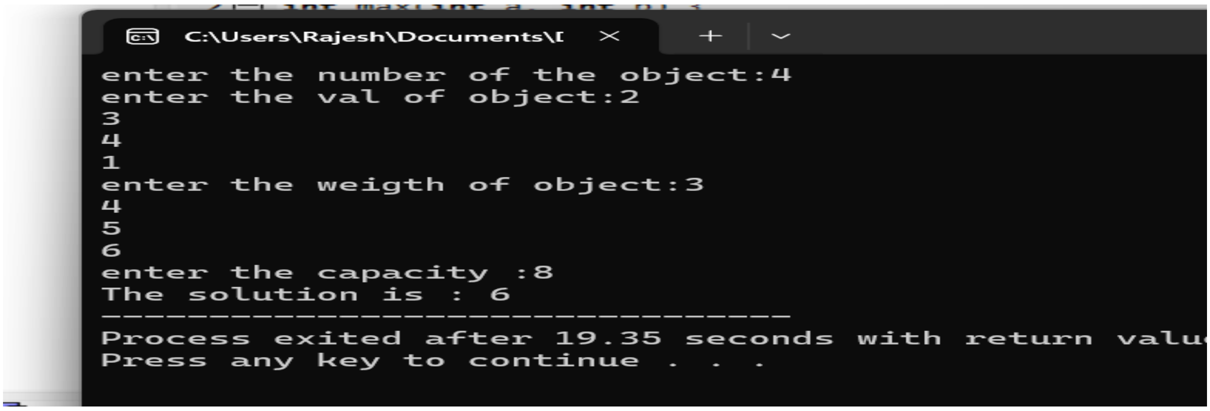
1) **Knapsack using dynamic programming**

```
#include<stdio.h>
int max(int a, int b) {
  if(a>b){
    return a;
  } else {
    return b;
  }
}
int knapsack(int W, int wt[], int val[], int n) {
  int i, w;
  int knap[n+1][W+1];
  for (i = 0; i <= n; i++) {
    for (w = 0; w <= W; w++) {
      if (i==0 || w==0)
        knap[i][w] = 0;
      else if (wt[i-1] <= w)
        knap[i][w] = max(val[i-1] + knap[i-1][w-wt[i-1]], knap[i-1][w]);
      else
        knap[i][w] = knap[i-1][w];
    }
  }
  return knap[n][W];
}
int main() {
  int val[10],i,n;
  int wt[20];
  int W;
  printf("enter the number of the object:");
  scanf("%d",&n);
  printf("enter the val of object:");
  for(i=0;i<n;i++)
  {
        scanf("%d",&val[i]);
  }
  printf("enter the weigth of object:");
  for(i=0;i<n;i++)
  {
        scanf("%d",&wt[i]);
  }
  printf("enter the capacity :");
  scanf("%d",&W);
  printf("The solution is : %d", knapsack(W, wt, val, n));
  return 0;
}
```

Output:



```
enter the number of the object:4
enter the val of object:2
3
4
1
enter the weigth of object:3
4
5
6
enter the capacity :8
The solution is : 6
--------------------------------
Process exited after 19.35 seconds with return valu
Press any key to continue . . .
```

