Day -4

Assignment

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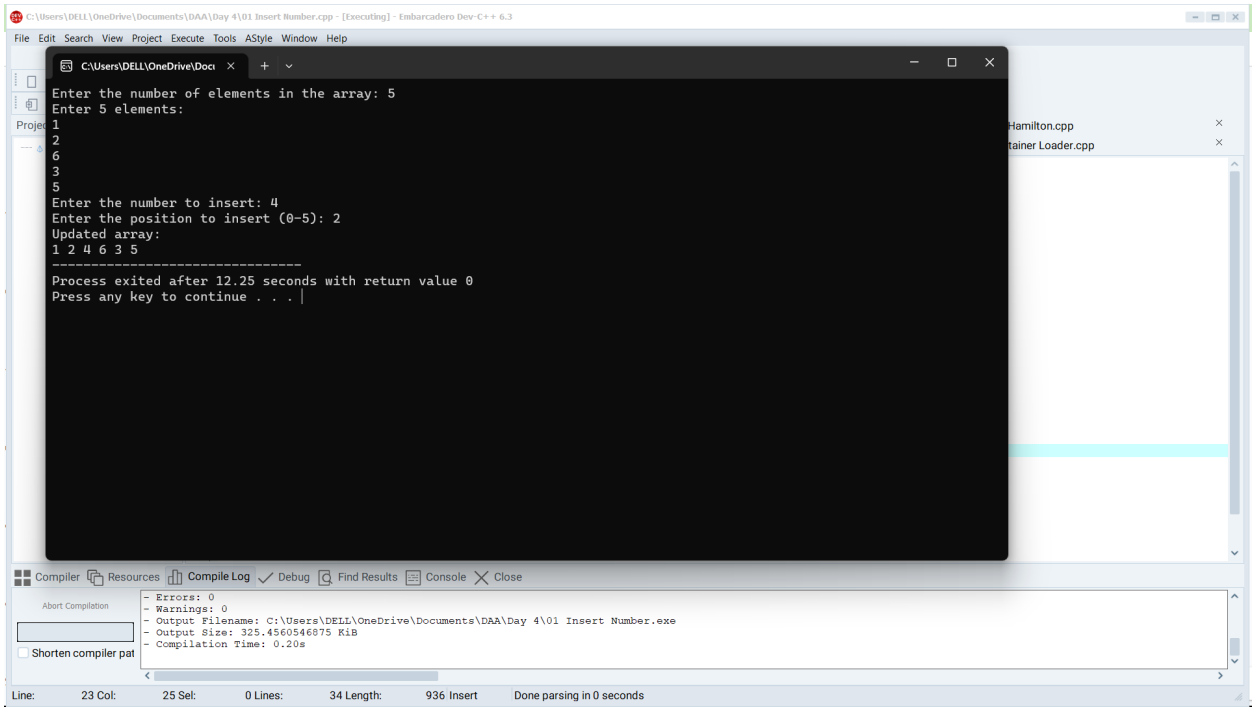
1. Write a program to inset a number in a list.

```
#include <stdio.h>

int main() {

        int originalArray[100];

        int newArray[101];

        int n, num, pos, i;

        printf("Enter the number of elements in the array: ");

        scanf("%d", &n);

   printf("Enter %d elements:\n", n);

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

        scanf("%d", &originalArray[i]);

        }

        printf("Enter the number to insert: ");

        scanf("%d", &num);

        printf("Enter the position to insert (0-%d): ", n);

        scanf("%d", &pos);

        if (pos < 0 || pos > n) {

        printf("Invalid position. Position should be between 0 and %d\n", n);
```

```
        return 1;
        }
        for (i = 0; i < pos; i++) {
        newArray[i] = originalArray[i];
        }
        newArray[pos] = num;
        for (i = pos; i < n; i++) {
        newArray[i + 1] = originalArray[i];
        }
        n++;
        printf("Updated array:\n");
        for (i = 0; i < n; i++) {
        printf("%d ", newArray[i]);
        }
        return 0;
}
```

OUTPUT:

