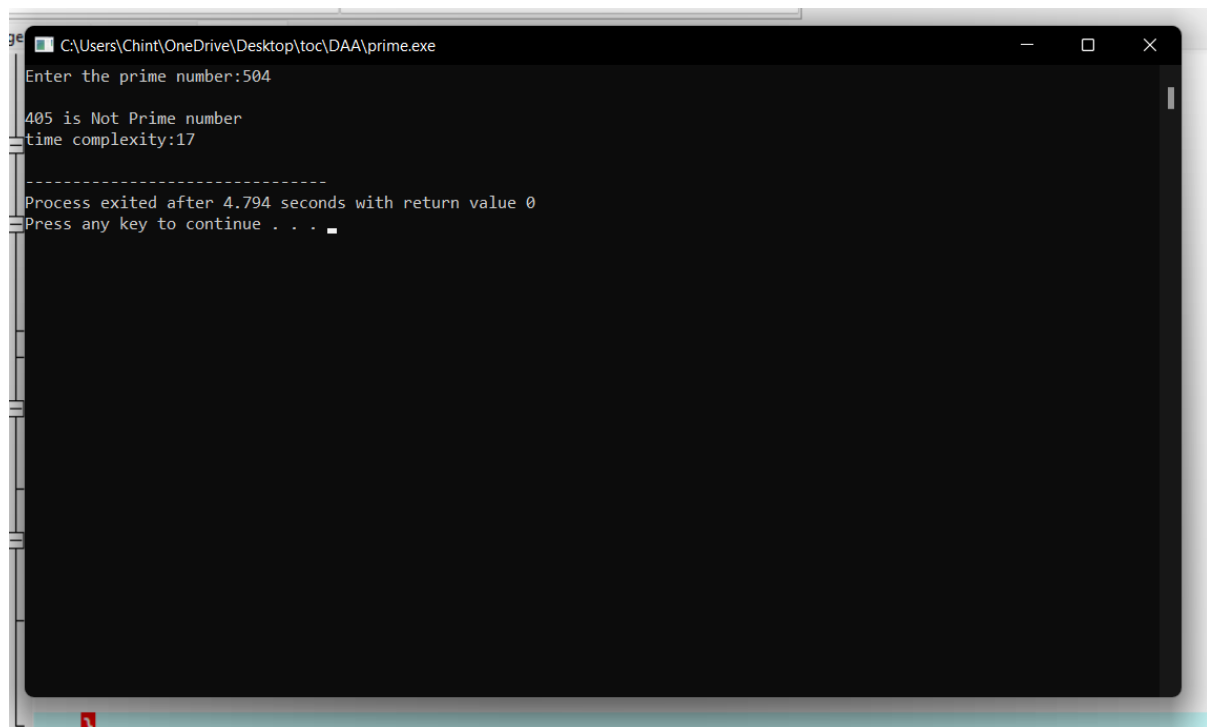
Enter the 4 elements of first matrix: 5
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3
4
Enter the 4 elements of second matrix: 3
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```

for (int j = 2; j <= sum / 2; j++)
{
    count++;
    if ((sum % j) == 0)
    {
        count++;
        flag = 1;
        break;
    }
}
if (flag == 0)
{
    count++;
    printf("%d is also prime number",sum);
}
else
{
    count++;
    printf("%d is Not Prime number\n",sum);
}
count++;
printf("time complexity:%d\n",count);
}

```

Output:



```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\prime.exe
Enter the prime number:504

405 is Not Prime number
time complexity:17

-----
Process exited after 4.794 seconds with return value 0
Press any key to continue . . .

```

8. Let there be N workers and N jobs. Any worker can be assigned to perform any job, incurring

some

cost that may vary depending on the work-job assignment. It is required to perform all jobs by assigning exactly one worker to each job and exactly one job to each agent in such a way that the total cost of the assignment is minimized. Write a program to solve a assignment problem for the given data sets using branch and bound.

	Job 1	Job 2	Job 3	Job 4
Person A	12	8	9	10
Person B	11	10	10	9
Person C	9	11	8	12
Person D	11	9	23	7

9. Compute the program to find the GCD of two numbers. And also find the finf of time Recursion

used to estimate time complexity.

Perform the test cases for the given set of no's

A. (36,48) B. (144, 90) C. (-56,88) D. (84,84)

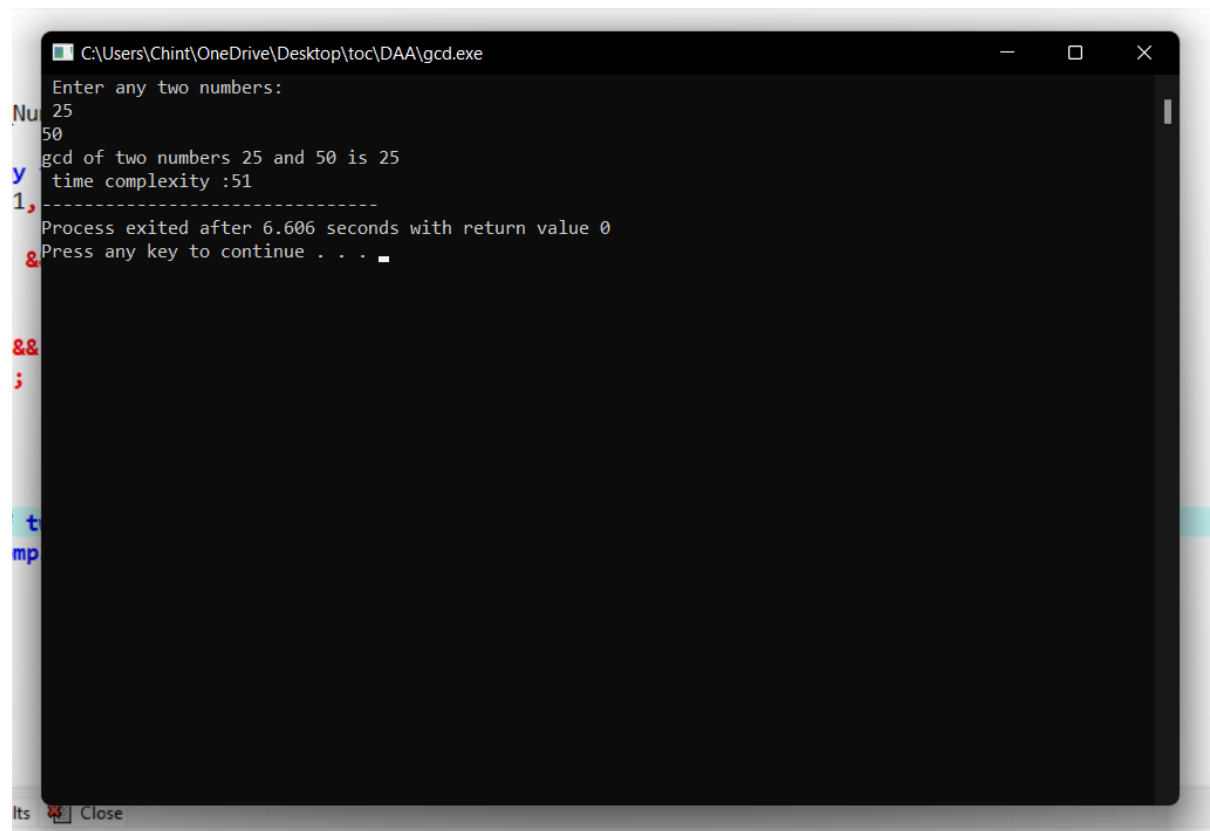
Program:

```
#include <stdio.h>
int main()
{
    int n1, n2, i, GCD_Num;
    int count=0;
    printf ( " Enter any two numbers: \n ");
    scanf ( "%d %d", &n1, &n2);

    for( i = 1; i <= n1 && i <= n2; ++i)
    {
        count++;
        if (n1 % i ==0 && n2 % i == 0)
            GCD_Num = i;
        count++;
    }
    count++;

    printf ("gcd of two numbers %d and %d is %d \n ", n1, n2, GCD_Num);
    printf("time complexity :%d ",count);
    return 0;
}
```

Output:



```
C:\Users\Chint\OneDrive\Desktop\toc\DAA\gcd.exe
Enter any two numbers:
Nu 25
50
gcd of two numbers 25 and 50 is 25
time complexity :51
-----
Process exited after 6.606 seconds with return value 0
Press any key to continue . . .
```

10. Using Divide and Conquer strategy to find Max and Min value in the list and estimate time

complexity.

Testing Condition – Count the number of times in Comparison to find Min_Max value in a list n for the given set of elements.

- A. (23,45,6,8,-9,44,7,8)
- B. (8,-5,7,2,6,0,1,9)
- C. (45, y, 9, 8,4, 7,11, 22,16)

Program:

```
#include<stdio.h>
#include<stdio.h>
int max, min;
int a[100];
void maxmin(int i, int j)
{
    int max1, min1, mid;
    if(i==j)
    {
        max = min = a[i];
```

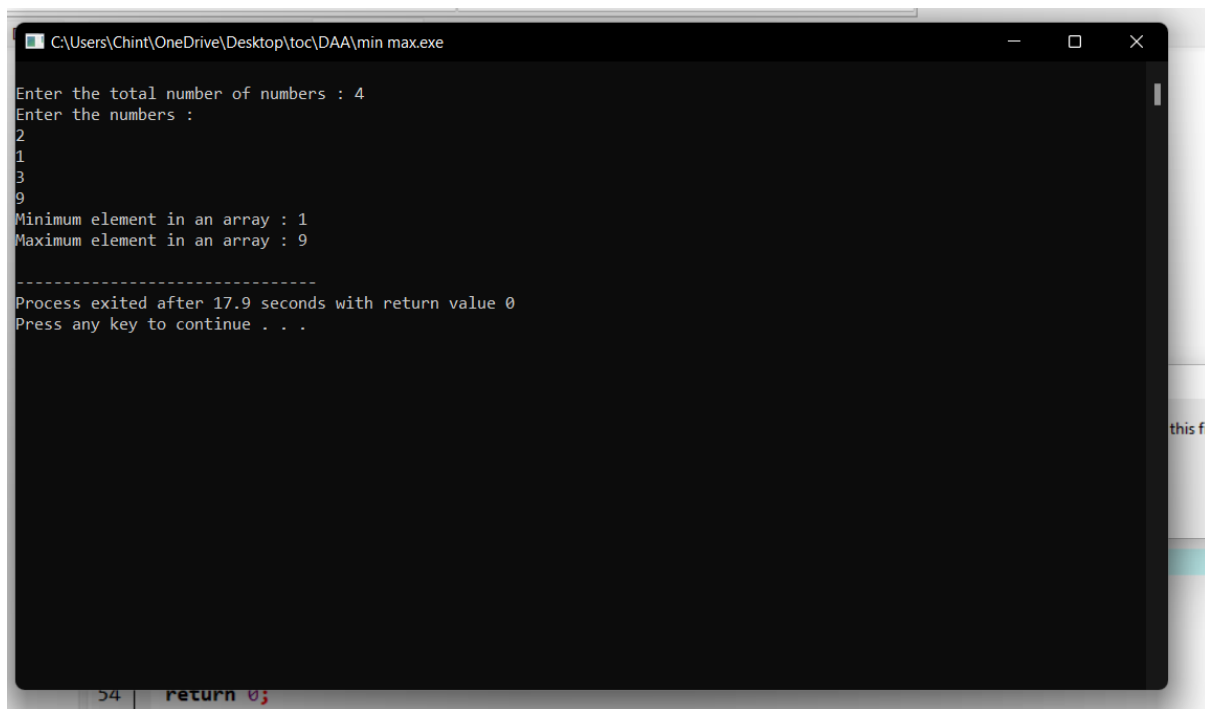
```

    }
else
{
    if(i == j-1)
    {
        if(a[i] < a[j])
        {
            max = a[j];
            min = a[i];
        }
        else
        {
            max = a[i];
            min = a[j];
        }
    }
else
{
    mid = (i+j)/2;
    maxmin(i, mid);
    max1 = max; min1 = min;
    maxmin(mid+1, j);
    if(max < max1)
        max = max1;
    if(min > min1)
        min = min1;
    }
}
}
}
int main ()
{
    int i, num;
    printf ("\nEnter the total number of numbers : ");
    scanf ("%d",&num);
    printf ("Enter the numbers : \n");
    for (i=1;i<=num;i++)
        scanf ("%d",&a[i]);

    max = a[0];
    min = a[0];
    maxmin(1, num);
    printf ("Minimum element in an array : %d\n", min);
    printf ("Maximum element in an array : %d\n", max);
    return 0;
}

```

Output:



```
C:\Users\Chint\OneDrive\Desktop\toe\DAA\min max.exe
Enter the total number of numbers : 4
Enter the numbers :
2
1
3
9
Minimum element in an array : 1
Maximum element in an array : 9

-----
Process exited after 17.9 seconds with return value 0
Press any key to continue . . .
```

11. Generate a program for Pascal triangle. Estimate the time complexity for the row=5

```

      1
    1  1
  1  2  1
1  3  3  1
1  4  6  4  1
```

Program:

```
#include<stdio.h>
int main()
{
    int rows, coef = 1, space, i, j;
    int count=0;
    printf("Enter the number of rows: ");
    scanf("%d", &rows);
    for (i = 0; i<rows; i++)
    {
        count++;
        for (space = 1; space <= rows - i; space++)
            printf(" ");
```



```

        count++;
    for (j = 0; j <= i; j++)
    {
        count++;
        if(j == 0 || i == 0){
            coef = 1;
            count++;
        }

        else
        {
            coef = coef * (i - j + 1) / j;
        }
        count++;
        printf("%4d", coef);
    }
    printf("\n");
    count++;
}
printf("time complexity:%d",count);
return 0;
}

```

Output:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\pascal.exe
Enter the number of rows: 5
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
time complexity:50
-----
Process exited after 3.585 seconds with return value 0
Press any key to continue . . .

```

12. Compute Binomial coefficient for n=8, k=8 using dynamic programming

Using condition such as

- I $nC_k = 1$ if $k=0$ or $n=k$**
II $nC_k = (n-1)C_{k-1} + (n-1)C_k$ for $n>k>0$

Program:

```
#include <stdio.h>
int count=0;
int bin_table(int val) {
    for (int i = 0; i <= val; i++) {
        count++;
        printf("%2d", i);
        int num = 1;
        for (int j = 0; j <= i; j++) {
            count++;
            if (i != 0 && j != 0)
                num = num * (i - j + 1) / j;
            count++;
            printf("%4d", num);
        }
        printf("\n");
        count++;
    }
}
int main() {
    int value = 5;
    bin_table(value);
    printf("Time complexity:%d",count);
    return 0;
}
```

Output:

```
0 1
1 1 1
2 1 2 1
3 1 3 3 1
4 1 4 6 4 1
5 1 5 10 10 5 1
Time complexity:54
-----
```

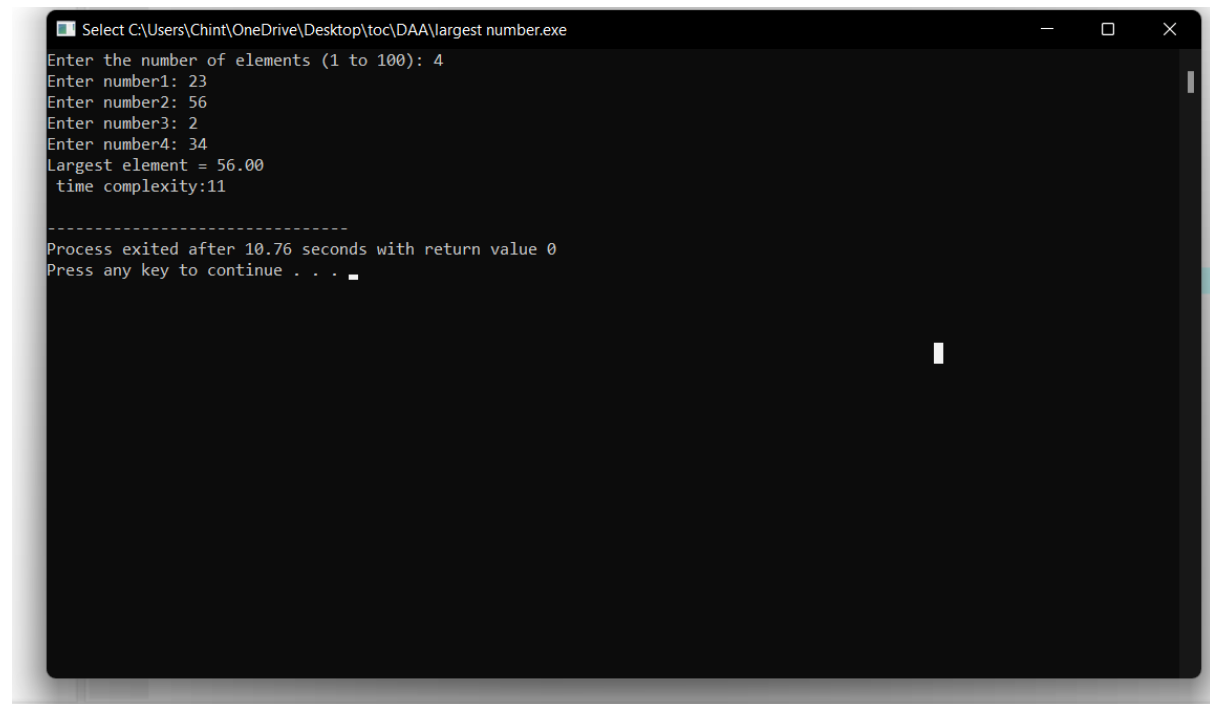
13. Write a program to find the largest element value in an array. Estimate the time complexity and no of comparison for the given set of values.

Program:

```
#include <stdio.h>
int main() {
    int n;
    int count=0;
    double arr[100];
    printf("Enter the number of elements (1 to 100): ");
    scanf("%d", &n);
    count++;
    for (int i = 0; i < n; ++i) {
        count++;
        printf("Enter number%d: ", i + 1);
        scanf("%lf", &arr[i]);
    }
    for (int i = 1; i < n; ++i) {
        count++;
        if (arr[0] < arr[i]) {
            arr[0] = arr[i];
        }
        count++;
    }

    printf("Largest element = %.2lf \n ", arr[0]);
    printf("time complexity:%d\n",count);
    return 0;
}
```

Output:



```
Select C:\Users\Chint\OneDrive\Desktop\toc\DAA\largest number.exe
Enter the number of elements (1 to 100): 4
Enter number1: 23
Enter number2: 56
Enter number3: 2
Enter number4: 34
Largest element = 56.00
time complexity:11

-----
Process exited after 10.76 seconds with return value 0
Press any key to continue . . .
```

14. Consider a two integer arrays nums1 and nums2, sorted in non-increasing order and two integers m and n, representing the number of elements in nums1 and nums2 respectively. Write a program to Merge them into a single array using Merge Sort. Derive time complexity of merge sort.