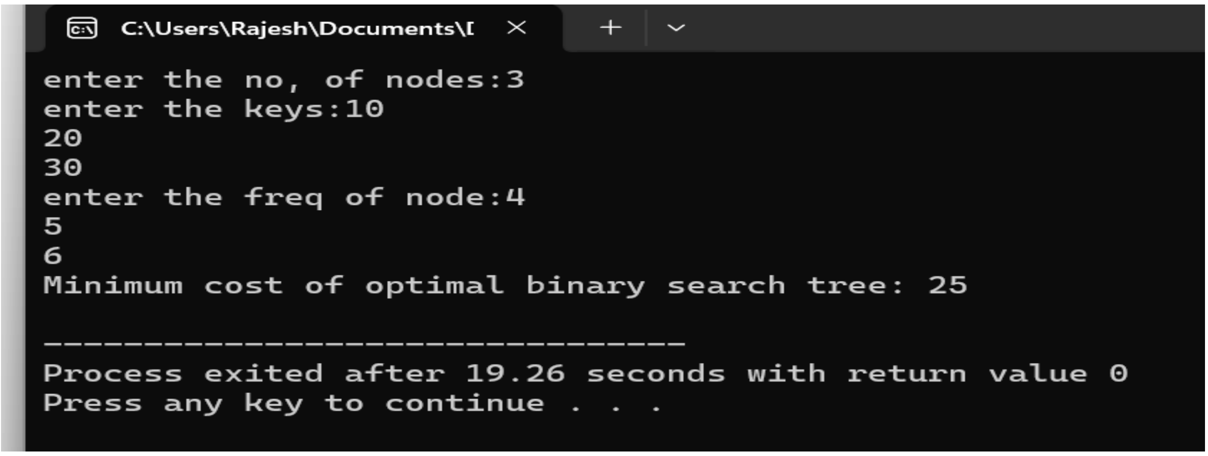
2) **Using Dynamic programming concept to find out Optimal binary search tree.**

```
#include <stdio.h>


int sum(int freq[], int low, int high)
 {
   int sum = 0;
   for (int k = low; k <= high; k++)
     {
      sum += freq[k];
   }
   return sum;
}


int minCostBST(int keys[], int freq[], int n)
{
   int cost[n][n];
   for (int i = 0; i < n; i++)
     {
      cost[i][i] = freq[i];
   }
   for (int length = 2; length <= n; length++)
```

```
    {
    for (int i = 0; i <= n - length + 1; i++)
           {
      int j = i + length - 1;
      cost[i][j] =999;
      for (int r = i; r <= j; r++)
                   {
        int c = 0;
        if (r > i)
                          {
          c += cost[i][r - 1];
        }
        if (r < j)
                          {
          c += cost[r + 1][j];
        }
        c += sum(freq, i, j);
        if (c < cost[i][j])
                         {
          cost[i][j] = c;
        }
      }
    }
  }
  return cost[0][n - 1];
}

int main()
 {
  int keys[10], freq[10];
  int n,i;
```

```
   printf("enter the no, of nodes:");
   scanf("%d",&n);
   printf("enter the keys:");
   for(i=0;i<n;i++)
   {
     scanf("%d",&keys[i]);
     }
     printf("enter the freq of node:");
     for(i=0;i<n;i++)
     {
               scanf("%d",&freq[i]);
     }

   int minCost = minCostBST(keys, freq, n);
   printf("Minimum cost of optimal binary search tree: %d\n", minCost);

   return 0;
}
```

Output:

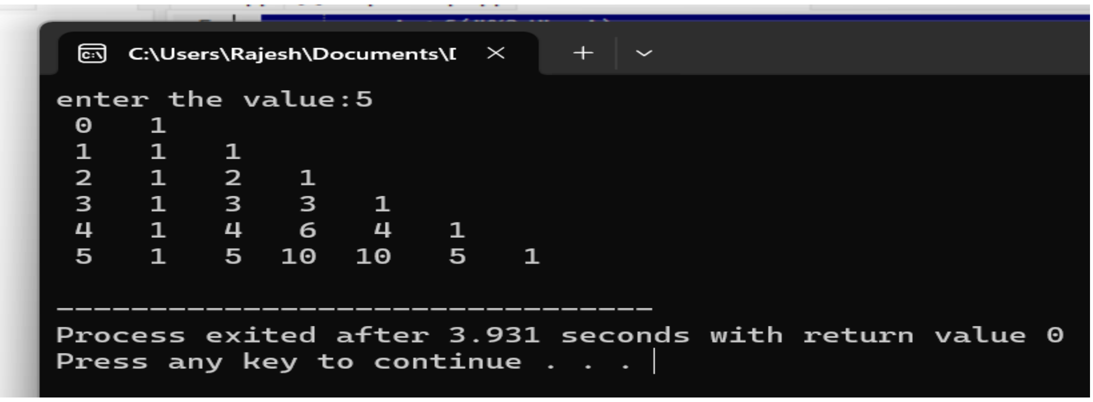


```
enter the no, of nodes:3
enter the keys:10
20
30
enter the freq of node:4
5
6
Minimum cost of optimal binary search tree: 25

--------------------------------
Process exited after 19.26 seconds with return value 0
Press any key to continue . . .
```

3) **Using Dynamic programming techniques to find binomial coefficient of a given number**

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

```
int bin_table(int val) {
  for (int i = 0; i <= val; i++)
  {
    printf("%2d", i);
    int num = 1;
    for (int j = 0; j <= i; j++)
         {
      if (i != 0 && j != 0)
                {
      num = num * (i - j + 1) / j;
      }
      printf("%4d", num);
    }
   printf(" \n");
  }
}
int main() {
  int value;
  printf("enter the value:");
  scanf("%d",&value);
  bin_table(value);
  return 0;
}
```

