CSA0672 – DAA – DAY 3

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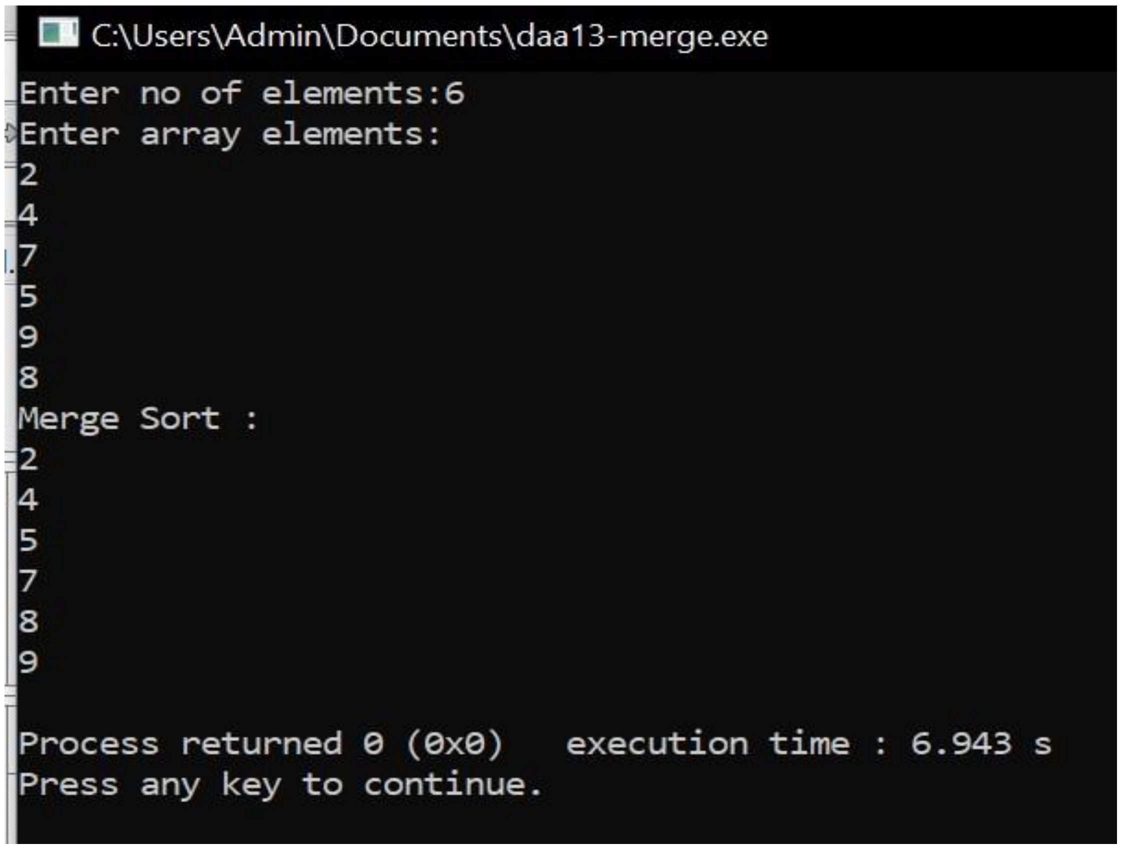
Write a C program to merge sort using divide and Conquer

Program:

```
#include<stdio.h> void mergesort(int
a[],int i,int j); void merge(int a[],int i1,int
j1,int i2,int j2); int main() { int a[30],n,i;
printf("Enter no of elements:");
scanf("%d",&n); printf("Enter array
elements:\n"); for(i=0;i<n;i++)
{ scanf("%d",&a[i]);
} mergesort(a,0,n-1);
printf("Merge Sort :
\n"); for(i=0;i<n;i++)
{ printf("%d\n",a[i]);
} return
0;
}

void mergesort(int a[],int i,int j)
{ int
mid;
   if(i<j)    {
mid=(i+j)/2;
mergesort(a,i,mid);
mergesort(a,mid+1,j);
merge(a,i,mid,mid+1,j);
    }
} void merge(int a[],int i1,int j1,int i2,int
j2)
{     int temp[50];     int
i,j,k;     i=i1;     j=i2;
k=0;     while(i<=j1 &&
j<=j2)
    {
if(a[i]<a[j])
        {
            temp[k++]=a[i++];
        }
else
        {
            temp[k++]=a[j++];
        }
    }
    while(i<=j1)
    {
        temp[k++]=a[i++];
    }
    while(j<=j2)
    {
        temp[k++]=a[j++];
    }
    for(i=i1,j=0;i<=j2;i++,j++)
```

```
   {
a[i]=temp[j];
   }
}
```