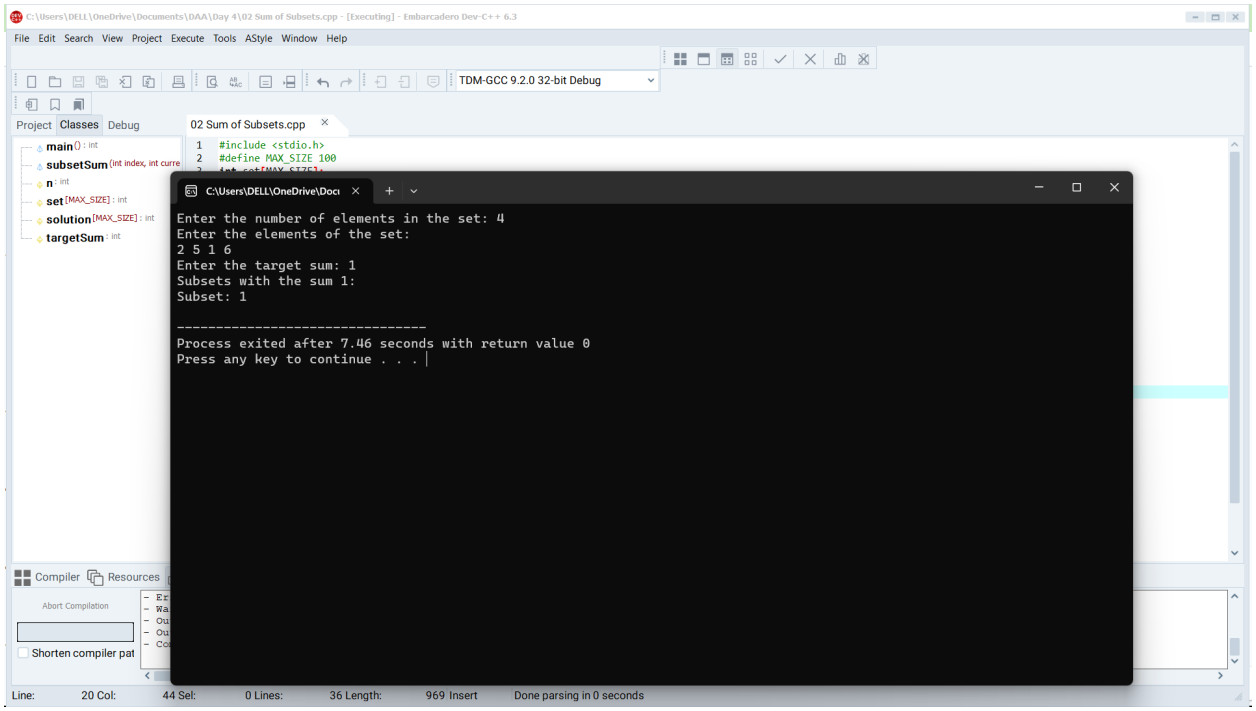


2. Write a program to perform sum of subsets problem using backtracking.

```
#include <stdio.h>

#define MAX_SIZE 100

int set[MAX_SIZE];

int solution[MAX_SIZE];

int n, targetSum;

void subsetSum(int index, int currentSum, int size) {

        if (currentSum == targetSum) {

        printf("Subset: ");

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

        printf("%d ", solution[i]);

        }
```

```
        printf("\n");
        return;
        }
        if (currentSum > targetSum || index >= n) {
        return;
        }
        solution[size] = set[index];
        subsetSum(index + 1, currentSum + set[index], size + 1);
        subsetSum(index + 1, currentSum, size);
}

int main() {
        printf("Enter the number of elements in the set: ");
        scanf("%d", &n);
        printf("Enter the elements of the set:\n");
        for (int i = 0; i < n; i++) {
        scanf("%d", &set[i]);
   }
        printf("Enter the target sum: ");
        scanf("%d", &targetSum);
        printf("Subsets with the sum %d:\n", targetSum);
        subsetSum(0, 0, 0);
        return 0;
}
```

OUTPUT:



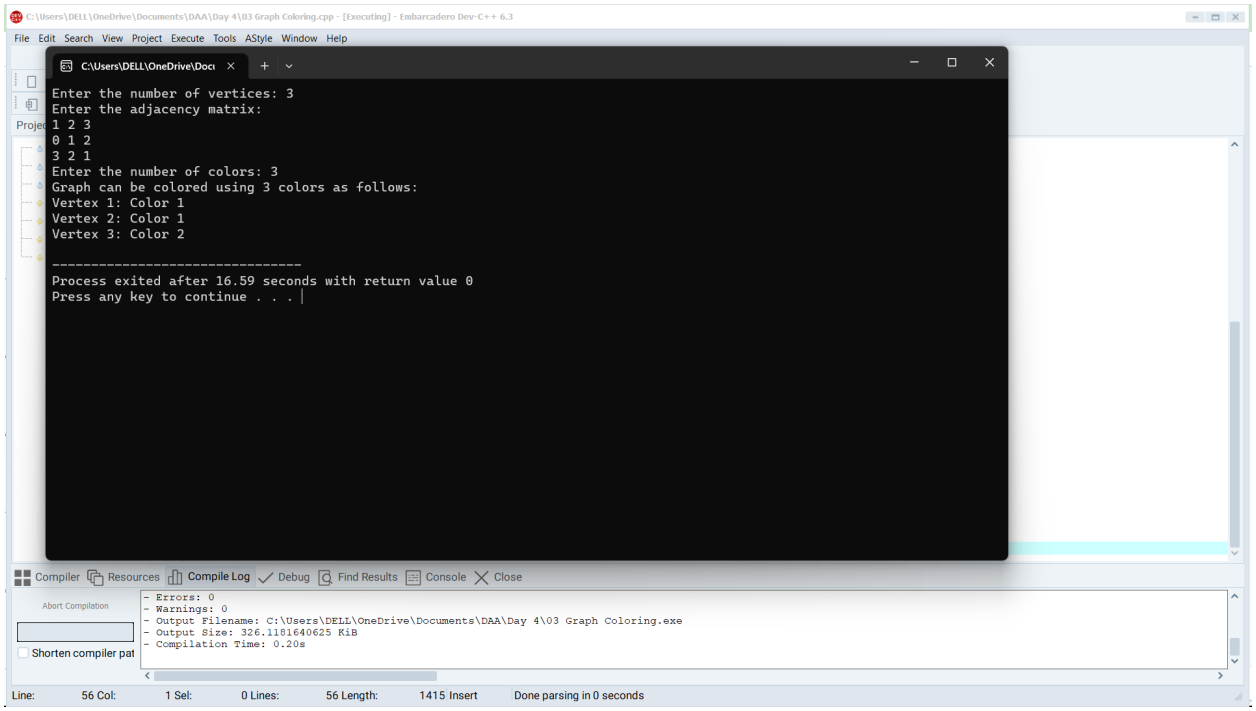
3. Write a program to perform graph coloring problem using backtracking.

```
#include <stdio.h>

#include <stdbool.h>

#define MAX_VERTICES 100

int graph[MAX_VERTICES][MAX_VERTICES];

int colors[MAX_VERTICES];

int numVertices, numColors;

bool isSafe(int v, int c) {

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

        if (graph[v][i] && colors[i] == c) {

        return false;

        }
```

```
        }
        return true;
}
bool graphColoring(int v) {
        if (v == numVertices) {
        return true;
        }
        for (int c = 1; c <= numColors; c++) {
        if (isSafe(v, c)) {
        colors[v] = c;
        if (graphColoring(v + 1)) {
                return true;
        }
        colors[v] = 0;
        }
        }
        return false;
}

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

        printf("Enter the adjacency matrix:\n");
```

```
        for (int i = 0; i < numVertices; i++) {
        for (int j = 0; j < numVertices; j++) {
        scanf("%d", &graph[i][j]);
        }
        }

        printf("Enter the number of colors: ");
        scanf("%d", &numColors);

        if (graphColoring(0)) {
        printf("Graph can be colored using %d colors as follows:\n", numColors);
        for (int i = 0; i < numVertices; i++) {
        printf("Vertex %d: Color %d\n", i + 1, colors[i]);
        }
        } else {
        printf("Graph cannot be colored with %d colors.\n", numColors);
        }

        return 0;
}
```

OUTPUT:



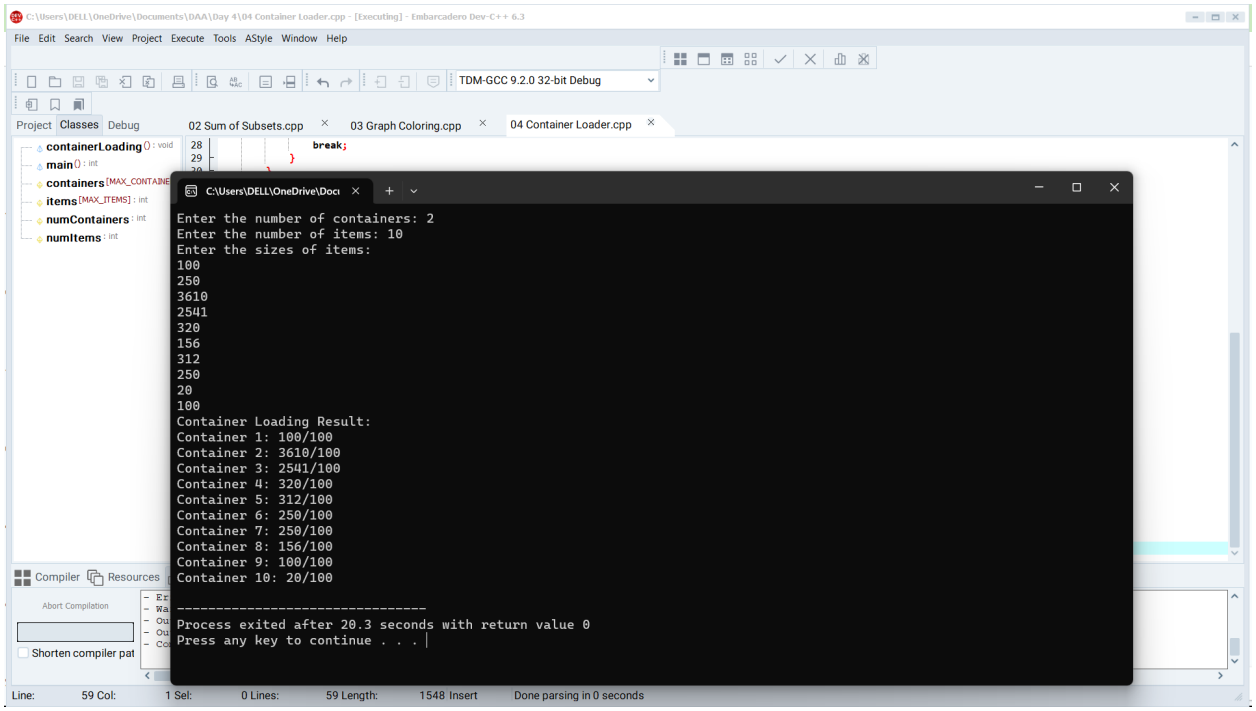
4. Write a program to compute container loader Problem.

```
#include <stdio.h>

#include <stdbool.h>

#define MAX_CONTAINERS 100

#define MAX_ITEMS 100

int containers[MAX_CONTAINERS];

int items[MAX_ITEMS];

int numContainers, numItems;

void containerLoading() {

        for (int i = 0; i < numItems - 1; i++) {

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

        if (items[i] < items[j]) {

                int temp = items[i];
```

```
            items[i] = items[j];
            items[j] = temp;
}
}
}
int containerIndex = 0;
for (int i = 0; i < numContainers; i++) {
containers[i] = 0;
}
for (int i = 0; i < numItems; i++) {
bool placed = false;
for (int j = 0; j <= containerIndex; j++) {
if (containers[j] + items[i] <= 100) {
            containers[j] += items[i];
            placed = true;
    break;
}
}

if (!placed) {
containerIndex++;
containers[containerIndex] = items[i];
}
}
```

```
        printf("Container Loading Result:\n");
        for (int i = 0; i <= containerIndex; i++) {
        printf("Container %d: %d/%d\n", i + 1, containers[i], 100);
        }
}

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

        printf("Enter the number of items: ");
        scanf("%d", &numItems);

        printf("Enter the sizes of items:\n");
        for (int i = 0; i < numItems; i++) {
        scanf("%d", &items[i]);
        }

        containerLoading();

        return 0;
}
```

OUTPUT:

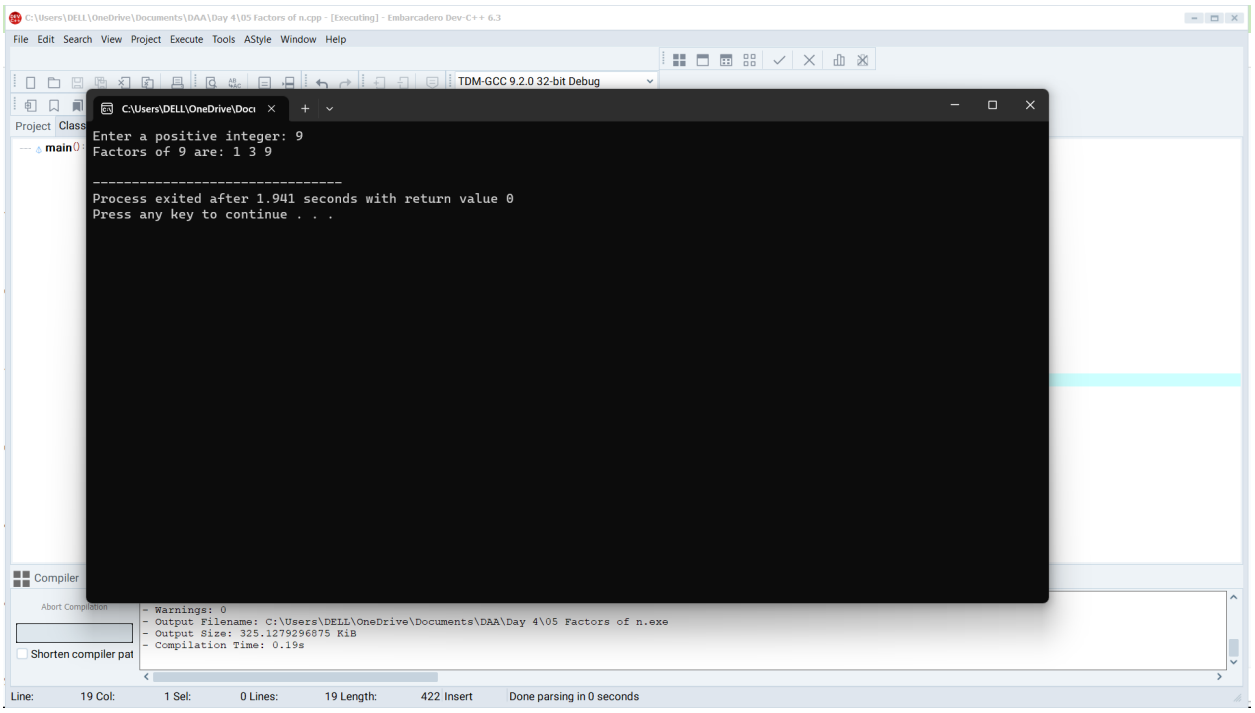


5. Write a program to generate the list of all factor for n value.

```
#include <stdio.h>

int main() {

        int n;

        printf("Enter a positive integer: ");

        scanf("%d", &n);

        if (n <= 0) {

        printf("Please enter a positive integer.\n");

        } else {

        printf("Factors of %d are: ", n);

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

        if (n % i == 0) {

                printf("%d ", i);
```

```
        }
        }
        printf("\n");
        }
        return 0;
}
```

OUTPUT:



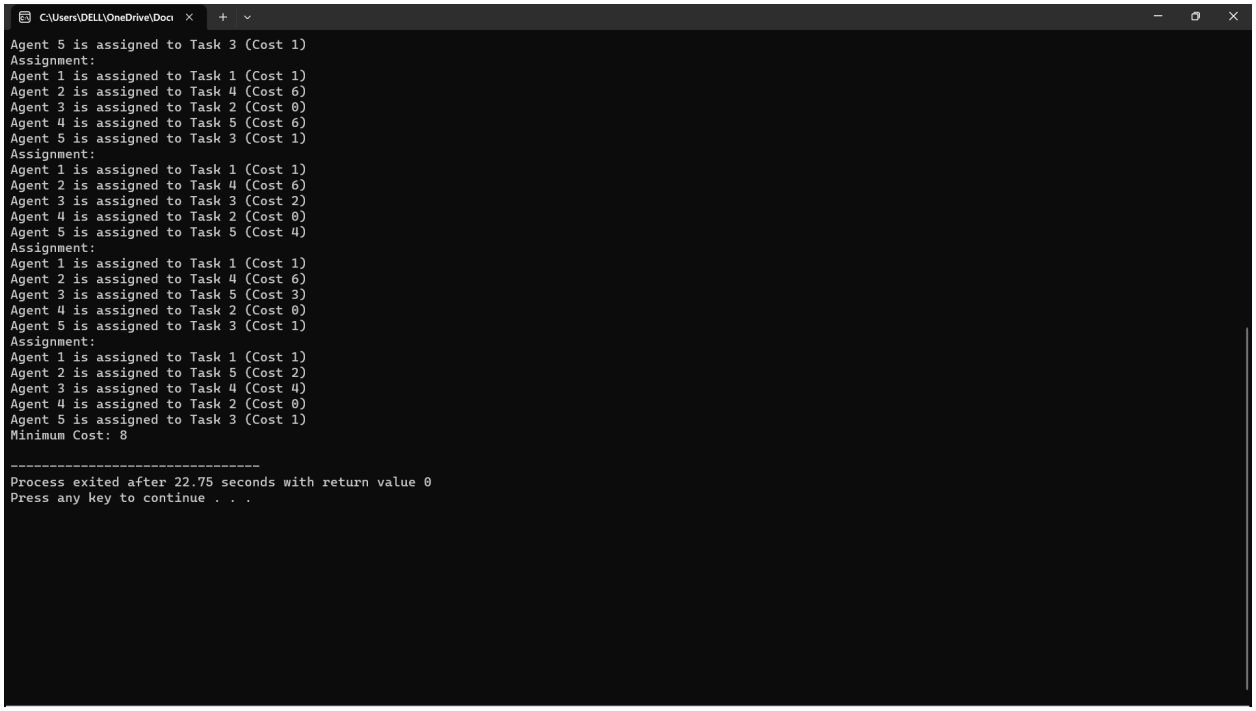
6. Write a program to perform Assignment problem using branch and bound.

```
#include <stdio.h>

#include <limits.h>

#define N 5

int costMatrix[N][N];

int assignment[N];
```

```
int usedRows[N], usedCols[N];

int minCost = INT_MAX;


void printAssignment() {

	printf("Assignment:\n");

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

	printf("Agent %d is assigned to Task %d (Cost %d)\n", i + 1, assignment[i] + 1,
costMatrix[i][assignment[i]]);

	}

}


void branchAndBound(int agent, int costSoFar) {

	if (agent == N) {

	if (costSoFar < minCost) {

	minCost = costSoFar;

	printAssignment();

	}

	return;

	}


	for (int task = 0; task < N; task++) {

	if (!usedCols[task] && (costSoFar + costMatrix[agent][task] < minCost)) {

	assignment[agent] = task;

	usedCols[task] = 1;

	branchAndBound(agent + 1, costSoFar + costMatrix[agent][task]);
```

```
            usedCols[task] = 0;
             }
            }
}

int main() {
            printf("Enter the cost matrix (%d x %d):\n", N, N);
            for (int i = 0; i < N; i++) {
            for (int j = 0; j < N; j++) {
            scanf("%d", &costMatrix[i][j]);
            }
            }

            for (int i = 0; i < N; i++) {
            assignment[i] = -1;
            }

            branchAndBound(0, 0);

            printf("Minimum Cost: %d\n", minCost);

            return 0;
}
```

OUTPUT:

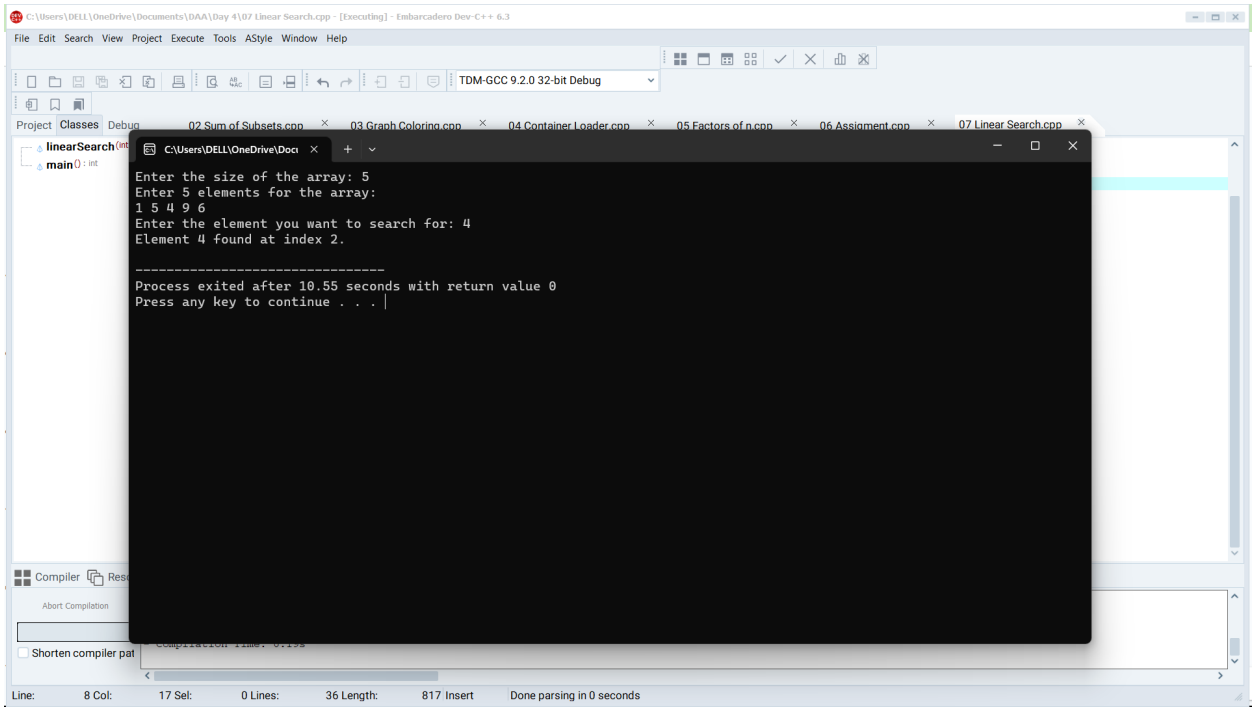


7. Write a program for to perform liner search.

```
#include <stdio.h>

int linearSearch(int arr[], int size, int target) {
        for (int i = 0; i < size; i++) {
        if (arr[i] == target) {
        return i;
        }
        }
        return -1;
}

int main() {
        int arr[100];
```

```
    int size, target;

    printf("Enter the size of the array: ");
    scanf("%d", &size);

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

    printf("Enter the element you want to search for: ");
    scanf("%d", &target);

    int result = linearSearch(arr, size, target);

    if (result != -1) {
    printf("Element %d found at index %d.\n", target, result);
    } else {
    printf("Element %d not found in the array.\n", target);
    }

    return 0;
}
```

OUTPUT:



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

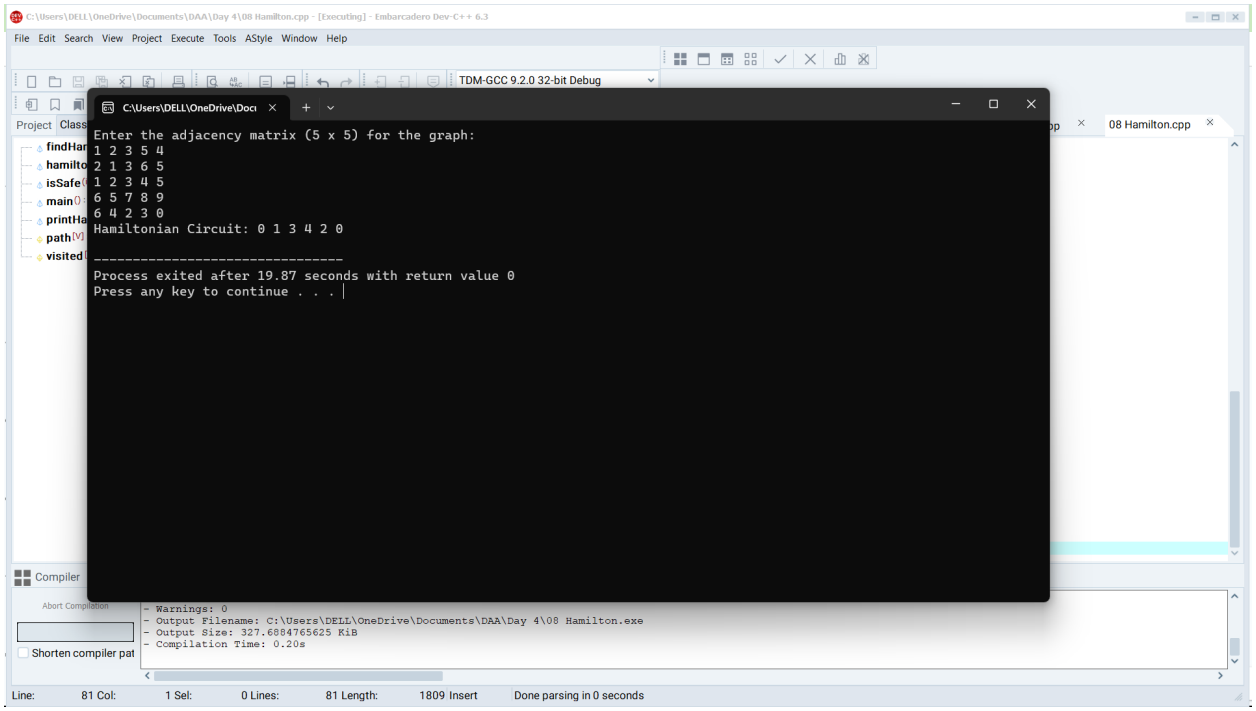
```
#include <stdio.h>

#include <stdbool.h>

#define V 5

int path[V];

bool visited[V];

void printHamiltonianCircuit() {

        printf("Hamiltonian Circuit: ");

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

        printf("%d ", path[i]);

        }

        printf("%d\n", path[0]);
```

```
}
bool isSafe(int v, int pos, int graph[V][V]) {
        if (!graph[path[pos - 1]][v])
        return false;

        for (int i = 0; i < pos; i++) {
        if (path[i] == v)
        return false;
        }

        return true;
}
bool hamiltonianCircuitUtil(int graph[V][V], int pos) {
        if (pos == V) {
        if (graph[path[pos - 1]][path[0]] == 1) {
        printHamiltonianCircuit();
        return true;
        }
        return false;
        }

        for (int v = 1; v < V; v++) {
        if (!visited[v] && isSafe(v, pos, graph)) {
        path[pos] = v;
```

```
        visited[v] = true;

        if (hamiltonianCircuitUtil(graph, pos + 1))
                return true;

        path[pos] = -1;
        visited[v] = false;
        }
        }

        return false;
}

bool findHamiltonianCircuit(int graph[V][V]) {
        for (int i = 0; i < V; i++) {
        path[i] = -1;
        visited[i] = false;
        }

        path[0] = 0;
        visited[0] = true;

        if (hamiltonianCircuitUtil(graph, 1) == false) {
        printf("No Hamiltonian Circuit exists\n");
```

```
        return false;
        }

        return true;
}

int main() {
        int graph[V][V];

        printf("Enter the adjacency matrix (%d x %d) for the graph:\n", V, V);
        for (int i = 0; i < V; i++) {
        for (int j = 0; j < V; j++) {
        scanf("%d", &graph[i][j]);
        }
        }

        if (findHamiltonianCircuit(graph) == false)
        printf("No Hamiltonian Circuit exists\n");

        return 0;
}
```

OUTPUT:


C:\Users\DELL\OneDrive\Documents\DAA\Day 4\08 Hamilton.cpp - [Executing] - Embarcadero Dev-C++ 6.3
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 9.2.0 32-bit Debug
C:\Users\DELL\OneDrive\Doc
Enter the adjacency matrix (5 x 5) for the graph:
1 2 3 5 4
2 1 3 6 5
1 2 3 4 5
6 5 7 8 9
6 4 2 3 0
Hamiltonian Circuit: 0 1 3 4 2 0
Process exited after 19.87 seconds with return value 0
Press any key to continue . . .
08 Hamilton.cpp
Compiler
- Warnings: 0
- Output Filename: C:\Users\DELL\OneDrive\Documents\DAA\Day 4\08 Hamilton.exe
- Output Size: 327.6884765625 KiB
- Compilation Time: 0.20s
Shorten compiler pat
Line: 81 Col: 1 Sel: 0 Lines: 81 Length: 1809 Insert
Done parsing in 0 seconds