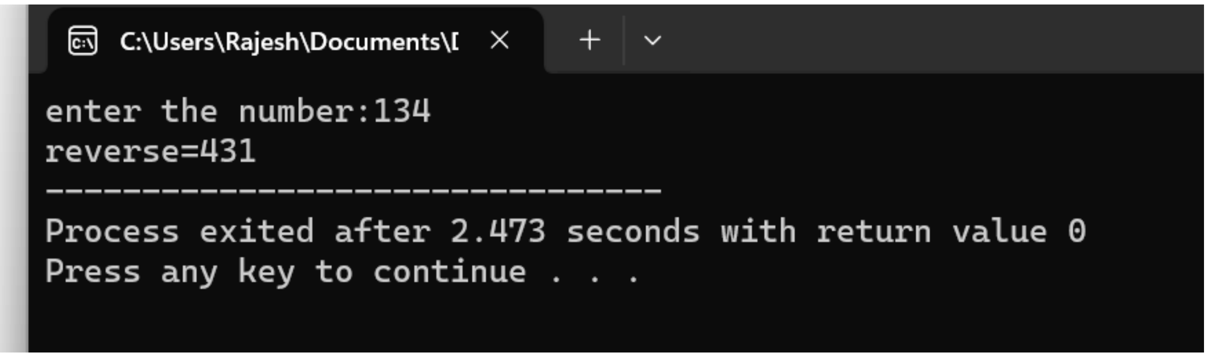


```
enter the value:5
 0   1
 1   1   1
 2   1   2   1
 3   1   3   3   1
 4   1   4   6   4   1
 5   1   5  10  10   5   1

--------------------------------
Process exited after 3.931 seconds with return value 0
Press any key to continue . . .
```

4) **Write a program to find the reverse of a given number using recursive.**

```
#include<stdio.h>
int rev(int n,int b)
{ int d,sum=0;
        if(n==0)
        {
            return b;
        }
        else
        {

          return rev(n/10,b*10+n%10);
        }

}
int main()
{
        int n,result;
        printf("enter the number:");
        scanf("%d",&n);
        result=rev(n,0);
        printf("reverse=%d",result);
        return 0;
}
```

Output:



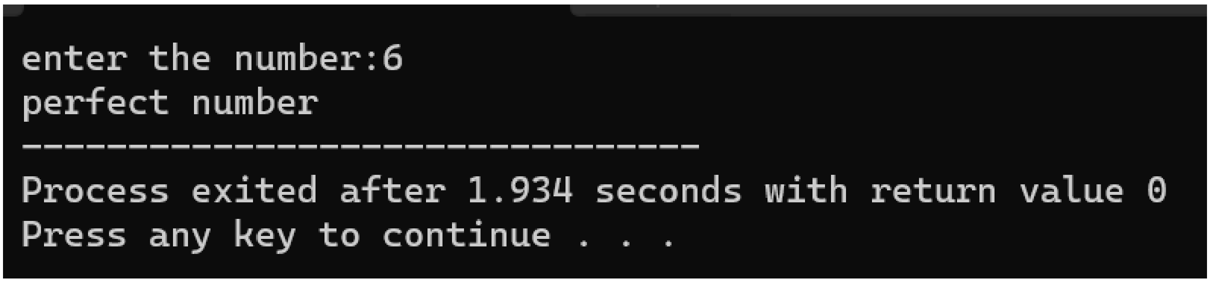
```
enter the number:134
reverse=431
--------------------------------
Process exited after 2.473 seconds with return value 0
Press any key to continue . . .
```

5) Write a program to find the perfect number.

```
#include<stdio.h>

int main()

{

      int n,sum=0,i,temp;

      printf("enter the number:");

      scanf("%d",&n);

      temp=n;

      for(i=1;i<n;i++)

      {

            if(n%i==0)
```

```
                {
                        sum+=i;
                }
        }
        if(sum==temp)
        {
                printf("perfect number");
        }
        else
        {
                printf("not perfect number");
        }
}
```

Output:

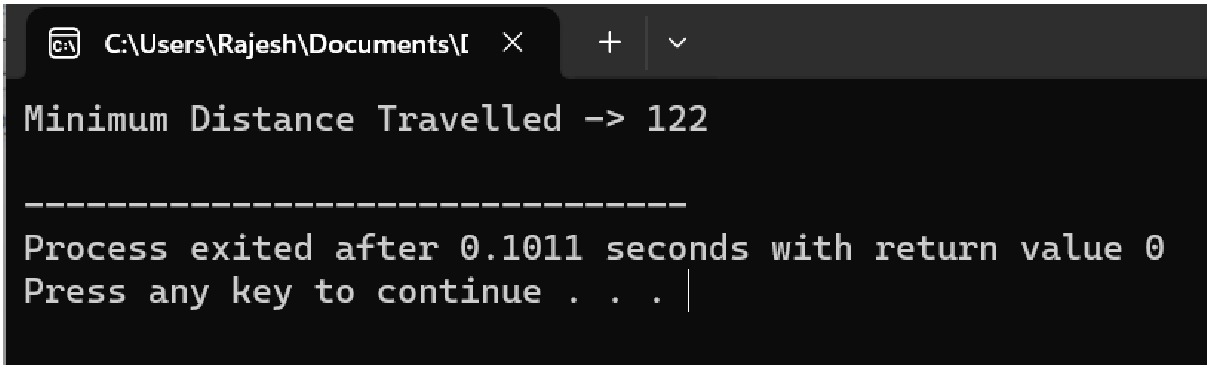


```
enter the number:6
perfect number
--------------------------------
Process exited after 1.934 seconds with return value 0
Press any key to continue . . .
```

6) **Write a program to perform a travelling salesman problem using dynamic programming**

```
#include <stdio.h>
#include <limits.h>
#define MAX 9999
int n = 4;
int distan[20][20] = {
  {0, 22, 26, 30},
  {30, 0, 45, 35},
  {25, 45, 0, 60},
  {30, 35, 40, 0}};
int DP[32][8];
int TSP(int mark, int position) {
  int completed_visit = (1 << n) - 1;
  if (mark == completed_visit) {
     return distan[position][0];
```

```
    }
    if (DP[mark][position] != -1) {
      return DP[mark][position];
    }
    int answer = MAX;
    for (int city = 0; city < n; city++) {
      if ((mark & (1 << city)) == 0) {
        int newAnswer = distan[position][city] + TSP(mark | (1 << city), city);
        answer = (answer < newAnswer) ? answer : newAnswer;
      }
    }
    return DP[mark][position] = answer;
  }
  int main() {
    for (int i = 0; i < (1 << n); i++) {
      for (int j = 0; j < n; j++) {
        DP[i][j] = -1;
      }
    }
    printf("Minimum Distance Travelled -> %d\n", TSP(1, 0));
    return 0;
  }
```



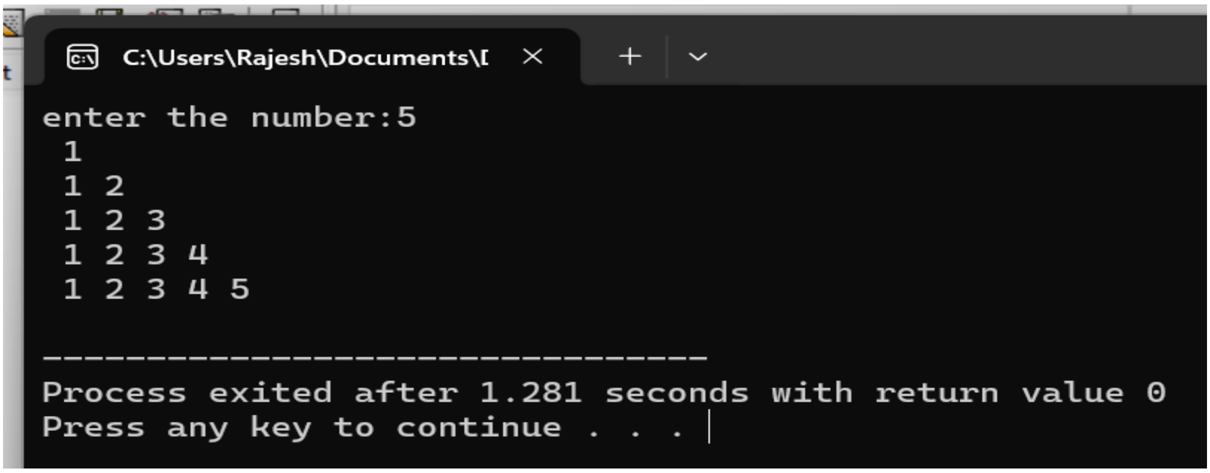
```
Minimum Distance Travelled -> 122

--------------------------------
Process exited after 0.1011 seconds with return value 0
Press any key to continue . . .
```