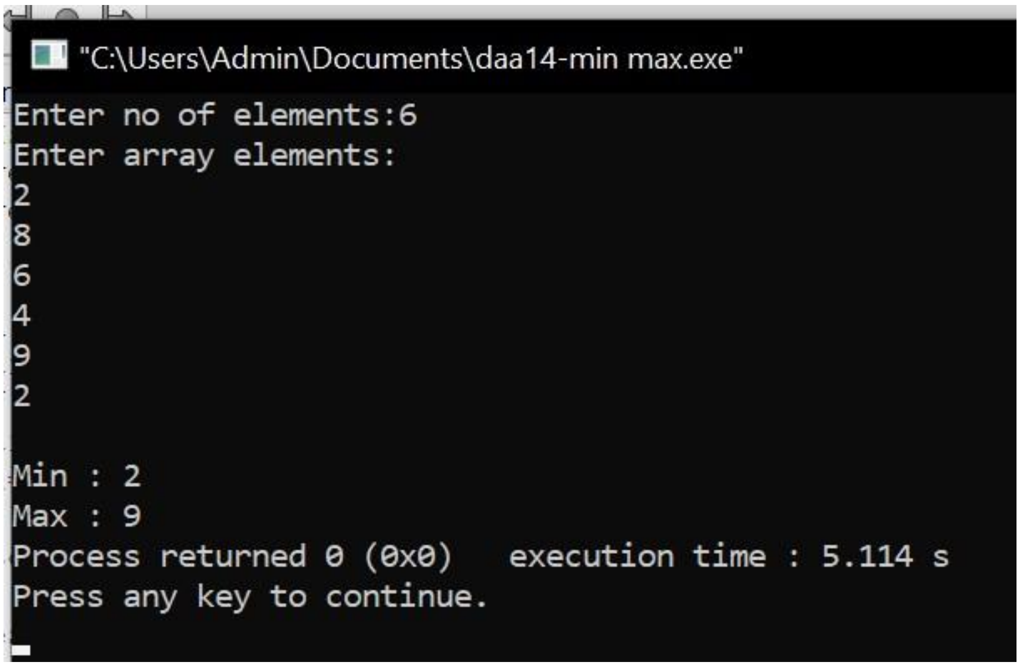
```
C:\Users\Admin\Documents\daa13-merge.exe
Enter no of elements:6
Enter array elements:
2
4
7
5
9
8
Merge Sort :
2
4
5
7
8
9

Process returned 0 (0x0)   execution time : 6.943 s
Press any key to continue.
```

2. Write a C program to find max-min using divide and Conquer

Program:

```
#include<stdio.h> void mergesort(int
a[],int i,int j); void merge(int a[],int i1,int
j1,int i2,int j2);
int main() {
   int a[30],n,i;
   printf("Enter no of elements:");
scanf("%d",&n);
   printf("Enter array elements:\n");
for(i=0;i<n;i++)
   {
      scanf("%d",&a[i]);
   }
   mergesort(a,0,n-1);
printf("\nMin : %d",a[0]);
printf("\nMax : %d",a[n-1]);
   return 0;
}

void mergesort(int a[],int i,int j)
{     int mid;     if(i<j)     {
mid=(i+j)/2;
mergesort(a,i,mid);
mergesort(a,mid+1,j);
      merge(a,i,mid,mid+1,j);
   }
}
void merge(int a[],int i1,int j1,int i2,int j2)
{     int
temp[50];     int
i,j,k;     i=i1;
j=i2;
   k=0;
   while(i<=j1 && j<=j2)
   {
      if(a[i]<a[j])
      {
         temp[k++]=a[i++];
      }
else
      {
         temp[k++]=a[j++];
      }
   }
   while(i<=j1)
   {
      temp[k++]=a[i++];
   }
   while(j<=j2)
   {
      temp[k++]=a[j++];
   }
   for(i=i1,j=0;i<=j2;i++,j++)
```

```
        {
            a[i]=temp[j];
        }
    }
```



