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192011132

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

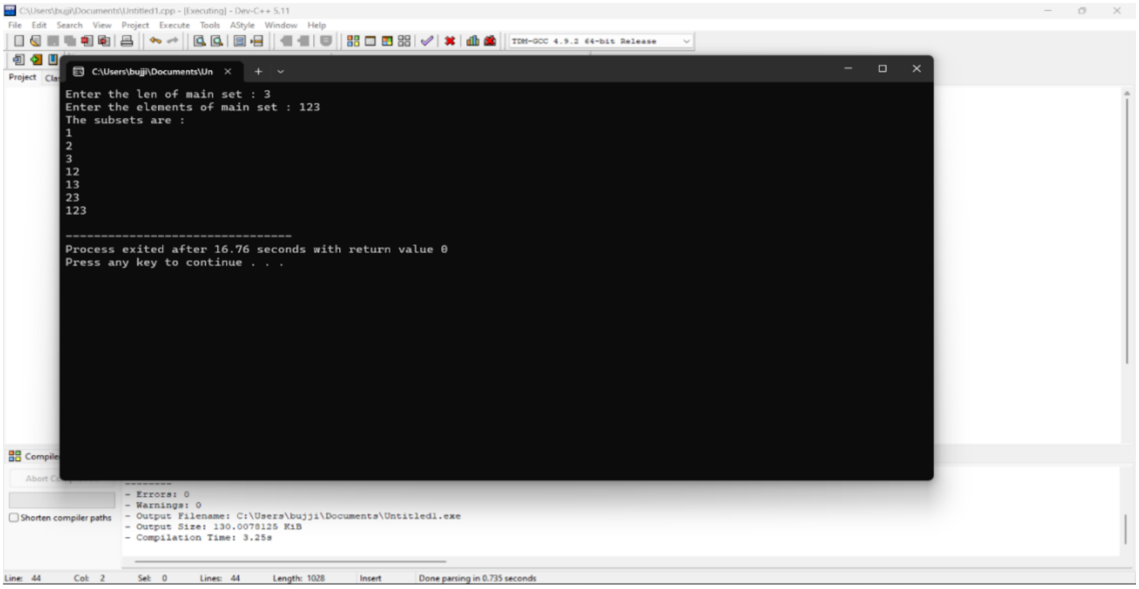
Input nums= [1,2,3]

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

Program :

```
#include <stdio.h>
char string[50], n;
void subset(int, int, int);
 int main()
{
    int i, len;
    printf("Enter the len of main set : ");
    scanf("%d", &len);
    printf("Enter the elements of main set : ");
    scanf("%s", string);
    n = len;
    printf("The subsets are :\n");
    for (i = 1;i <= n;i++)
        subset(0, 0, i);
}
void subset(int start, int index, int num_sub)
{
    int i, j;
    if (index - start + 1  ==  num_sub)
    {
        if (num_sub  ==  1)
        {
           for (i = 0;i < n;i++)
              printf("%c\n", string[i]);
        }
        else
        {
           for (j = index;j < n;j++)
           {
              for (i = start;i < index;i++)
                 printf("%c", string[i]);
              printf("%c\n", string[j]);
           }
           if (start != n - num_sub)
              subset(start + 1, start + 1, num_sub);
        }
     }
     else
     {
        subset(start, index + 1, num_sub);
     }
}
```

Output :



C:\Users\bujji\Documents\Untitled1.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Release
Project Cla
C:\Users\bujji\Documents\Un
Compile
Abort C
Shorten compiler paths

```
Enter the len of main set : 3
Enter the elements of main set : 123
The subsets are :
1
2
3
12
13
23
123

--------------------------------
Process exited after 16.76 seconds with return value 0
Press any key to continue . . .
```

```
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\bujji\Documents\Untitled1.exe
- Output Size: 130.0078125 KiB
- Compilation Time: 3.25s
```

Line: 44 Col: 2 Sel: 0 Lines: 44 Length: 1028 Insert Done parsing in 0.735 seconds