7) Write a program for the given pattern using recursion

```
n=4             1
             1  2
             1  2  3
             1  2  3  4
```

```
#include<stdio.h>

int main()

{

        int i,j,k=0,n;
        printf("enter the number:");
        scanf("%d",&n);
        for(i=1;i<=n;i++)
        {
                k=0;
                for(j=1;j<=i;j++)
                {
                        k=k+1;
                        printf(" %d",k);


                }
                printf("\n");
        }
}
```

Output:

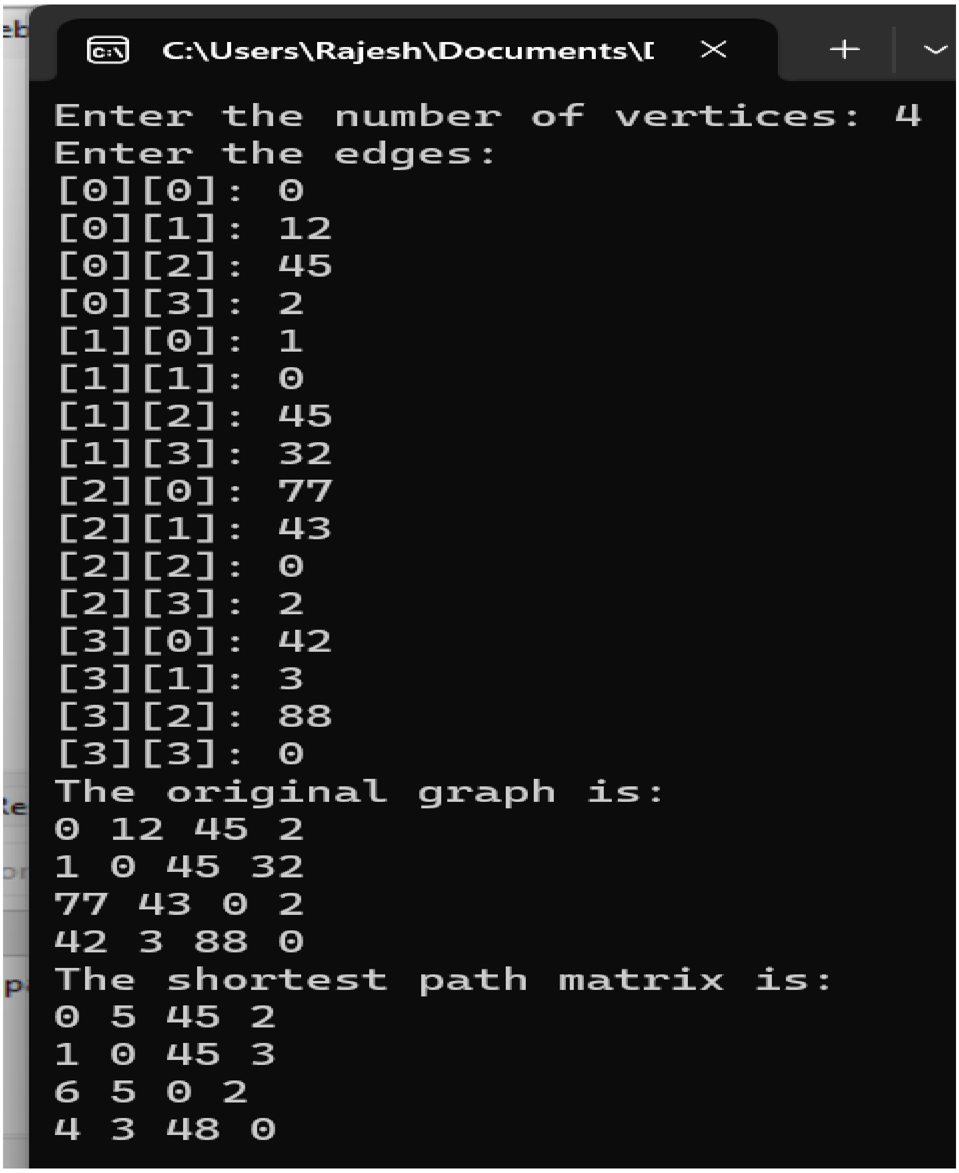


```
enter the number:5
 1
 1 2
 1 2 3
 1 2 3 4
 1 2 3 4 5

--------------------------------
Process exited after 1.281 seconds with return value 0
Press any key to continue . . .
```