Program:

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

// Merges two subarrays of arr[].
// First subarray is arr[l..m]
// Second subarray is arr[m+1..r]
void merge(int arr[], int l,
           int m, int r)
{
    int i, j, k;
    int n1 = m - l + 1;
    int n2 = r - m;

    // Create temp arrays
    int L[n1], R[n2];

    // Copy data to temp arrays
    // L[] and R[]
    for (i = 0; i < n1; i++)
        L[i] = arr[l + i];
    for (j = 0; j < n2; j++)
        R[j] = arr[m + 1 + j];

    // Merge the temp arrays back
    // into arr[l..r]
    // Initial index of first subarray
    i = 0;

    // Initial index of second subarray
    j = 0;

    // Initial index of merged subarray
    k = l;
    while (i < n1 && j < n2)
    {
        if (L[i] <= R[j])
        {
            arr[k] = L[i];
            i++;
        }
        else
        {
            arr[k] = R[j];
            j++;
        }
        k++;
    }
    while (i < n1)
        arr[k] = L[i++];
    while (j < n2)
        arr[k] = R[j++];
}
```

```

        j++;
    }
    k++;
}

// Copy the remaining elements
// of L[], if there are any
while (i < n1) {
    arr[k] = L[i];
    i++;
    k++;
}

// Copy the remaining elements of
// R[], if there are any
while (j < n2)
{
    arr[k] = R[j];
    j++;
    k++;
}
}

// l is for left index and r is
// right index of the sub-array
// of arr to be sorted
void mergeSort(int arr[],
               int l, int r)
{
    if (l < r)
    {
        // Same as (l+r)/2, but avoids
        // overflow for large l and h
        int m = l + (r - l) / 2;

        // Sort first and second halves
        mergeSort(arr, l, m);
        mergeSort(arr, m + 1, r);

        merge(arr, l, m, r);
    }
}

// UTILITY FUNCTIONS
// Function to print an array
void printArray(int A[], int size)
{
    int i;
    for (i = 0; i < size; i++)
        printf("%d ", A[i]);
    printf("\n");
}

```

```

}

// Driver code
int main()
{
    int arr[] = {12, 11, 13, 5, 6, 7};
    int arr_size = sizeof(arr) / sizeof(arr[0]);

    printf("Given array is \n");
    printArray(arr, arr_size);

    mergeSort(arr, 0, arr_size - 1);

    printf("\nSorted array is \n");
    printArray(arr, arr_size);
    return 0;
}

```

Output:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\merge sort.exe
merge
Given array is
80 12 11 13 5 6 7
81
82 Sorted array is
83 5 6 7 11 12 13
84 -----
85 Process exited after 0.05916 seconds with return value 0
86 Press any key to continue . . .
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106

```

15. Write a program to find all pair shortest path using Floyd's technique and to estimate time complexity.

	A	B	C	D
--	----------	----------	----------	----------

A	0	8	7	8
B	9	0	11	12
C	10	9	0	11
D	8	10	11	0

Program:

```
#include <stdio.h>

// defining the number of vertices
#define nV 4

#define INF 999

void printMatrix(int matrix[][nV]);

// Implementing floyd warshall algorithm
void floydWarshall(int graph[][nV]) {
    int matrix[nV][nV], i, j, k;

    for (i = 0; i < nV; i++)
        for (j = 0; j < nV; j++)
            matrix[i][j] = graph[i][j];

    // Adding vertices individually
    for (k = 0; k < nV; k++) {
        for (i = 0; i < nV; i++) {
            for (j = 0; j < nV; j++) {
                if (matrix[i][k] + matrix[k][j] < matrix[i][j])
                    matrix[i][j] = matrix[i][k] + matrix[k][j];
            }
        }
    }
    printMatrix(matrix);
}

void printMatrix(int matrix[][nV]) {
    for (int i = 0; i < nV; i++) {
        for (int j = 0; j < nV; j++) {
            if (matrix[i][j] == INF)
                printf("%4s", "INF");
            else
                printf("%4d", matrix[i][j]);
        }
        printf("\n");
    }
}

int main() {
```

```

int graph[nV][nV] = {{0, 8, INF, 8},
                    {9, 0, INF, 12},
                    {INF, 9, 0, INF},
                    {INF, INF, 11, 0}};
floydWarshall(graph);
}

```

Output:

```

Select C:\Users\Chint\OneDrive\Desktop\toc\DAA\floyds.exe

0  8  19  8
9  0  23  12
18 9  0  21
29 20 11  0

-----
Process exited after 0.07599 seconds with return value 0
Press any key to continue . . .

```

1. $N = 0.2$

.16. Write a program for to perform liner search and estimate time complexity. Compute the

amount of time for completion.

Input series

A = (56,89,7,13,75, 23, 8, 12) Key element 75

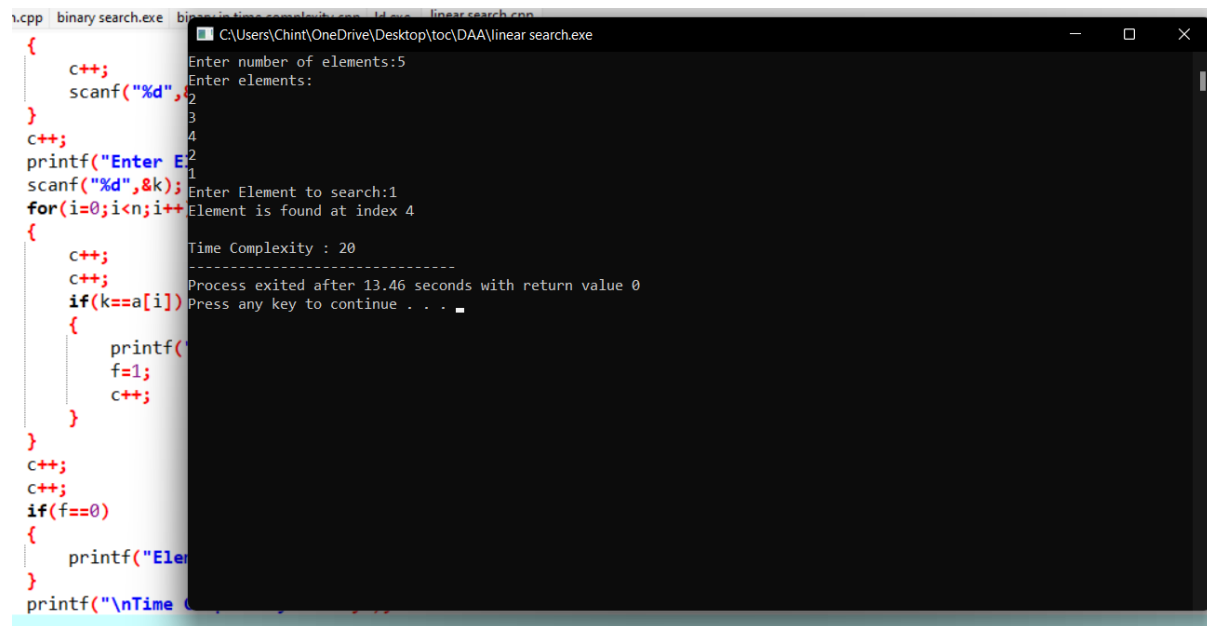
B= (89,45 -23,45,0, 44, 2) Key element 0

C= (45,67,56,A,34,-2,100) Key element 90

Program:

```
#include<stdio.h>
int main()
{
    int c=0;
    int n,k,i,j,f=0,a[50];
    c++;
    printf("Enter number of elements:");
    scanf("%d",&n);
    printf("Enter elements:\n");
    for(i=0;i<n;i++)
    {
        c++;
        scanf("%d",&a[i]);
    }
    c++;
    printf("Enter Element to search:");
    scanf("%d",&k);
    for(i=0;i<n;i++)
    {
        c++;
        c++;
        if(k==a[i])
        {
            printf("Element is found at index %d\n",i);
            f=1;
            c++;
        }
    }
    c++;
    c++;
    if(f==0)
    {
        printf("Element is not found");
    }
    printf("\nTime Complexity : %d",c);
}
```

Output:



```
1.cpp binary search.exe C:\Users\Chint\OneDrive\Desktop\toc\DAA\linear search.exe
{
    c++;
    scanf("%d",&a[i]);
}
c++;
printf("Enter Element to search:");
scanf("%d",&k);
for(i=0;i<n;i++)
{
    c++;
    c++;
    if(k==a[i])
    {
        printf("Element is found at index %d",i);
        f=1;
        c++;
    }
}
c++;
c++;
if(f==0)
{
    printf("Element not found");
}
printf("\nTime Complexity : %d",c);
}
```

17. Write a program to find the factorial (fact) of a number and to estimate time complexity.

Condition such as i. $n=0$, return 1 otherwise $\text{fact}(n-1) * n$

Program:

```
#include <stdio.h>
int main() {
    int n, i;
    int count=0;
    unsigned long long fact = 1;
    printf("Enter an integer: ");
    scanf("%d", &n);
    count++;
    if (n < 0)
        printf("Error! Factorial of a negative number doesn't exist.");
    else {
        for (i = 1; i <= n; ++i) {
            fact *= i;
            count++;
        }
        printf("Factorial of %d = %llu \n ", n, fact);
        printf(" time compexity : %d ",count);
    }

    return 0;
}
```

Output:

```
int main() {  
    C:\Users\Chint\OneDrive\Desktop\toc\DAA\factorial.exe  
    Enter an integer: 5  
    Factorial of 5 = 120  
    time complexity : 6  
    -----  
    Process exited after 2.145 seconds with return value 0  
    Press any key to continue . . .  
}
```