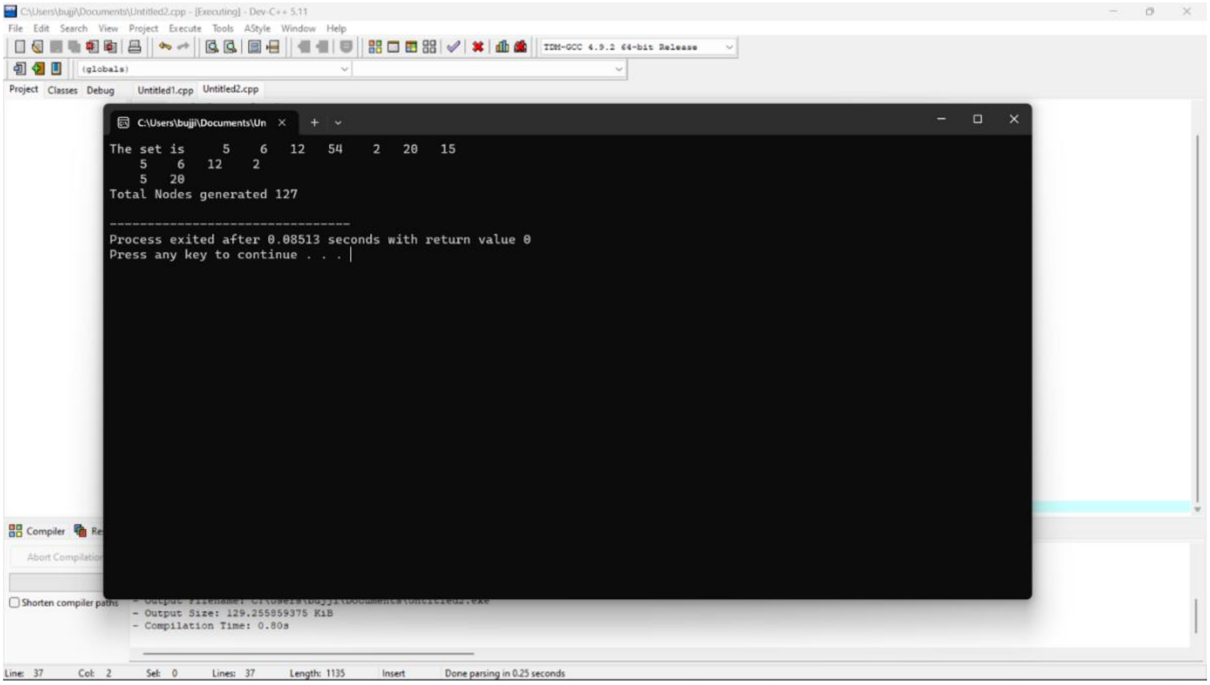
2.Write a program to perform sum of subsets problem using backtracking and estimate time complexity. Identify the test cases.

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>

#include <stdlib.h>

static int total_nodes;

void printValues(int A[], int size){

  for (int i = 0; i < size; i++) {

    printf("%*d", 5, A[i]);

  }

  printf("\n");

}

void subset_sum(int s[], int t[], int s_size, int t_size, int sum, int ite, int const target_sum){

  total_nodes++;

  if (target_sum == sum) {

    printValues(t, t_size);

    subset_sum(s, t, s_size, t_size - 1, sum - s[ite], ite + 1, target_sum);

    return;

  }
  else {
    for (int i = ite; i < s_size; i++) {
      t[t_size] = s[i];
      subset_sum(s, t, s_size, t_size + 1, sum + s[i], i + 1, target_sum);
    }
  }
}
void generateSubsets(int s[], int size, int target_sum){
  int* tuplet_vector = (int*)malloc(size * sizeof(int));
  subset_sum(s, tuplet_vector, size, 0, 0, 0, target_sum);
  free(tuplet_vector);
}
int main(){
  int set[] = { 5, 6, 12 , 54, 2 , 20 , 15 };
  int size = sizeof(set) / sizeof(set[0]);
  printf("The set is ");
  printValues(set , size);
  generateSubsets(set, size, 25);
  printf("Total Nodes generated %d\n", total_nodes);
  return 0;
}
```

Output :



```
The set is      5     6    12    54     2    20    15
    5    6   12     2
    5   20
Total Nodes generated 127

--------------------------------
Process exited after 0.08513 seconds with return value 0
Press any key to continue . . .
```