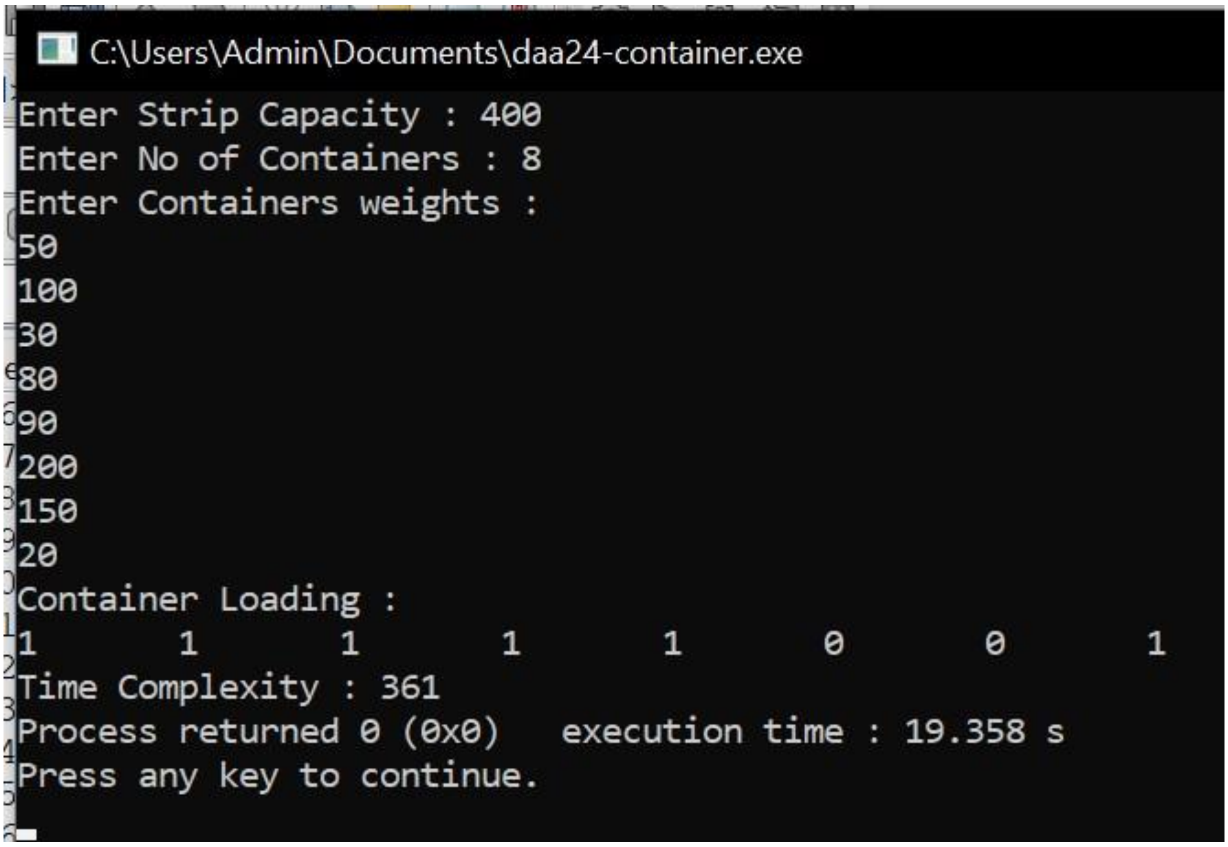
```
"C:\Users\Admin\Documents\daa14-min max.exe"
Enter no of elements:6
Enter array elements:
2
8
6
4
9
2

Min : 2
Max : 9
Process returned 0 (0x0)   execution time : 5.114 s
Press any key to continue.
```