**18. Write a program to perform Knapsack problem for the following set of object values.,
Knapsack weight 100**

item	Weight	Profit
1	40	80
2	30	70
3	20	50
4	30	80

Program:

```
#include<stdio.h>  
  
void knapsack(int n, float weight[], float profit[], float capacity) {  
    float x[20], tp = 0;  
    int i, j, u;  
    u = capacity;  
  
    for (i = 0; i < n; i++)  
        x[i] = 0.0;  
  
    for (i = 0; i < n; i++) {  
        if (weight[i] > u)  
            break;  
    }
```

```

        else {
            x[i] = 1.0;
            tp = tp + profit[i];
            u = u - weight[i];
        }
    }

    if (i < n)
        x[i] = u / weight[i];

    tp = tp + (x[i] * profit[i]);

    printf("\nThe result vector is:- ");
    for (i = 0; i < n; i++)
        printf("%f\t", x[i]);

    printf("\nMaximum profit is:- %f", tp);
}

int main() {
    float weight[20], profit[20], capacity;
    int num, i, j;
    float ratio[20], temp;

    printf("\nEnter the no. of objects:- ");
    scanf("%d", &num);

    printf("\nEnter the wts and profits of each object:- ");
    for (i = 0; i < num; i++) {
        scanf("%f %f", &weight[i], &profit[i]);
    }

    printf("\nEnter the capacity of knapsack:- ");
    scanf("%f", &capacity);

    for (i = 0; i < num; i++) {
        ratio[i] = profit[i] / weight[i];
    }

    for (i = 0; i < num; i++) {
        for (j = i + 1; j < num; j++) {
            if (ratio[i] < ratio[j]) {
                temp = ratio[j];
                ratio[j] = ratio[i];
                ratio[i] = temp;

                temp = weight[j];
                weight[j] = weight[i];
                weight[i] = temp;
            }
        }
    }
}

```

```

        temp = profit[j];
        profit[j] = profit[i];
        profit[i] = temp;
    }
}
}

knapsack(num, weight, profit, capacity);
return(0);
}

```

Output:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\knapsack.exe
Enter the no. of objects:- 4
Enter the wts and profits of each object:- 40 80
30 70
20 50
30 80
Enter the capacity of knapsack:- 100
The result vector is:- 1.000000 1.000000 1.000000 0.500000
Maximum profit is:- 240.000000
-----
Process exited after 64.38 seconds with return value 0
Press any key to continue . . .

```

19. Write a program to print the first n perfect numbers. (Hint Perfect number means a positive integer that is equal to the sum of its proper divisors)

Sample Input:

N = 3

Sample Output:

First 3 perfect numbers are: 6 , 28 , 496

Test Cases:

2. N = 0

3. N = 5

4. N = -2

5. N = -5

Program:

```
#include <stdio.h>

int main()
{
    int i, j, end, sum;

    /* Input upper limit to print perfect number */
    printf("Enter upper limit: ");
    scanf("%d", &end);

    printf("All Perfect numbers between 1 to %d:\n", end);

    /* Iterate from 1 to end */
    for(i=1; i<=end; i++)
    {
        sum = 0;

        /* Check whether the current number i is Perfect number or not */
        for(j=1; j<i; j++)
        {
            if(i % j == 0)
            {
                sum += j;
            }
        }

        /* If the current number i is Perfect number */
        if(sum == i)
        {
            printf("%d, ", i);
        }
    }

    return 0;
}
```

Output:

```

15 printf("All Perfect numbers between 1 to 100:");
16
17 /* Iterate from 1 to end */
18 for(i=1; i<=end; i++)
19 {
20     sum = 0;
21
22     /* Check whether the current number i is Perfect or not */
23     for(j=1; j<i; j++)
24     {
25         if(i % j == 0)
26         {
27             sum += j;
28         }
29     }
30
31     /* If the current number i is Perfect */
32     if(sum == i)
33     {
34         printf("%d, ", i);
35     }
36 }
37
38 return 0;
39

```

Output Window:

```

Enter upper limit: 100
All Perfect numbers between 1 to 100:
6, 28,
Process exited after 2.658 seconds with return value 0
Press any key to continue . . .

```

20. Program to Find Even Sum of Fibonacci Series Till number N?(day 2)

Sample Input: n = 4

Sample Output: 33

(N = 4, So here the Fibonacci series will be produced from 0th term till 8th term: 0, 1, 1, 2, 3, 5, 8, 13, 21)

Sum of numbers at even indexes = 0 + 1 + 3 + 8 + 21 = 33)

Program:

```

#include<stdio.h>
int fab(int n){
    int n1=0,n2=1,n3,c=0,sum=0,ini=0;
    int count=0;
    printf("%d %d ",n1,n2);
    while(c<n){
        count++;
        n3=n1+n2;
        count++;
        printf("%d ",n3);
        if(ini%2==0){
            count++;
            sum+=n3;
            count++;
            c++;
            count++;
        }
        ini++;
        count++;
        n1=n2;
        count++;
        n2=n3;
        count++;
    }count++;
}

```

```

printf("\nsum: %d\n",sum);
printf("Time complexity: %d",count);
return 0;
}

int main(){
int n;
printf("Enter the n value: ");
scanf("%d",&n);
fab(n);
}

```

Output:

```

Enter the n value: 4
0 1 1 2 3 5 8 13 21
sum: 33
Time complexity: 48
-----

```

21. Write a program to perform Selection sort and estimate time Complexity

Estimate the time iteration for the following set of numbers.

- A. (10,5, 80,-2,5,23, 45) B. (12, 3, 0, 34, -11, 34, 22, 8) C. (3, 35, -56, 66, 77, ,-78, 82)

Program:

```

#include <stdio.h>
void selectionSort(int arr[], int size);
void swap(int *a, int *b);
void selectionSort(int arr[], int size)
{
    int i, j;
    for (i = 0 ; i < size; i++)
    {
        for (j = i ; j < size; j++)
        {
            if (arr[i] > arr[j])
                swap(&arr[i], &arr[j]);
        }
    }
}

void swap(int *a, int *b)
{
    int temp;
    temp = *a;
    *a = *b;
    *b = temp;
}

```



```

}
int main()
{
    int array[10], i, size;
    printf("How many numbers you want to sort: ");
    scanf("%d", &size);
    printf("\nEnter %d numbers\t", size);
    printf("\n");
    for (i = 0; i < size; i++)
        scanf("%d", &array[i]);
    selectionSort(array, size);
    printf("\nSorted array is ");
    for (i = 0; i < size; i++)
        printf(" %d ", array[i]);
    return 0;
}

```

Output:

How many numbers you want to sort: 5

Enter 5 numbers

5
6
1
4
2

Sorted array is 1 2 4 5 6

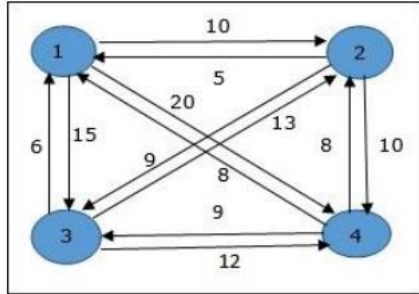
22. Determine an optimal tour in a weighted, directed graph. The weights are nonnegative numbers. The

inputs are weighted, directed graph, and n, the number of vertices in the graph. The graph is

represented by a two-dimensional array W, which has both its rows and columns indexed from 1 to n,

where $W[i][j]$ is the weight on the edge from the i th vertex to the j th vertex. Write a program for

travelling salesman problem using dynamic programming for the below given graph.



Program:

```

#include <iostream>

using namespace std;
const int n = 4;
const int MAX = 1000000;
int dist[n + 1][n + 1] = {
    { 0, 0, 0, 0, 0 }, { 0, 0, 10, 15, 20 },
    { 0, 10, 0, 25, 25 }, { 0, 15, 25, 0, 30 },
    { 0, 20, 25, 30, 0 },
};

int memo[n + 1][1 << (n + 1)];

int fun(int i, int mask)
{
    if (mask == ((1 << i) | 3))
        return dist[1][i];

    if (memo[i][mask] != 0)
        return memo[i][mask];

    int res = MAX;

    for (int j = 1; j <= n; j++)
        if ((mask & (1 << j)) && j != i && j != 1)
            res = std::min(res, fun(j, mask & ~(1 << i))
                + dist[j][i]);
    return memo[i][mask] = res;
}

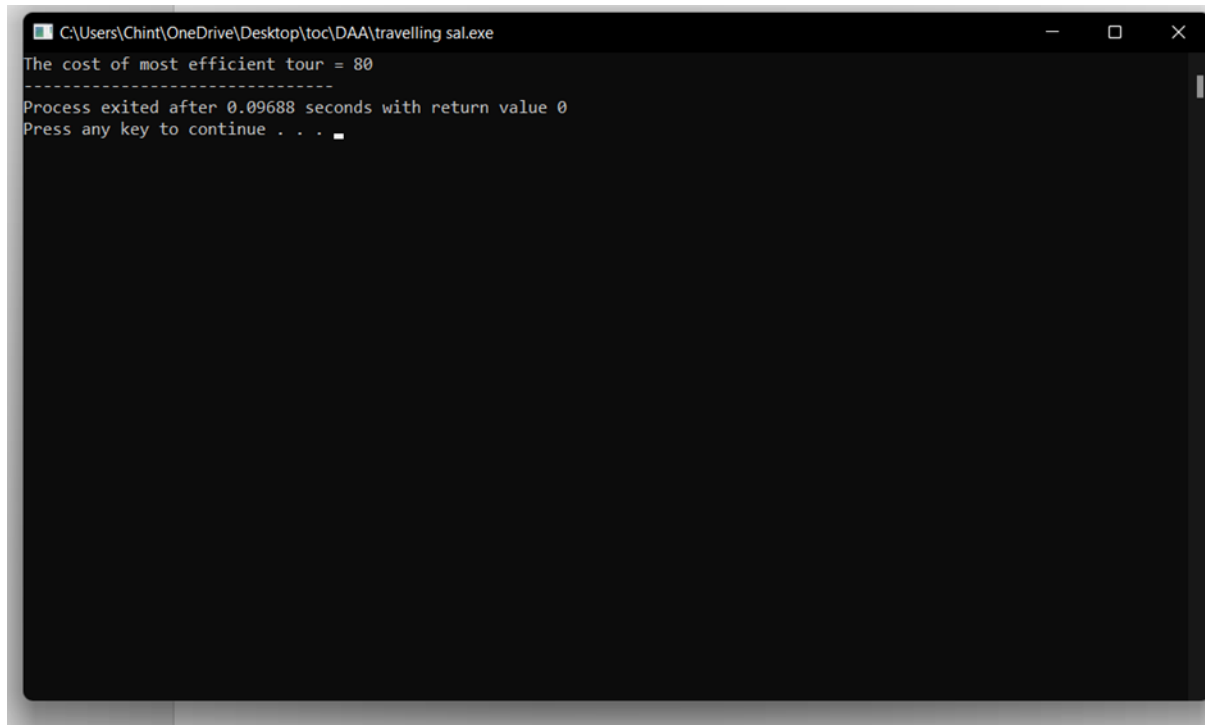
int main()
{
    int ans = MAX;
    for (int i = 1; i <= n; i++)
        ans = std::min(ans, fun(i, (1 << (n + 1)) - 1)
            + dist[i][1]);

    printf("The cost of most efficient tour = %d", ans);
}

```

```
    return 0;  
}
```

Output:



```
C:\Users\Chint\OneDrive\Desktop\toc\DAA\travelling sal.exe  
The cost of most efficient tour = 80  
-----  
Process exited after 0.09688 seconds with return value 0  
Press any key to continue . . .
```

23. Write a program using choice to check

Case 1: Given string is palindrome or not

Case 2: Given number is palindrome or not

Sample Input:

Case = 1

String = MADAM

Sample Output:

Palindrome

Test cases:

- 1. MONEY**
- 2. 5678765**
- 3. MALAY12321ALAM**
- 4. MALAYALAM**
- 5. 1234.4321**

24. Write a program to insert a number in a list

Testing Condition

- i. Insert at the beginning**
- ii. Insert in the middle**
- iii. Insert at the last**

iv. Not Available position in a list

Program:

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

#define MAX 100

int list[MAX];
int position, num, size = 0;

void insertAtBeginning() {
    int i;
    if (size == MAX) {
        printf("List is full. Cannot insert at the beginning\n");
        return;
    }

    for (i = size; i > 0; i--) {
        list[i] = list[i - 1];
    }

    list[0] = num;
    size++;
    printf("Number %d inserted at position %d\n", num, position);
}

void insertInMiddle() {
    int i;
    if (size == MAX) {
        printf("List is full. Cannot insert in the middle\n");
        return;
    }

    for (i = size; i > position - 1; i--) {
        list[i] = list[i - 1];
    }

    list[position - 1] = num;
    size++;
    printf("Number %d inserted at position %d\n", num, position);
}

void insertAtLast() {
    if (size == MAX) {
        printf("List is full. Cannot insert at the end\n");
        return;
    }

    list[size] = num;
```

```

    size++;
    printf("Number %d inserted at position %d\n", num, size);
}

int main() {
    int choice;
    while (1) {
        printf("1. Insert at the beginning\n");
        printf("2. Insert in the middle\n");
        printf("3. Insert at the last\n");
        printf("4. Exit\n");
        printf("Enter your choice: ");
        scanf("%d", &choice);

        switch (choice) {
            case 1:
                printf("Enter the number to insert: ");
                scanf("%d", &num);
                position = 1;
                insertAtBeginning();
                break;

            case 2:
                printf("Enter the number to insert: ");
                scanf("%d", &num);
                printf("Enter the position to insert the number: ");
                scanf("%d", &position);
                if (position < 1 || position > size + 1) {
                    printf("Invalid position\n");
                } else {
                    insertInMiddle();
                }
                break;

            case 3:
                printf("Enter the number to insert: ");
                scanf("%d", &num);
                position = size + 1;
                insertAtLast();
                break;

            case 4:
                exit(0);

            default:
                printf("Invalid choice\n");
                break;
        }
    }

    return 0;
}

```

```
}
```

Output:

Insert at the beginning

2. Insert in the middle

3. Insert at the last

4. Exit

Enter your choice: 1

Enter the number to insert: 5

Number 5 inserted at position 1

1. Insert at the beginning

2. Insert in the middle

3. Insert at the last

4. Exit

Enter your choice: 2

Enter the number to insert: 6

Enter the position to insert the number: 2

Number 6 inserted at position 2

1. Insert at the beginning

2. Insert in the middle

3. Insert at the last

4. Exit

Enter your choice: 3

Enter the number to insert: 4

Number 4 inserted at position 3

1. Insert at the beginning

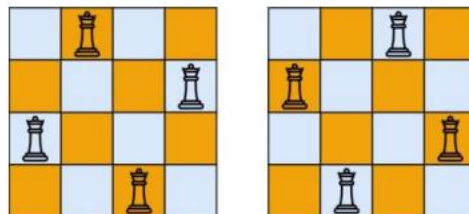
2. Insert in the middle

3. Insert at the last

4. Exit

Enter your choice: 4

25. The n-queens puzzle is the problem of placing n queens on an n x n chessboard such that no two queens attack each other. Given an integer n, return all distinct solutions to the n-queens puzzle. You may return the answer in any order. Write a program for the same.



Program:

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
int a[30],count=0;
```

```

int place(int pos) {
    int i;
    for (i=1;i<pos;i++) {
        if((a[i]==a[pos])||((abs(a[i]-a[pos])==abs(i-pos))))
            return 0;
    }
    return 1;
}
void print_sol(int n) {
    int i,j;
    count++;
    printf("\n\ntime comolexity  %#d:\n",count);
    for (i=1;i<=n;i++) {
        for (j=1;j<=n;j++) {
            if(a[i]==j)
                printf("Q\t"); else
                printf("*\t");

        }
        printf("\n");
    }
}
void queen(int n) {
    int k=1;
    a[k]=0;
    while(k!=0) {
        a[k]=a[k]+1;
        while((a[k]<=n)&&!place(k))
            a[k]++;
        if(a[k]<=n) {
            if(k==n)
                print_sol(n); else {
                    k++;
                    a[k]=0;
                }
        } else
            k--;
    }
}
main() {
    int i,n;
    printf("Enter the number of Queens\n");
    scanf("%d",&n);
    queen(n);
    printf("\nTotal solutions=%d",count);
    getch();
}

```

Output:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\n queens.exe
Enter the number of Queens
4

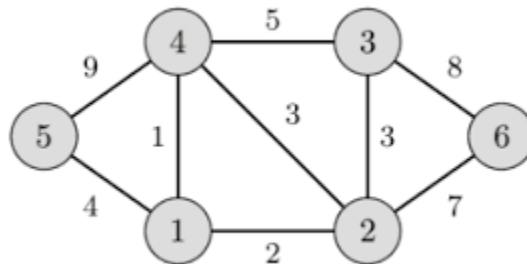
time comolexity #1:
*   Q   *   *
*   *   *   Q
Q   *   *   *
*   *   Q   *

time comolexity #2:
*   *   Q   *
Q   *   *   *
*   *   *   Q
*   Q   *   *

Total solutions=2
-----
Process exited after 71.1 seconds with return value 0
Press any key to continue . . .

```

26. Write a program to perform Minimum spanning tree using greedy techniques and estimate time complexity for the given set of values.



Program:

```

#include <limits.h>
#include <stdbool.h>
#include <stdio.h>
#define V 5
int minKey(int key[], bool mstSet[])
{
    int min = INT_MAX, min_index, count=0;

    for (int v = 0; v < V; v++)
        if (mstSet[v] == false && key[v] < min)
            min = key[v], min_index = v;
    count++;
}

```



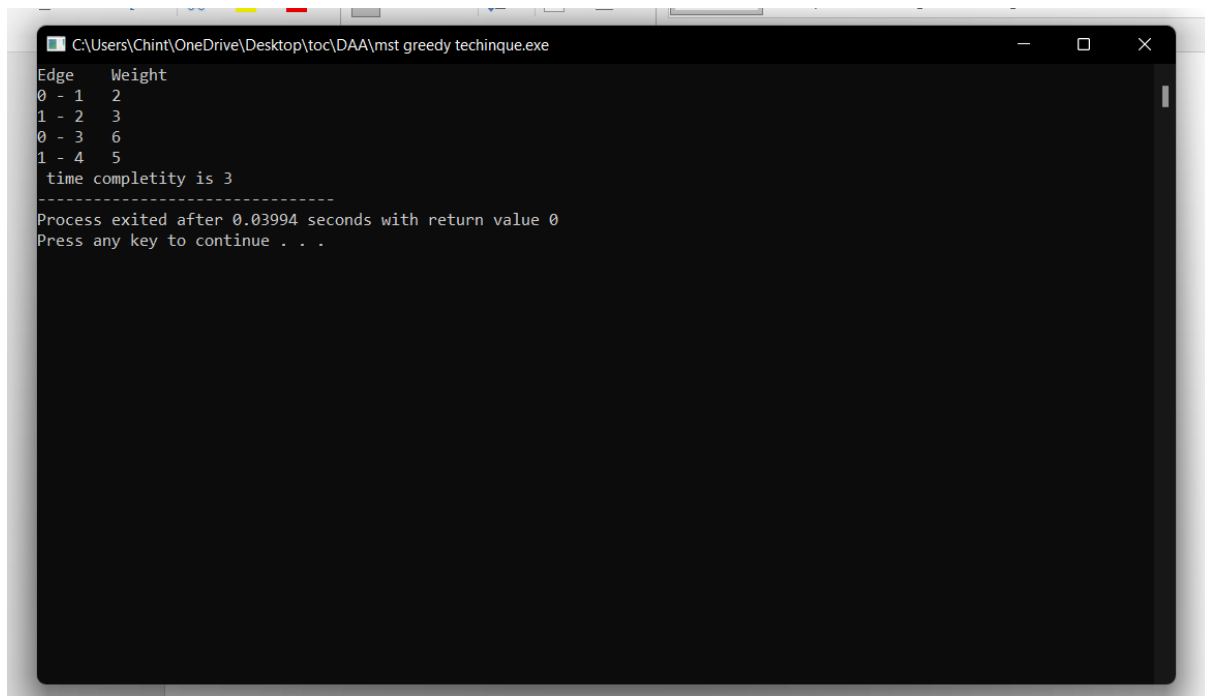
```

    return min_index;
}
int printMST(int parent[], int graph[V][V])
{
    int count=0;
    printf("Edge \tWeight\n");
    for (int i = 1; i < V; i++)
        printf("%d - %d \t%d \n", parent[i], i,
            graph[i][parent[i]]);
    count++;
}
void primMST(int graph[V][V])
{
    int count=0;
    int parent[V];
    int key[V];
    bool mstSet[V];
    for (int i = 0; i < V; i++)
        key[i] = INT_MAX, mstSet[i] = false;
    count++;
    key[0] = 0;
    count++;
    parent[0] = -1;
    count++;
    for (int count = 0; count < V - 1; count++) {
        int u = minKey(key, mstSet);
        count++;
        mstSet[u] = true;
        count++;
        for (int v = 0; v < V; v++)
            if (graph[u][v] && mstSet[v] == false
                && graph[u][v] < key[v])
                parent[v] = u, key[v] = graph[u][v];
    }
    printMST(parent, graph);
    printf(" time completity is %d",count);
}
int main()
{
    int graph[V][V] = { { 0, 2, 0, 6, 0 },
        { 2, 0, 3, 8, 5 },
        { 0, 3, 0, 0, 7 },
        { 6, 8, 0, 0, 9 },
        { 0, 5, 7, 9, 0 } };
    primMST(graph);

    return 0;
}