```
- Output Size: 129.255859375 KiB
- Compilation Time: 0.80s
```

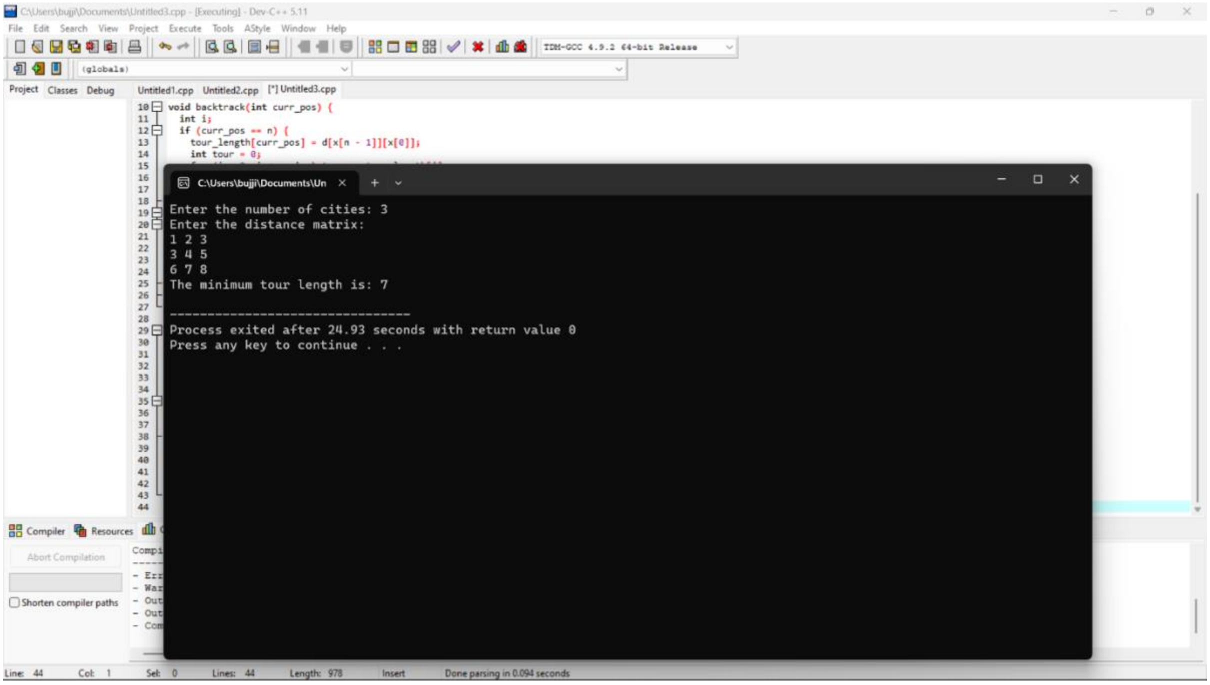
3.Determine an optimal tour in a weighted, directed graph. The weights are nonnegative numbers. The inputs are weighted, directed graph, and n, the number of vertices in the graph. The graph is represented by a two-dimensional array W, which has both its rows and columns indexed from 1 to n, where W [i] [j] is the weight on the edge from the ith vertex to the jth vertex. Write a program for travelling salesman problem using dynamic programming for the below given graph.

Program :

```
#include <stdio.h>

#include <stdbool.h>

#define MAX 20

#define INF 99999

int n, d[MAX][MAX], x[MAX];

int best_tour_length = INF, tour_length[MAX];
```

```
void backtrack(int curr_pos) {
  int i;
  if (curr_pos == n) {
    tour_length[curr_pos] = d[x[n - 1]][x[0]];
    int tour = 0;
    for (i = 0; i < n; i++) tour += tour_length[i];
    if (tour < best_tour_length) best_tour_length = tour;
    return;
  }
  for (i = 0; i < n; i++) {
    if (x[i] == -1) {
      x[i] = curr_pos;
      tour_length[curr_pos] = d[x[curr_pos - 1]][i];
      backtrack(curr_pos + 1);
      x[i] = -1;
    }
  }
}
int main() {
  int i, j;
  printf("Enter the number of cities: ");
  scanf("%d", &n);
  printf("Enter the distance matrix:\n");
  for (i = 0; i < n; i++)
    for (j = 0; j < n; j++) {
      scanf("%d", &d[i][j]);
      x[i] = -1;
    }
  x[0] = 0;
  backtrack(1);

  printf("The minimum tour length is: %d\n", best_tour_length);

  return 0;