3. 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> int

main()

{    int

c=0;

   int n,e,w[20],w1[20],x[20],i,j,k,j1=0;

c++;

   printf("Enter Strip Capacity : ");

scanf("%d",&e);

   printf("Enter No of Containers : ");

scanf("%d",&n);
```

```
    printf("Enter Containers weights : \n");
for(i=0;i<n;i++)
    {
c++;
        scanf("%d",&w[i]);
    }
    c++;
for(i=0;i<n;i++)
    {
c++;
x[i]=0; }
c++;
for(i=0;i<n
;i++)
    {        c++;
w1[i]=w[i];
    }
    c++;
for(i=0;i<n;i++)
    {        c++;
for(j=0;j<n;j++)
        {            c++;
c++;
if(w[i]<w[j])
            {
k=w[i];
c++;
w[i]=w[j];
c++;
w[j]=k;
c++;            }        }
c++;
   }    c++;
for(i=0;i<n;i++)
   {        c++;
c++;
if(e>w[i])
      {
          e=e-w[i];
c++;
for(j=0;j<n;j++)
          {               c++;
c++;
if(w[i]==w1[j])
             {
x[j]=1;
c++;

}           }
c++;
      }
   }
   c++;     printf("Container
Loading :\n");     for(i=0;i<n;i++)
   {
c++;
      printf("%d\t",x[i]);
   }
   c++;
   printf("\nTime Complexity : %d",c);
}
```



C:\Users\Admin\Documents\daa24-container.exe

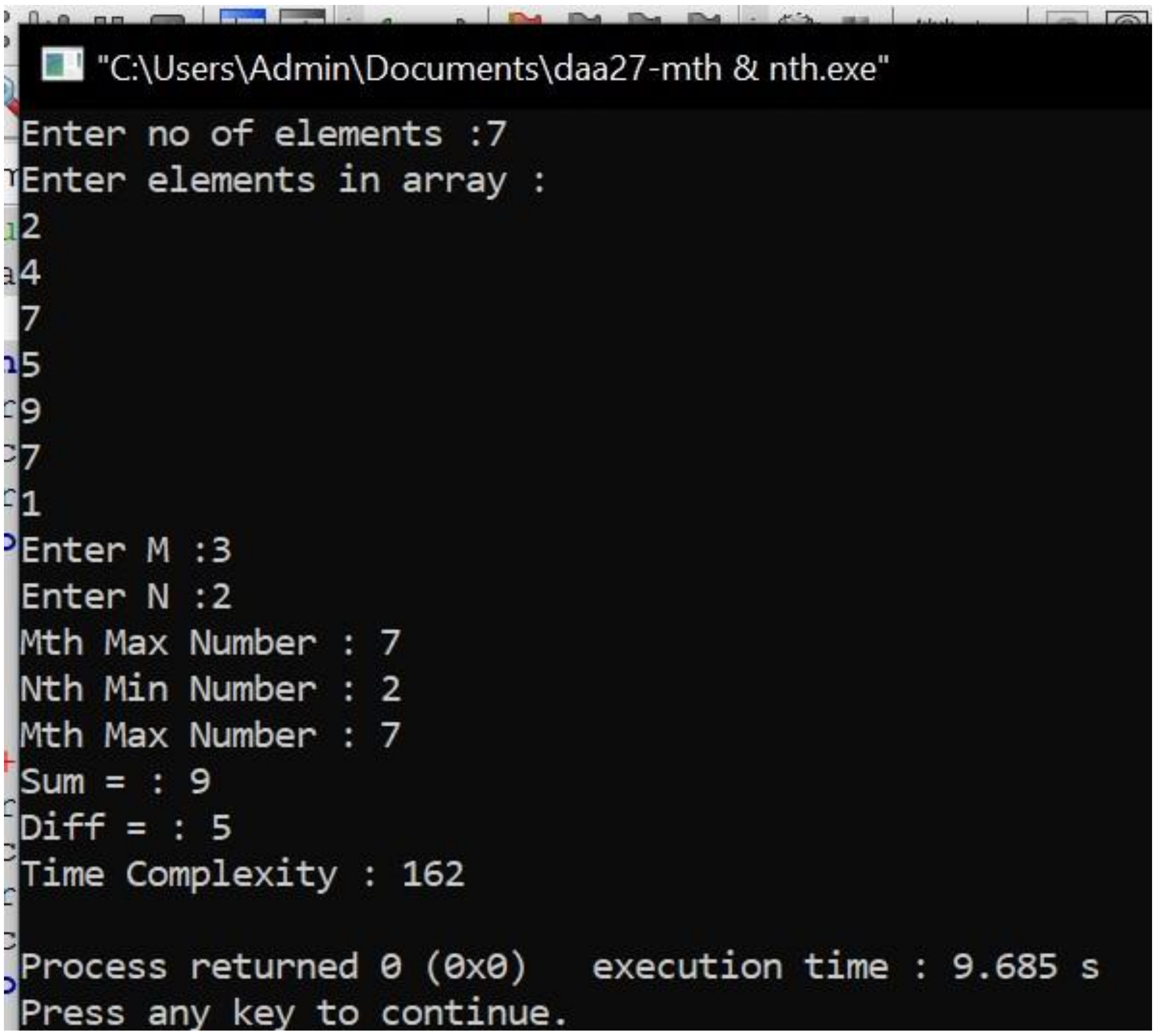
```
Enter Strip Capacity : 400
Enter No of Containers : 8
Enter Containers weights :
50
100
30
80
90
200
150
20
Container Loading :
1       1       1       1       1       0       0       1
Time Complexity : 361
Process returned 0 (0x0)   execution time : 19.358 s
Press any key to continue.
```

4. 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 –**
a.	**{16, 16, 16 16, 16}, M = 0, N = 1**	**(illegal input)**
b.	**{0, 0, 0, 0}, M = 1, N = 2**	**0**
c.	**{-12, -78, -35, -42, -85}, M = 3 , N = 3**	**-7**
d.	**{15, 19, 34, 56, 12}, M = 6 , N = -3**	**(illegal input)**
e.	**{85, 45, 65, 75, 95}, M = 5 , N = 2**	**-20**

Program:

```
#include<stdio.h> int
main()
{
   int a,ar[100],m,n,i,j,sum,diff,k,c=0;
printf("Enter no of elements :");
scanf("%d",&a);
   printf("Enter elements in array :\n");
for(i=0;i<a;i++)
   {
c++;
      scanf("%d",&ar[i]);
   }
   c++;
   printf("Enter M :");
scanf("%d",&m);
printf("Enter N :");
scanf("%d",&n);

for(i=0;i<a;i++)

   {        c++;

for(j=0;j<a;j++)

       {            c++;

c++;

if(ar[i]<ar[j])

           {

k=ar[i];

c++;

ar[i]=ar[j];

c++;

ar[j]=k;

c++;

           }

}

c++;

   }c++;

   printf("Mth Max Number : %d\n",ar[a-m]);

printf("Nth Min Number : %d\n",ar[n-1]);

printf("Mth Max Number : %d\n",ar[a-m]);

printf("Sum = : %d\n",ar[n-1]+ar[a-m]);     c++;

   printf("Diff = : %d\n",ar[a-m]-ar[n-1]);
   c++;

   printf("Time Complexity : %d\n",c);

}
```



```
"C:\Users\Admin\Documents\daa27-mth & nth.exe"
Enter no of elements :7
Enter elements in array :
2
4
7
5
9
7
1
Enter M :3
Enter N :2
Mth Max Number : 7
Nth Min Number : 2
Mth Max Number : 7
Sum = : 9
Diff = : 5
Time Complexity : 162