```

Output:



```
C:\Users\Chint\OneDrive\Desktop\toc\DAA\mst greedy technique.exe
Edge    Weight
0 - 1    2
1 - 2    3
0 - 3    6
1 - 4    5
time completity is 3
-----
Process exited after 0.03994 seconds with return value 0
Press any key to continue . . .
```

27. Write a program to perform sorting without using swapping and estimate time complexity.

Program:

```
#include <stdio.h>

void selection_sort(int arr[], int n) {
    int i, j, min_idx;
    for (i = 0; i < n-1; i++) {
        min_idx = i;
        for (j = i+1; j < n; j++)
            if (arr[j] < arr[min_idx])
                min_idx = j;
        int temp = arr[min_idx];
        for (j = min_idx; j > i; j--)
            arr[j] = arr[j-1];
        arr[i] = temp;
    }
}

int main() {
    int arr[] = { 64, 25, 12, 22, 11 };
    int n = sizeof(arr)/sizeof(arr[0]);
    selection_sort(arr, n);
    printf("Sorted array: \n");
}
```

```

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

```

Output:

Sorted array:
11 12 22 25 64

28 Write a program to perform Bubble sort and estimate time Complexity for n values.

Perform test cases for the following set of numbers.

A..(10,5, 80,-2,5,23, 45) B. (12, 3, 0, 34, -11, 34, 22, 8) C.(3, 35, -56, 66, 77, -78, 82)

Program:

```

#include<stdio.h>

int main(){
    int ele,count=0;

    printf("Enter total element: ");
    scanf("%d",&ele);

    int arr[ele];
    printf("Enter the elements: ");

    for (int i = 0; i < ele; i++){
        count++;
        scanf("%d",&arr[i]);
    }count++;

    for (int i = 0; i < ele; i++)
    {
        count++;
        for (int j =i+1; j < ele; j++)
        {
            count++;
            if (arr[i]>arr[j])
            {
                count++;
                int temp=arr[i];
                count++;

```

```

        arr[i]=arr[j];
        count++;
        arr[j]=temp;
        count++;
    }
    }count++;

}count++;

printf("sorted array: ");
for (int i = 0; i < ele; i++)
{count++;
    count++;
    printf("%d \n ",arr[i]);
}count++;
printf("time complexity: %d\n",count);
}

```

OUTPUT:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\bubble sort.exe
Enter total element: 4
Enter the elements: 2
3
1
2
sorted array: 1
2
2
3
time complexity: 41

-----
Process exited after 5.988 seconds with return value 0
Press any key to continue . . .

```

29. Write a program to print the reverse of a string. And estimate the time complexity for the given inputs.

Test cases:

“ as\nr5Y”

“7yut02”

“EryEq

output –

Y5rn|sa

20tuy7

qEyrE

Program:

```
#include<stdio.h>

int main(){
    char val[25];

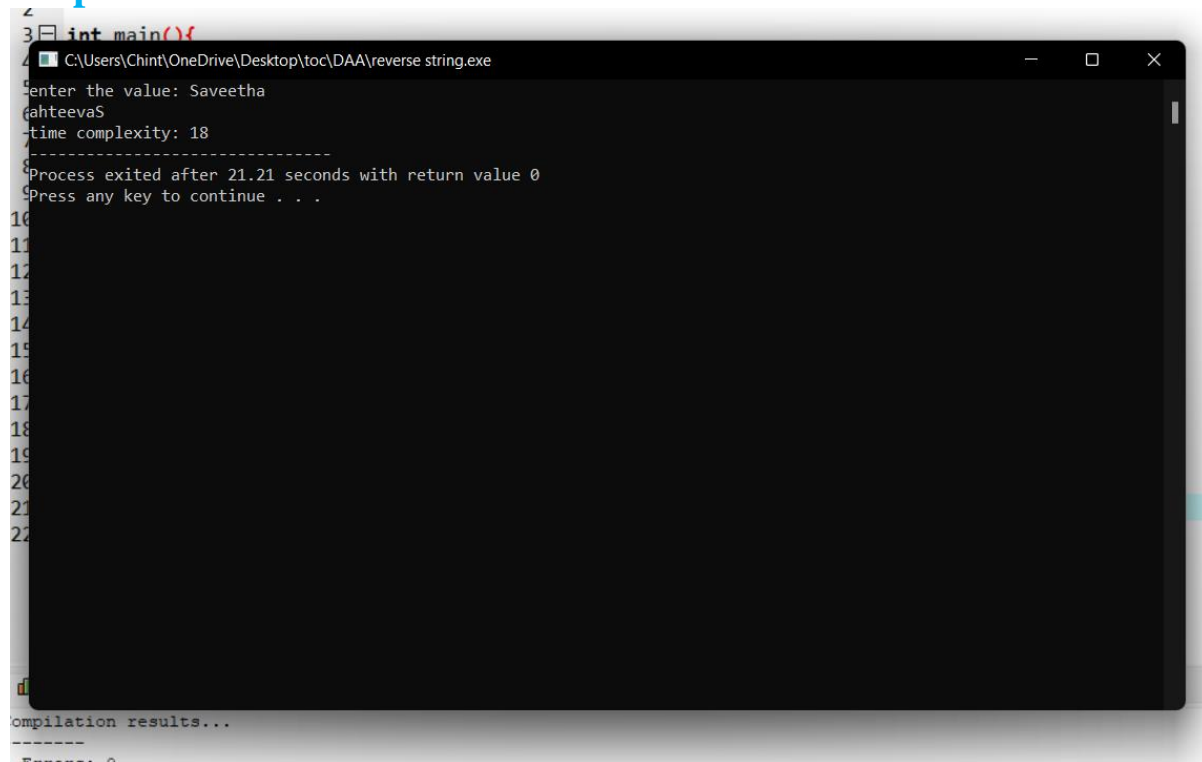
    printf("enter the value: ");
    scanf("%s",&val);

    int count=0,c=0;

    while (val[count]!='\0'){
        count++;
        c++;
    }c++;

    for(int i=count-1;i>=0;i--){
        c++;
        printf("%c",val[i]);
    }c++;
    printf("\ntime complexity: %d",c);
}
```

Output:



```
3 int main()
4 C:\Users\Chint\OneDrive\Desktop\toC\DAA\reverse string.exe
5 enter the value: Saveetha
6 ahteevaS
7 time complexity: 18
8 -----
9 Process exited after 21.21 seconds with return value 0
10 Press any key to continue . . .
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```

P : successful search
P(1:4) = (2,3,1,1)

q: Unsuccessful Search
q(0:4) = (2,3,1,1,2)

Program:

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

#define MAX_NODES 100
#define MIN(a, b) ((a) < (b) ? (a) : (b))

int keys[MAX_NODES]; // array of keys
int freq[MAX_NODES]; // frequency of each key
int cost[MAX_NODES][MAX_NODES]; // cost matrix
int sum[MAX_NODES]; // cumulative frequency
int dp[MAX_NODES][MAX_NODES]; // dp array to store subproblems

int n; // number of nodes

int optimalSearchTree(int i, int j) {
    if (dp[i][j] != -1) {
        return dp[i][j];
    }
    if (i == j) {
        return dp[i][j] = freq[i];
    }
    int minCost = INT_MAX;
    for (int r = i; r <= j; r++) {
        int c = optimalSearchTree(i, r - 1) + optimalSearchTree(r + 1, j) + sum[j] - sum[i - 1];
        minCost = MIN(minCost, c);
    }
    return dp[i][j] = minCost;
}

int main() {
    printf("Enter the number of nodes: ");
    scanf("%d", &n);

    for (int i = 0; i < n; i++) {
        printf("Enter key[%d] and its frequency: ", i);
        scanf("%d%d", &keys[i], &freq[i]);
    }

    // calculate cumulative frequency
    for (int i = 0; i < n; i++) {
        sum[i] = sum[i - 1] + freq[i];
    }