}
```

Output :



```
void backtrack(int curr_pos) {
  int i;
  if (curr_pos == n) {
    tour_length[curr_pos] = d[x[n - 1]][x[0]];
    int tour = 0;
```

```
Enter the number of cities: 3
Enter the distance matrix:
1 2 3
3 4 5
6 7 8
The minimum tour length is: 7

--------------------------------
Process exited after 24.93 seconds with return value 0
Press any key to continue . . .
```

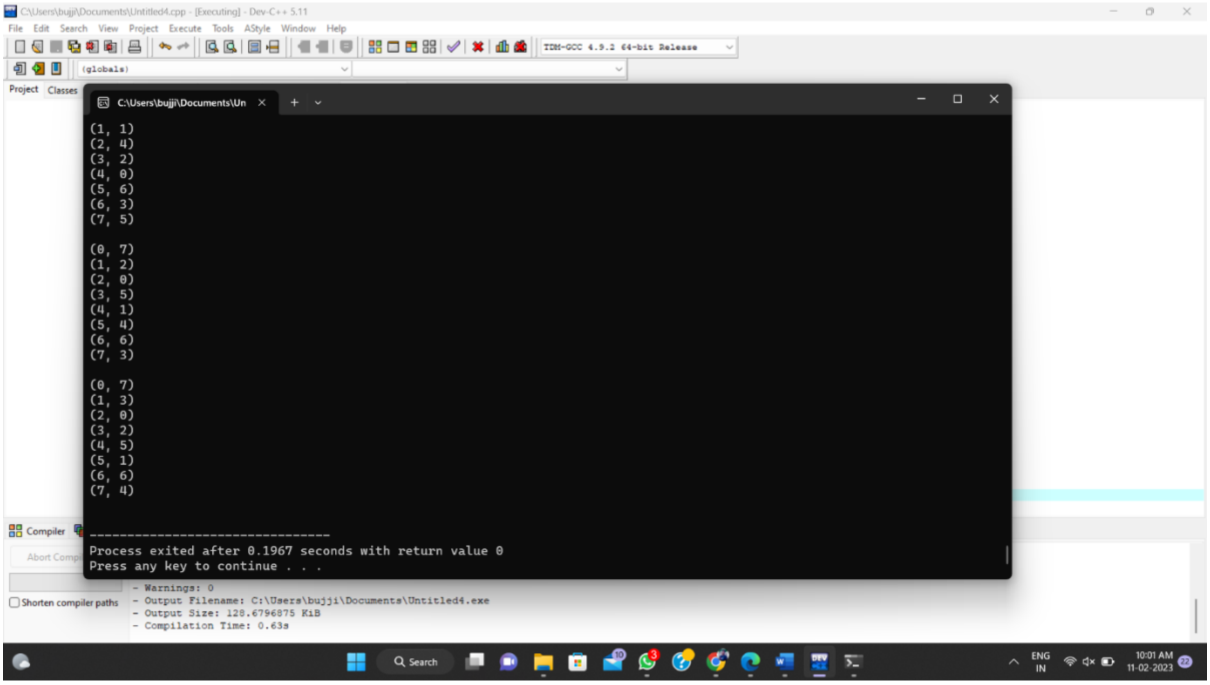
C:\Users\bujji\Documents\Untitled3.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Release
(globals)
Project Classes Debug
Untitled1.cpp Untitled2.cpp [*] Untitled3.cpp
C:\Users\bujji\Documents\Un
Compiler Resources
Abort Compilation
Shorten compiler paths
Line: 44 Col: 1 Sel: 0 Lines: 44 Length: 978 Insert Done parsing in 0.094 seconds

4.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 <stdbool.h>

#define N 8

int col[N];

bool check(int row) {

  int i;

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

    if (col[i] == col[row] ||
        row - i == col[row] - col[i] ||
        row - i == col[i] - col[row])
      return false;
  return true;
}
void backtrack(int row) {
  int i;
  if (row == N) {
    for (i = 0; i < N; i++) printf("(%d, %d)\n", i, col[i]);
    printf("\n");
    return;
  }
  for (i = 0; i < N; i++) {
    col[row] = i;
    if (check(row)) backtrack(row + 1);
  }
}
int main() {
  backtrack(0);
  return 0;
}
```