8) Write a program to perform Floyd’s algorithm

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

void floydWarshall(int **graph, int n)
{
  int i, j, k;
  for (k = 0; k < n; k++)
  {
    for (i = 0; i < n; i++)
    {
            for (j = 0; j < n; j++)
            {
                if (graph[i][j] > graph[i][k] + graph[k][j])
                    graph[i][j] = graph[i][k] + graph[k][j];
            }
        }
    }
}

int main(void)
{
    int n, i, j;
    printf("Enter the number of vertices: ");
    scanf("%d", &n);
    int **graph = (int **)malloc((long unsigned) n * sizeof(int *));
    for (i = 0; i < n; i++)
    {
        graph[i] = (int *)malloc((long unsigned) n * sizeof(int));
    }
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
        {
            if (i == j)
                graph[i][j] = 0;
            else
                graph[i][j] = 100;
        }
    }
    printf("Enter the edges: \n");
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
        {
            printf("[%d][%d]: ", i, j);
            scanf("%d", &graph[i][j]);
        }
    }
    printf("The original graph is:\n");
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
        {
            printf("%d ", graph[i][j]);
        }
        printf("\n");
    }
    floydWarshall(graph, n);
    printf("The shortest path matrix is:\n");
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
        {
            printf("%d ", graph[i][j]);
        }
        printf("\n");
    }
    return 0;
}
```

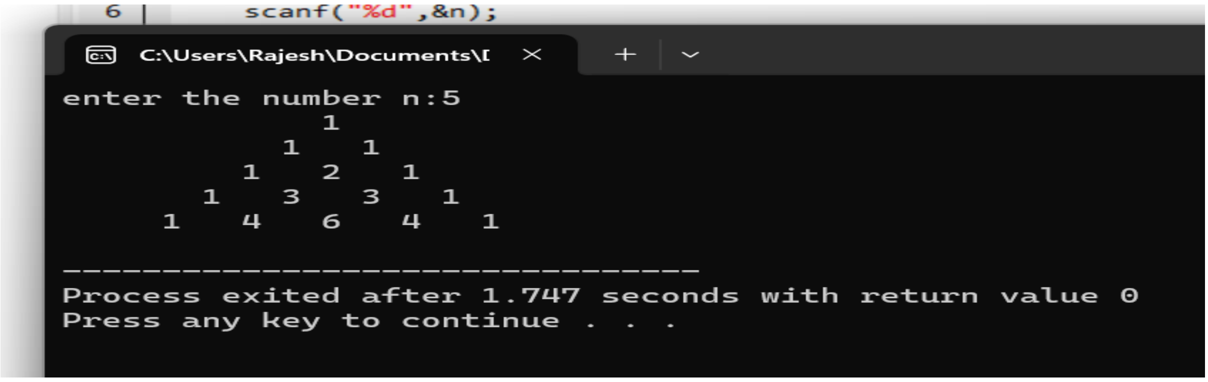
Output:



```
Enter the number of vertices: 4
Enter the edges:
[0][0]: 0
[0][1]: 12
[0][2]: 45
[0][3]: 2
[1][0]: 1
[1][1]: 0
[1][2]: 45
[1][3]: 32
[2][0]: 77
[2][1]: 43
[2][2]: 0
[2][3]: 2
[3][0]: 42
[3][1]: 3
[3][2]: 88
[3][3]: 0
The original graph is:
0 12 45 2
1 0 45 32
77 43 0 2
42 3 88 0
The shortest path matrix is:
0 5 45 2
1 0 45 3
6 5 0 2
4 3 48 0
```

9) Write a program for pascal triangle.

```
#include<stdio.h>
int main()
{
    int i,j,l,co,n;
    printf("enter the number n:");
    scanf("%d",&n);
    for(i=0;i<n;i++)
    {
        for(j=1;j<=n-i;j++)
        {
            printf("  ");
        }
        for(l=0;l<=i;l++)
        {
            if(l==0 || i==0)
                co=1;

            else
                co=co*(i-l+1)/l;
                printf("%4d",co);
        }
        printf("\n");
    }
}
```



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

```
enter the number n:5
             1
           1   1
         1   2   1
       1   3   3   1
     1   4   6   4   1

--------------------------------
Process exited after 1.747 seconds with return value 0
Press any key to continue . . .
```