    // initialize dp array
```

```

for (int i = 0; i < n; i++) {
    for (int j = 0; j < n; j++) {
        dp[i][j] = -1;
    }
}

printf("The minimum cost of the optimal binary search tree is: %d\n", optimalSearchTree(0, n - 1));

return 0;
}

```

Output:

```

Enter the number of nodes: 4
Enter key[0] and its frequency: 2
1
Enter key[1] and its frequency: 3
1
Enter key[2] and its frequency: 1
4
Enter key[3] and its frequency: 1
4
The minimum cost of the optimal binary search tree is: -2147483632

```

31. Write a program to perform permutation of an array of integers and make all the arrangement are to be in possible sequence.
Input a[]={1,2,3) **Output** [1,2,3], [1,3,2], [2, 1, 3], [2, 3, 1], [3,1,2], [3,2,1].

Program:

```

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

void swap(int *a, int *b) {
    int temp = *a;
    *a = *b;
    *b = temp;
}

void permute(int *arr, int start, int end) {
    if (start == end) {
        for (int i = 0; i <= end; i++)
            printf("%d ", arr[i]);
        printf("\n");
    } else {

```

```

        for (int i = start; i <= end; i++) {
            swap(&arr[start], &arr[i]);
            permute(arr, start + 1, end);
            swap(&arr[start], &arr[i]);
        }
    }
}

int main() {
    int n;
    printf("Enter the number of elements in the array: ");
    scanf("%d", &n);

    int arr[n];
    printf("Enter the elements of the array: ");
    for (int i = 0; i < n; i++)
        scanf("%d", &arr[i]);

    printf("The permutations are:\n");
    permute(arr, 0, n - 1);
    return 0;
}

```

Output:

Enter the number of elements in the array: 4

Enter the elements of the array: 8

7

3

2

The permutations are:

8 7 3 2

8 7 2 3

8 3 7 2

8 3 2 7

8 2 3 7

8 2 7 3

7 8 3 2

7 8 2 3

7 3 8 2

7 3 2 8

7 2 3 8

7 2 8 3

3 7 8 2

3 7 2 8

3 8 7 2

3 8 2 7

3 2 8 7

3 2 7 8

2 7 3 8

2 7 8 3
2 3 7 8
2 3 8 7
2 8 3 7
2 8 7 3

32. Write a program to check the given no is palindrome or not
Given an integer x, return true if x is a palindrome, and false otherwise

input	out put
121	True
234	False
4554	True

Program:

```
#include<stdio.h>
int main()
{
    int i,n,r,s=0;

    printf("\n Enter Integer Number:");
    scanf("%d",&n);

    //LOOP TO FIND REVERSE OF A NUMBER
    for(i=n;i>0; )
    {
        r=i%10;
        s=s*10+r;
        i=i/10;
    }

    /* CHECKING IF THE NUMBER ENTERED AND THE REVERSE NUMBER IS EQUAL OR NOT
    */
    if(s==n)
    {
        printf("\n %d is a Palindrome Number",n);
    }
    else
    {
        printf("\n %d is not a Palindrome Number",n);
    }
    return 0;
}
```

Output:

```

3  int main()
4  {
5      int i,n,r,s=0;
6
7      printf("\n Enter Integer Number:");
8      scanf("%d",&n);
9
10     //LOOP TO FIND REVERSE
11     for(i=n;i>0; )
12     {
13         r=i%10;
14         s=s*10+r;
15         i=i/10;
16     }
17
18     /* CHECKING IF THE NUMBER IS PALINDROME OR NOT */
19     if(s==n)
20     {
21         printf("\n %d is a Palindrome Number",n);
22     }
23     else
24     {
25         printf("\n %d is not a Palindrome Number",n);
26     }
27     return 0;
28 }

```

Execution Output:

```

Enter Integer Number:121
121 is a Palindrome Number
Process exited after 2.822 seconds with return value 0
Press any key to continue . . .

```

33. Write a program for the given pattern the given pattern If

n=4

```

      1
    1 2
  1 2 3
1 2 3 4

```

Program:

```

#include<stdio.h>
int main()
{
    int rows, i, j;
    int count=0;
    printf("Enter the number of rows: ");
    scanf("%d",&rows);
    for(i = 1; i <= rows; i++)
    {
        for(j = rows; j > i; j--)
        {
            printf(" ");
            count++;
        }

        for(j = 1; j <= i; j++)
        {

```

```

        printf("%d ",j);
        count++;
    }
    printf("\n");
}
printf("Time complexity:%d",count);
return 0;
}

```

Output:

Enter the number of rows: 4

1

1 2

1 2 3

1 2 3 4

Time complexity:16v

34. Write a program to find out Hamiltonian circuit Using backtracking method.

And estimate the time complexity for the given set of elements is

	a	b	c	d	e	f
a	0	0	1	1	1	1
b	0	0	1	0	0	1
c	1	1	0	1	1	1
d	1	0	1	0	1	0
e	1	0	0	1	0	0
f	1	1	1	0	0	0

Program:

```

#include <stdio.h>
#define MAX 20

int n;
int adj[MAX][MAX];
int x[MAX];

int is_safe(int v, int pos) {
    int i;
    for (i = 0; i < n; i++)
        if (adj[v][i] && x[i] == pos)
            return 0;
    return 1;
}

```

```

int hamiltonian_cycle(int pos) {
    int v;
    if (pos == n) {
        if (adj[x[pos - 1]][x[0]])
            return 1;
        else
            return 0;
    }
    for (v = 0; v < n; v++) {
        if (is_safe(v, pos)) {
            x[pos] = v;
            if (hamiltonian_cycle(pos + 1))
                return 1;
            x[pos] = -1;
        }
    }
    return 0;
}

int main() {
    int i, j;
    printf("Enter number of vertices: ");
    scanf("%d", &n);
    printf("Enter adjacency matrix:\n");
    for (i = 0; i < n; i++)
        for (j = 0; j < n; j++)
            scanf("%d", &adj[i][j]);
    for (i = 0; i < n; i++)
        x[i] = -1;
    x[0] = 0;
    if (hamiltonian_cycle(1) == 0)
        printf("\nSolution does not exist\n");
    else {
        printf("\nSolution exists:\n");
        for (i = 0; i < n; i++)
            printf("%d ", x[i]);
        printf("%d", x[0]);
    }
    return 0;
}

```

Output:

```

Enter number of vertices: 3
Enter adjacency matrix:
0
2
3
4
0
6

```

9
8
0

Solution exists:
0 0 1 0

35. Write a program to return all the possible subsets for a given integer array. Return the solution in any order.

Input nums= [1,2,3]

Output : [[], [1], [2], [3], [1,2], [1,3], [2,3], [1,2,3]]

Program:

36. Write a program to compute container loader Problem for the given values and estimate time complexity.

N=8 be total no of containers having weights (w1, w2, w3,...w8) = [50, 100, 30, 80, 90, 200, 150, 20]. Capacity value = 100

Program:

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

#define MAX_ITEMS 100
#define MAX_WEIGHT 100

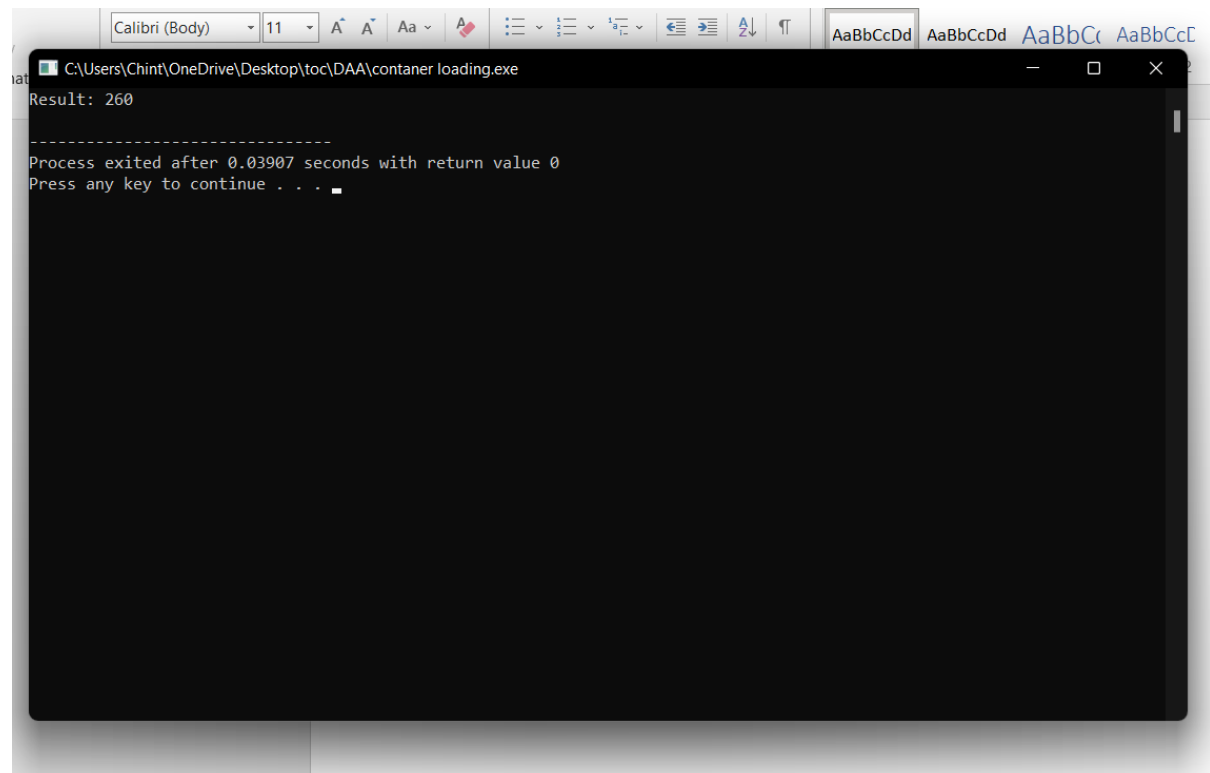
int weight[MAX_ITEMS];
int value[MAX_ITEMS];
int dp[MAX_ITEMS][MAX_WEIGHT];

int max(int a, int b) {
    return (a > b) ? a : b;
}

int knapsack(int n, int w) {
    int i, j;
    for (i = 0; i <= n; i++) {
        for (j = 0; j <= w; j++) {
            if (i == 0 || j == 0) {
                dp[i][j] = 0;
            } else if (weight[i-1] <= j) {
                dp[i][j] = max(value[i-1] + dp[i-1][j-weight[i-1]], dp[i-1][j]);
            } else {
                dp[i][j] = dp[i-1][j];
            }
        }
    }
    return dp[n][w];
}
```