Output :



C:\Users\bujji\Documents\Untitled4.cpp - [Executing] - Dev-C++ 5.11
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TDM-GCC 4.9.2 64-bit Release
(globals)
Project Classes
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Compiler
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☐ Shorten compiler paths
Search
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10:01 AM 11-02-2023

```
(1, 1)
(2, 4)
(3, 2)
(4, 0)
(5, 6)
(6, 3)
(7, 5)

(0, 7)
(1, 2)
(2, 0)
(3, 5)
(4, 1)
(5, 4)
(6, 6)
(7, 3)

(0, 7)
(1, 3)
(2, 0)
(3, 2)
(4, 5)
(5, 1)
(6, 6)
(7, 4)


--------------------------------
Process exited after 0.1967 seconds with return value 0
Press any key to continue . . .
```

```
- Warnings: 0
- Output Filename: C:\Users\bujji\Documents\Untitled4.exe
- Output Size: 128.6796875 KiB
- Compilation Time: 0.63s
```

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

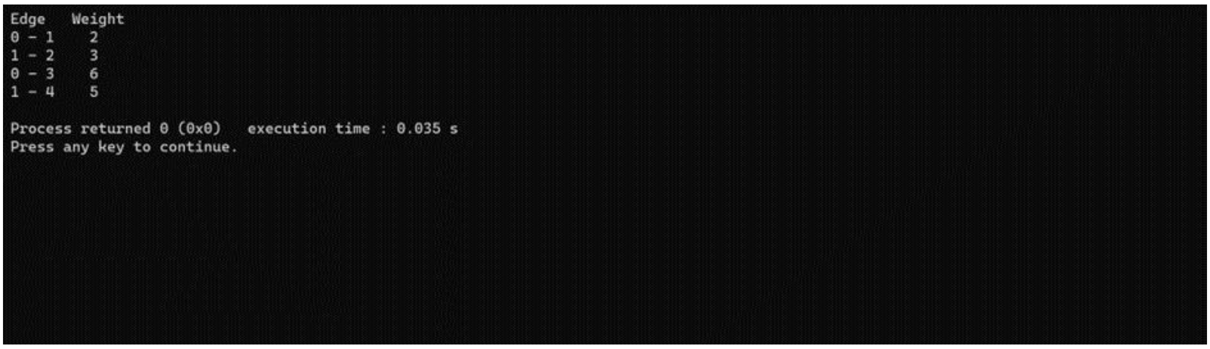
Program :

```
#include <stdio.h>

#include <limits.h>

#define V 5

int minKey(int key[], int mstSet[]) {

   int min = INT_MAX, min_index;

   int v;

   for (v = 0; v < V; v++)

      if (mstSet[v] == 0 && key[v] < min)

         min = key[v], min_index = v;

   return min_index;

}
```

```
int printMST(int parent[], int n, int graph[V][V]) {
    int i;
    printf("Edge   Weight\n");
    for (i = 1; i < V; i++)
        printf("%d - %d    %d \n", parent[i], i, graph[i][parent[i]]);
}
void primMST(int graph[V][V]) {
    int parent[V];
    int key[V], i, v, count;
    int mstSet[V];
for (v = 0; v < V; v++)

            if (graph[u][v] && mstSet[v] == 0 && graph[u][v] < key[v])
                parent[v] = u, key[v] = graph[u][v];
    }
    printMST(parent, V, graph);
}
int main() {
     2    3
    (0)--(1)--(2)
     |   / \   |
    6| 8/   \5 |7
     | /     \ |
    (3)-------(4)
     9          */
    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 :