Process returned 0 (0x0)   execution time : 9.685 s
Press any key to continue.
```

5. Write a program to perform Knapsack problem for the following set of object values., Knapsack weight 100 item Weight Profit

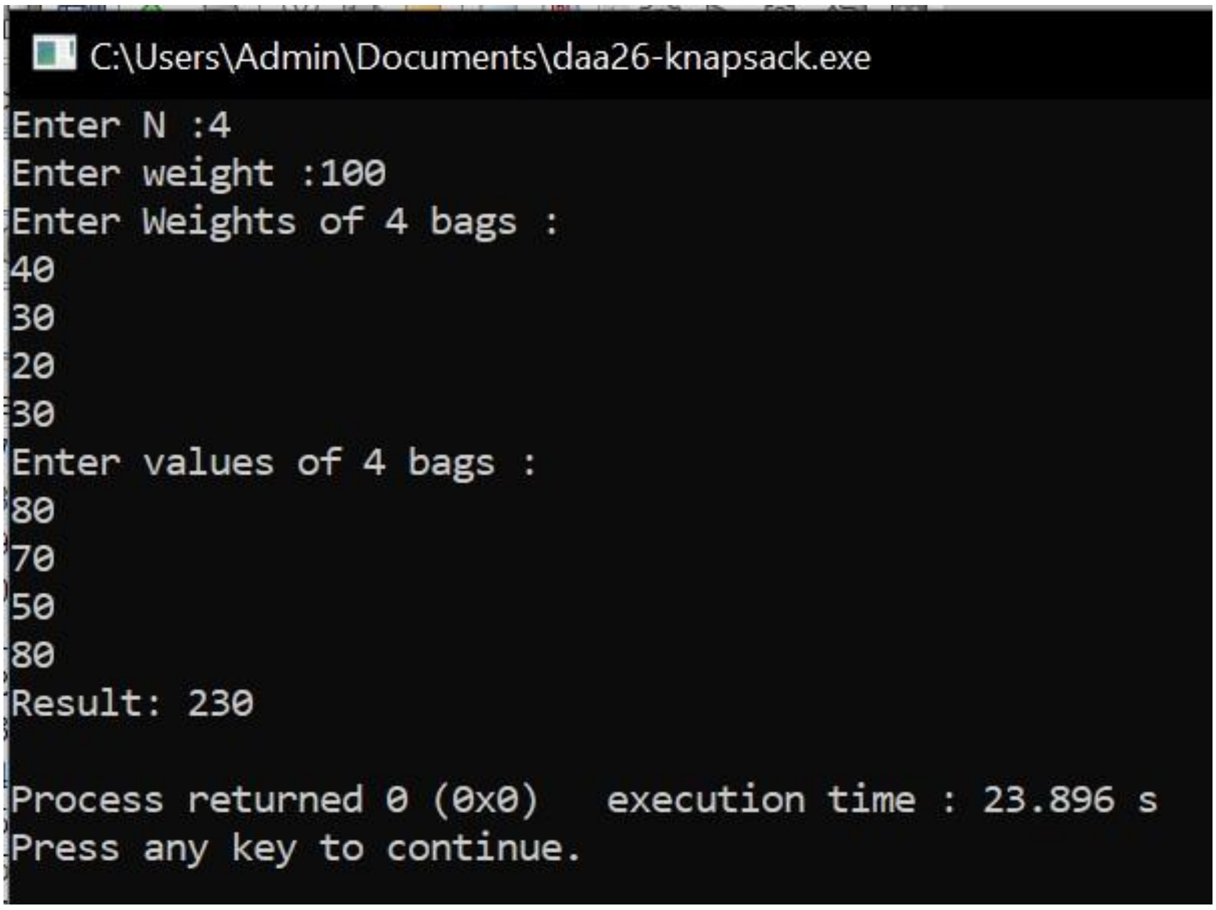
1	**40**	**80**
2	**30**	**70**
3	**20**	**50**

4 30 80

Program:

```
#include <stdio.h>
#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,w,i;
printf("Enter N :");
scanf("%d",&n);
printf("Enter weight :");
scanf("%d",&w);
  printf("Enter Weights of %d bags :",n);
for(i=0;i<n;i++)
  {
      scanf("%d",&weight[i]);
  }
  printf("Enter values of %d bags :",n);
  for(i=0;i<n;i++)
  {
      scanf("%d",&value[i]);
  }
  int result = knapsack(n, w);
printf("Result: %d\n", result);   return
0;
}
```



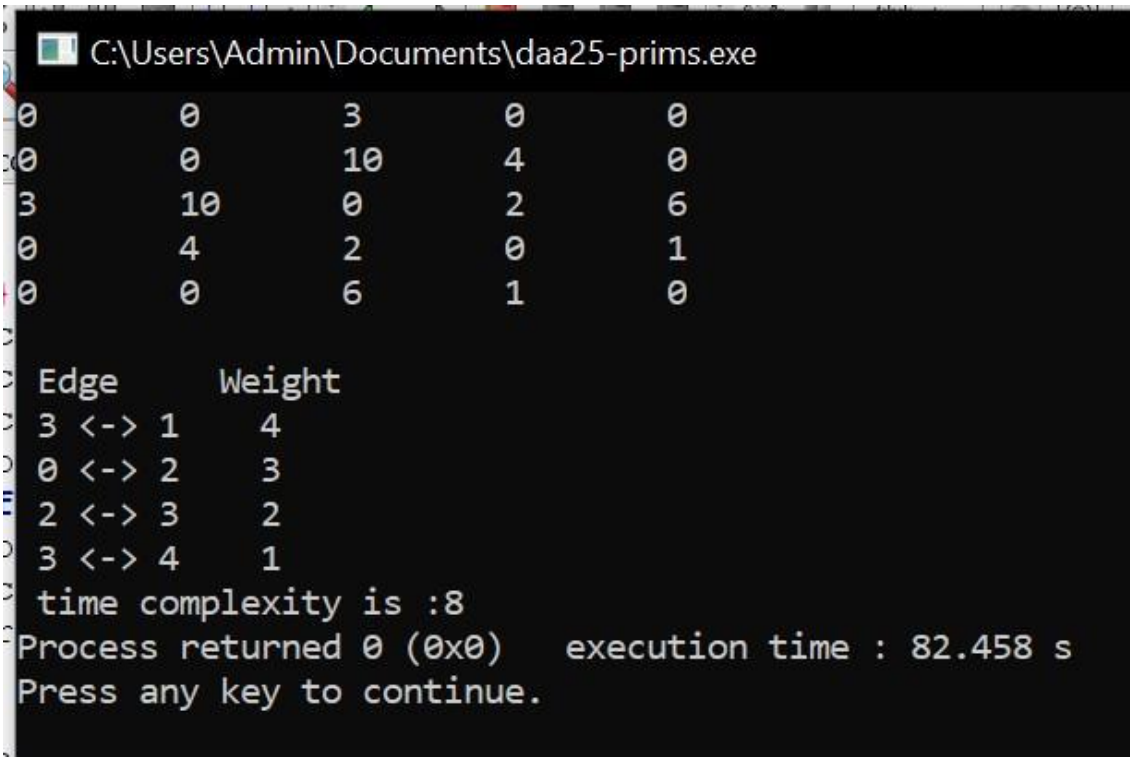
```
C:\Users\Admin\Documents\daa26-knapsack.exe
Enter N :4
Enter weight :100
Enter Weights of 4 bags :
40
30
20
30
Enter values of 4 bags :
80
70
50
80
Result: 230

Process returned 0 (0x0)   execution time : 23.896 s
Press any key to continue.
```

6. **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 i,j,g[vertices][vertices];
for (i=0;i<5;i++)
   {
      for(j=0;j<5;j++)
      {
         scanf("%d",&g[i][j]);
      }
   }
   prim(g);
   return 0;
}
```



```
C:\Users\Admin\Documents\daa25-prims.exe
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

 Edge     Weight
 3 <-> 1    4
 0 <-> 2    3
 2 <-> 3    2
 3 <-> 4    1
 time complexity is :8
Process returned 0 (0x0)   execution time : 82.458 s
Press any key to continue.
```