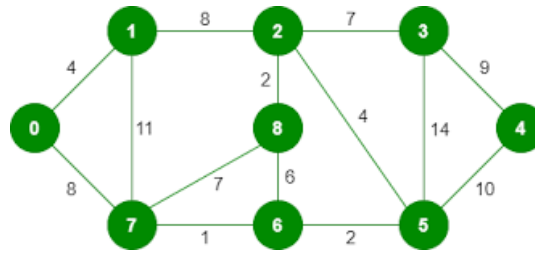
```
}  
  
int main() {  
    int n = 4;  
    int w = 10;  
    weight[0] = 1;  
    weight[1] = 2;  
    weight[2] = 3;  
    weight[4] = 4;  
    weight[5] = 5;  
    weight[6] = 6;  
    weight[7] = 7;  
    weight[8] = 8;  
    value[0] = 50;  
    value[1] = 100;  
    value[2] = 30;  
    value[3] = 80;  
    value[4] = 90;  
    value[5] = 200;  
    value[6] = 150;  
    value[7] = 20;  
    int result = knapsack(n, w);  
    printf("Result: %d\n", result);  
    return 0;  
}
```

Output:



```
Result: 260  
-----  
Process exited after 0.03907 seconds with return value 0  
Press any key to continue . . .
```

37. Write a program to find a minimum spanning tree using prims technique for the given graph.



Program:

```
#include <stdio.h>
#include <limits.h>
#define vertices 5
int minimum_key(int k[], int mst[])
{
    int minimum = INT_MAX, min,i,count=0;
    for (i = 0; i < vertices; i++)
        if (mst[i] == 0 && k[i] < minimum )
            minimum = k[i], min = i;
    return min;
    count++;
}
void prim(int g[vertices][vertices])
{
    int parent[vertices];
    int k[vertices];
    int mst[vertices];
    int i, count,edge,v;
    for (i = 0; i < vertices; i++)
    {
        k[i] = INT_MAX;
        count++;
        mst[i] = 0;
        count++;
    }
    count++;
    k[0] = 0;
    count++;
    parent[0] = -1;
    count++;

    for (count = 0; count < vertices-1; count++)
    {
        edge = minimum_key(k, mst);
        mst[edge] = 1;
        for (v = 0; v < vertices; v++)
        {
            if (g[edge][v] && mst[v] == 0 && g[edge][v] < k[v])
```

```

        {
            parent[v] = edge, k[v] = g[edge][v];
        }
    }
}

count++;
count++;
count++;
printf("\n Edge \t Weight\n");
for (i = 1; i < vertices; i++)
    printf(" %d <-> %d   %d \n", parent[i], i, g[i][parent[i]]);
count++;
printf(" time complexity is :%d",count);

}
int main()
{
    int g[vertices][vertices] = {{0, 0, 3, 0, 0},
                                   {0, 0, 10, 4, 0},
                                   {3, 10, 0, 2, 6},
                                   {0, 4, 2, 0, 1},
                                   {0, 0, 6, 1, 0},
                                   };

    prim(g);
    return 0;
}

```

Output:

```

C:\Users\Chint\OneDrive\Desktop\toc\DAA\prims.exe

Edge      Weight
3 <-> 1    4
0 <-> 2    3
2 <-> 3    2
3 <-> 4    1
time complexity is :8
-----
Process exited after 0.05919 seconds with return value 0
Press any key to continue . . .

```

38. Write a program to print a minimum and maximum value sequence for all the

numbers in a list.

Input a[]={3, 5, -4, 1, 8, 2, 0, 4} Output (-4, 8, 0, 5, 1, 4, 3, 2)

39. Write a program to check sub string is there in a string or not.

Input/Output
a. original string = "babad"
"babad"
Sub string = "shahad"
Output = Found

b. Original string = "babad"
Sub string = "daa"
Output = Not Found

c. Original string =
Sub string = "aba"
Output = Found

Program:

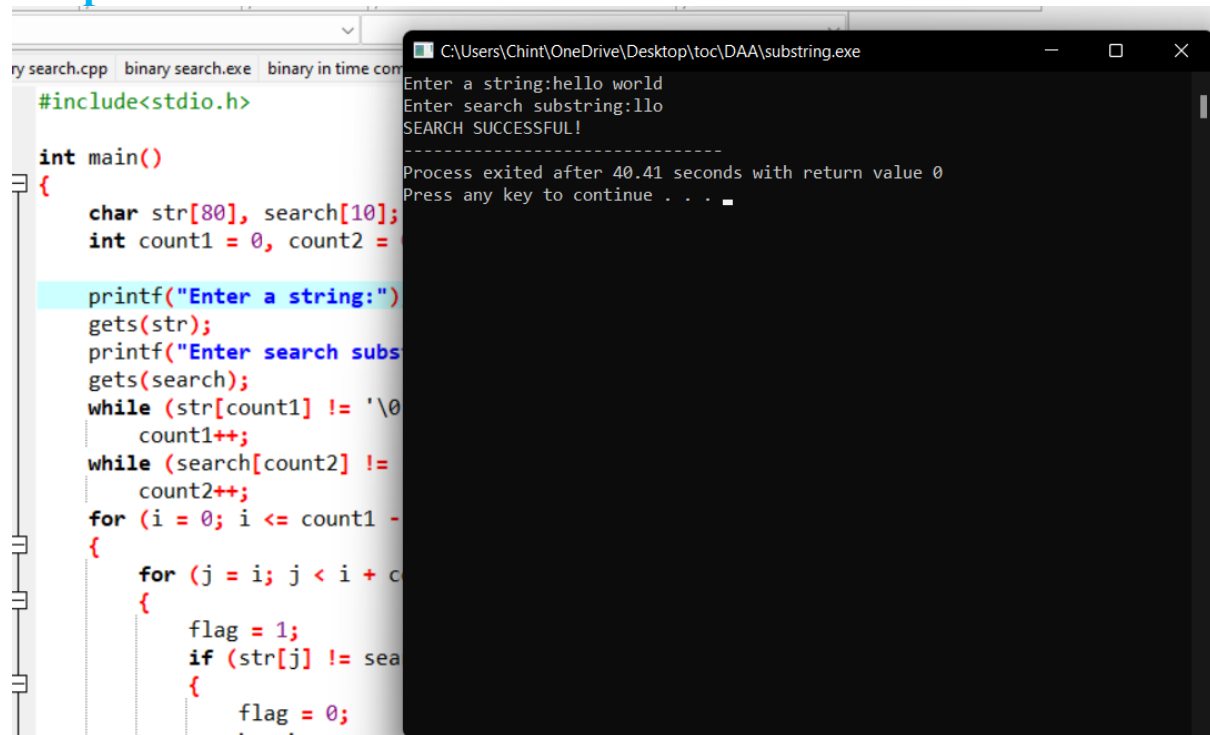
```
#include<stdio.h>
```

```
int main()
{
    char str[80], search[10];
    int count1 = 0, count2 = 0, i, j, flag;

    printf("Enter a string:");
    gets(str);
    printf("Enter search substring:");
    gets(search);
    while (str[count1] != '\0')
        count1++;
    while (search[count2] != '\0')
        count2++;
    for (i = 0; i <= count1 - count2; i++)
    {
        for (j = i; j < i + count2; j++)
        {
            flag = 1;
            if (str[j] != search[j - i])
            {
                flag = 0;
                break;
            }
        }
        if (flag == 1)
            break;
    }
    if (flag == 1)
        printf("SEARCH SUCCESSFUL!");
    else
        printf("SEARCH UNSUCCESSFUL!");

    return 0;
}
```

Output:



The image shows a C++ IDE with a file named `search.cpp` open. The code implements a substring search algorithm. It prompts the user to enter a string and a search substring. In the execution output, the user entered "hello world" for the string and "llo" for the substring. The program successfully found the substring and printed "SEARCH SUCCESSFUL!".

```
#include<stdio.h>

int main()
{
    char str[80], search[10];
    int count1 = 0, count2 = 0;

    printf("Enter a string:")
    gets(str);
    printf("Enter search substring:")
    gets(search);
    while (str[count1] != '\0')
        count1++;
    while (search[count2] != '\0')
        count2++;
    for (i = 0; i <= count1 - count2; i++)
    {
        for (j = i; j < i + count2; j++)
        {
            flag = 1;
            if (str[j] != search[j])
            {
                flag = 0;
                break;
            }
        }
        if (flag == 1)
        {
            printf("String contains the substring\n");
            return 0;
        }
    }
    printf("String does not contain the substring\n");
    return 0;
}
```

Execution Output:

```
C:\Users\Chint\OneDrive\Desktop\toc\DAA\substring.exe
Enter a string:hello world
Enter search substring:llo
SEARCH SUCCESSFUL!
Process exited after 40.41 seconds with return value 0
Press any key to continue . . .
```