```
Edge   Weight
0 - 1    2
1 - 2    3
0 - 3    6
1 - 4    5

Process returned 0 (0x0)   execution time : 0.035 s
Press any key to continue.
```

6.Writa a C program for binary seach tree and find the time complexity

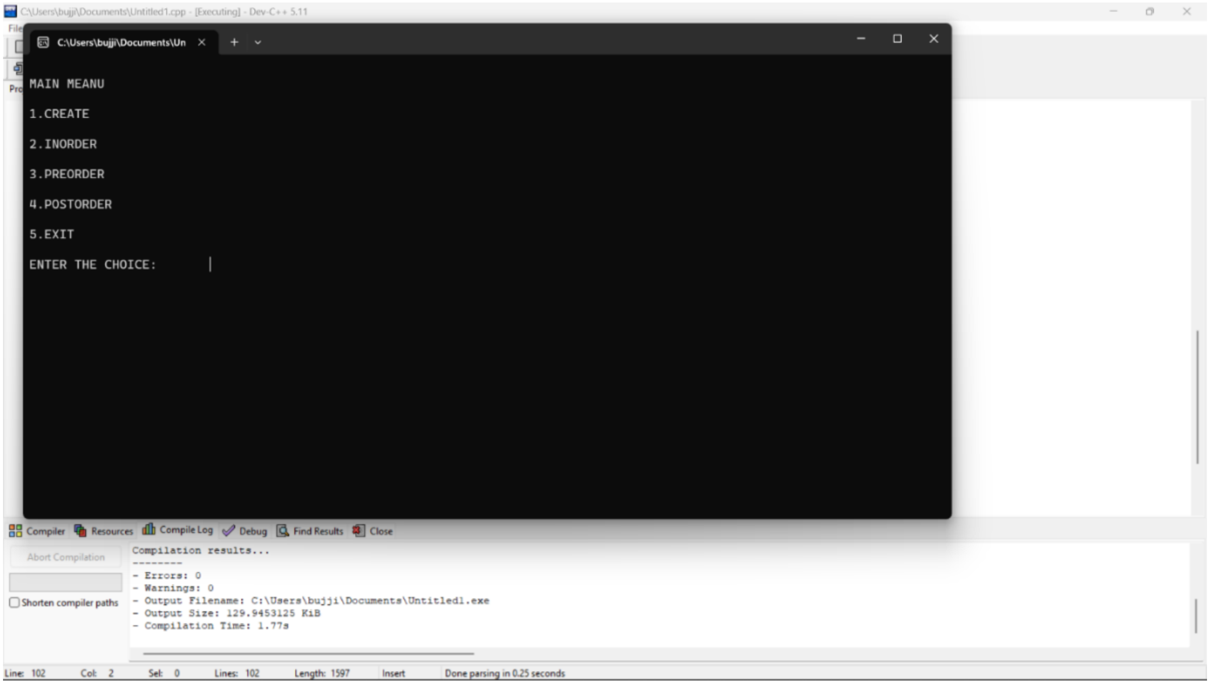
Program :

```
#include<stdio.h>

#include<stdlib.h>

struct node

{

	int data;

	struct node*left;

	struct node*right;

}*root=NULL,*newnode;

struct node*create(struct node*root,int ele)

{

	if(root==NULL)

	{

		newnode=(struct node*)malloc(sizeof(struct node));

		newnode->data=ele;

		newnode->left=NULL;

		newnode->right=NULL;

		return(newnode);

	}
```

```
		else if(ele>root->data)
			root->right=create(root->right,ele);
		else if(ele<root->data)
			root->left=create(root->left,ele);
		return(root);
}
void inorder(struct node *root)
{
		if(root!=NULL)
		{
			inorder(root->left);
			printf("%d\t",root->data);
			inorder(root->right);
		}

}
void preorder(struct node *root)
{
		if(root!=NULL)
		{
			printf("%d\t",root->data);
			preorder(root->left);
			preorder(root->right);
		}
}
void postorder(struct node *root)
{
		if(root!=NULL)
		{
```

```
                postorder(root->left);
                postorder(root->right);
                printf("%d\t",root->data);
        }
}
int main()
{
        int choice;
        while(1)
        {
        printf("\nMAIN MEANU\n");
        printf("\n1.CREATE\n");
        printf("\n2.INORDER\n");
        printf("\n3.PREORDER\n");
        printf("\n4.POSTORDER\n");
        printf("\n5.EXIT\n");
        printf("\nENTER THE CHOICE:\t");
        scanf("%d",&choice);
        switch(choice)
        {
                case 1:
                        int ele;
                        printf("ENTER THE ELEMENT:");
                        scanf("%d",&ele);
                        root=create(root,ele);
                        break;
                case 2:
                        inorder(root);
                        break;
                case 3:
                        preorder(root);
                        break;
                case 4:
                        postorder(root);
                        break;
                case 5:
                        exit(0);
                        break;
                default:
                        printf("\nWRONG CHOICE\n");
                        break;
        }
        }
}
```

Output :



C:\Users\bujji\Documents\Untitled1.cpp - [Executing] - Dev-C++ 5.11
C:\Users\bujji\Documents\Un
Compiler
Resources
Compile Log
Debug
Find Results
Close
Abort Compilation
□ Shorten compiler paths

```
MAIN MEANU

1.CREATE

2.INORDER

3.PREORDER

4.POSTORDER

5.EXIT

ENTER THE CHOICE:
```

```
Compilation results...
--------
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\bujji\Documents\Untitled1.exe
- Output Size: 129.9453125 KiB
- Compilation Time: 1.77s
```

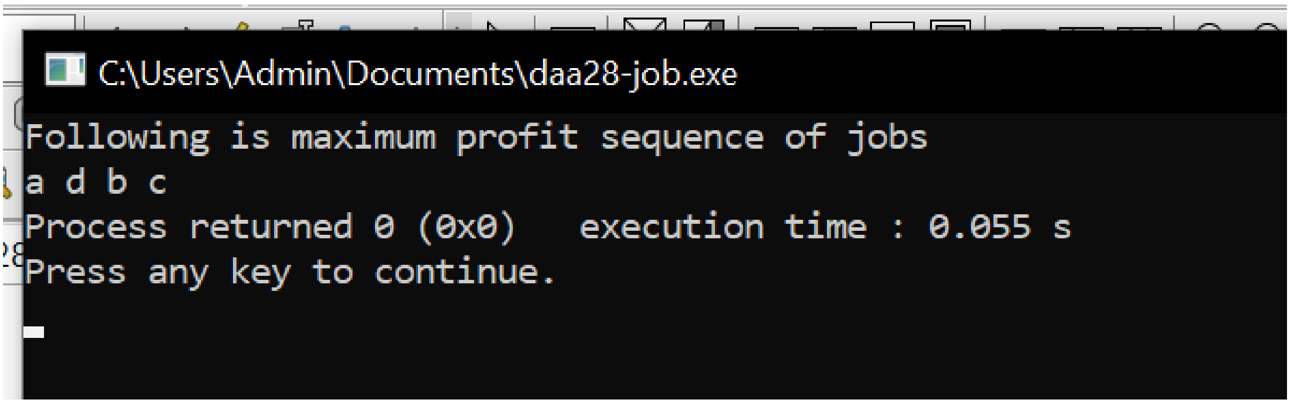
Line: 102   Col: 2   Sel: 0   Lines: 102   Length: 1597   Insert   Done parsing in 0.25 seconds

7.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**

Program :

```
#include <stdbool.h>

#include <stdio.h>

#include <stdlib.h>


typedef struct Job {


        char id;

        int dead;

        int profit;

} Job;


int compare(const void* a, const void* b)

{

        Job* temp1 = (Job*)a;

        Job* temp2 = (Job*)b;
        return (temp2->profit - temp1->profit);
}



int min(int num1, int num2)
{
        return (num1 > num2) ? num2 : num1;
}



void printJobScheduling(Job arr[], int n)
{

        qsort(arr, n, sizeof(Job), compare);

        int result[n];
        bool slot[n];
        for (int i = 0; i < n; i++)
                slot[i] = false;

        for (int i = 0; i < n; i++) {

                for (int j = min(n, arr[i].dead) - 1; j >= 0; j--) {

                        if (slot[j] == false) {
                                result[j] = i;
                slot[j] = true;
                break;
            }
        }
    }

    for (int i = 0; i < n; i++)
        if (slot[i])
            printf("%c ", arr[result[i]].id);
}

int main()
{
    Job arr[] = { { 'a', 12, 8, 9, 10 },
                { 'b', 11, 10, 10, 9 },
                { 'c', 9, 11, 8, 12 },
                { 'd', 11, 9, 23, 7 } };
    int n = sizeof(arr) / sizeof(arr[0]);
    printf(
        "Following is maximum profit sequence of jobs \n");

    printJobScheduling(arr, n);
    return 0;
}
```



```
Following is maximum profit sequence of jobs
a d b c
Process returned 0 (0x0)   execution time : 0.055 s
Press any key to continue.
```