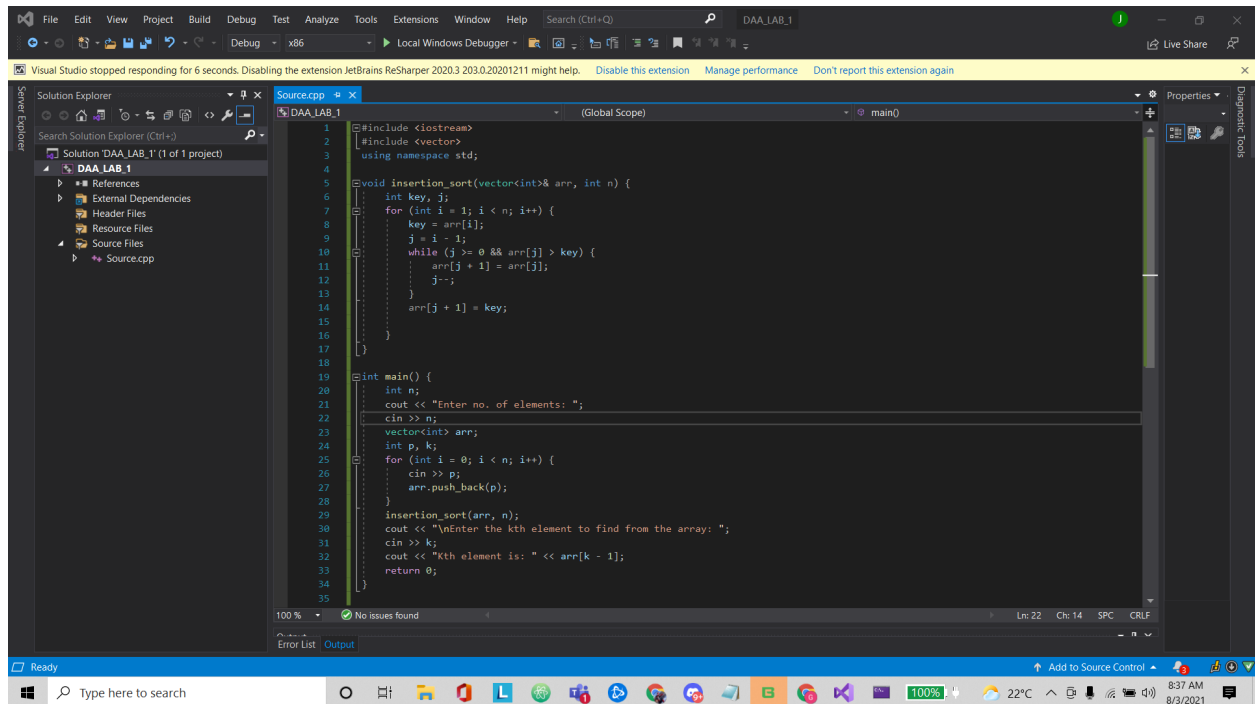


Question 1:

To find the kth smallest no. from a given array



The screenshot shows the Visual Studio IDE with a C++ project named 'DAA_LAB_1'. The source file 'Source.cpp' contains the following code:

```
1 #include <iostream>
2 #include <vector>
3 using namespace std;
4
5 void insertion_sort(vector<int>& arr, int n) {
6     int key, j;
7     for (int i = 1; i < n; i++) {
8         key = arr[i];
9         j = i - 1;
10        while (j >= 0 && arr[j] > key) {
11            arr[j + 1] = arr[j];
12            j--;
13        }
14        arr[j + 1] = key;
15    }
16 }
17
18
19 int main() {
20     int n;
21     cout << "Enter no. of elements: ";
22     cin >> n;
23     vector<int> arr;
24     int p, k;
25     for (int i = 0; i < n; i++) {
26         cin >> p;
27         arr.push_back(p);
28     }
29     insertion_sort(arr, n);
30     cout << "\nEnter the kth element to find from the array: ";
31     cin >> k;
32     cout << "Kth element is: " << arr[k - 1];
33     return 0;
34 }
35
```



The screenshot shows the Microsoft Visual Studio Debug Console with the following output:

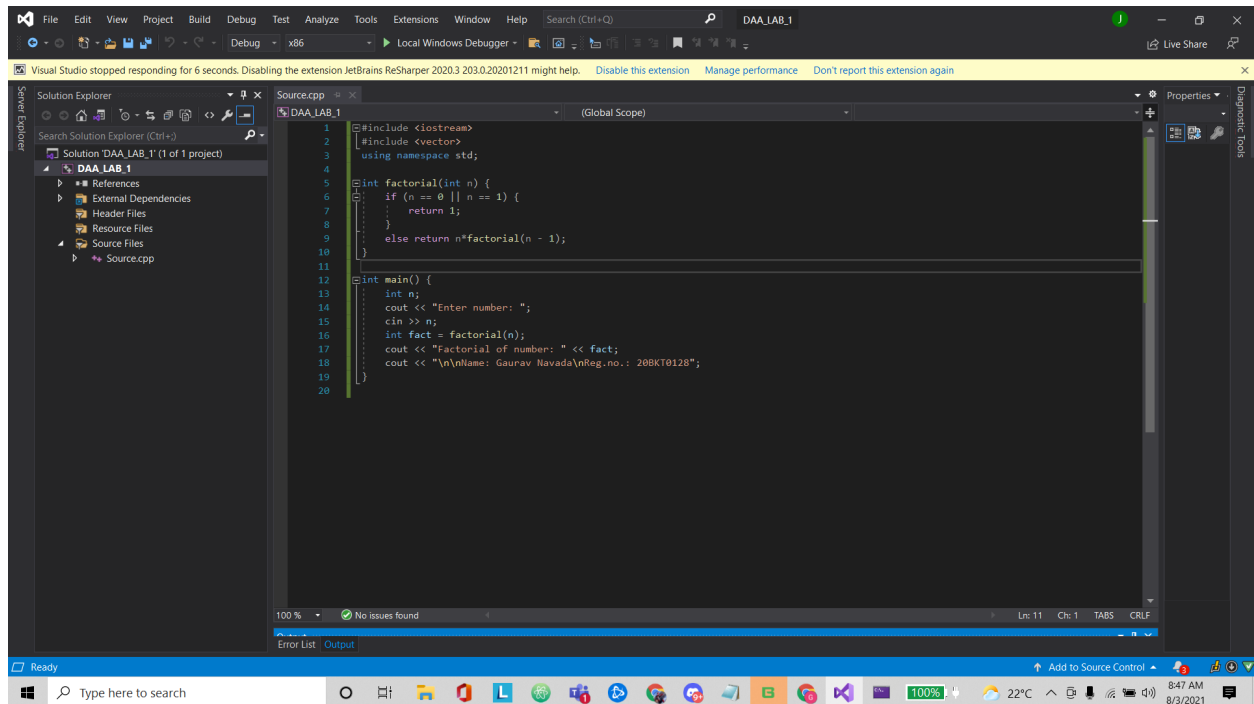
```
Enter no. of elements: 6
30
20
10
60
50
40

Enter the kth element to find from the array: 4
Kth element is: 40

Name: Gaurav Navada
Reg.no.: 20BKT0128
C:\Users\gaura\source\repos\DAA_LAB_1\Debug\DAA_LAB_1.exe (process 19744) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

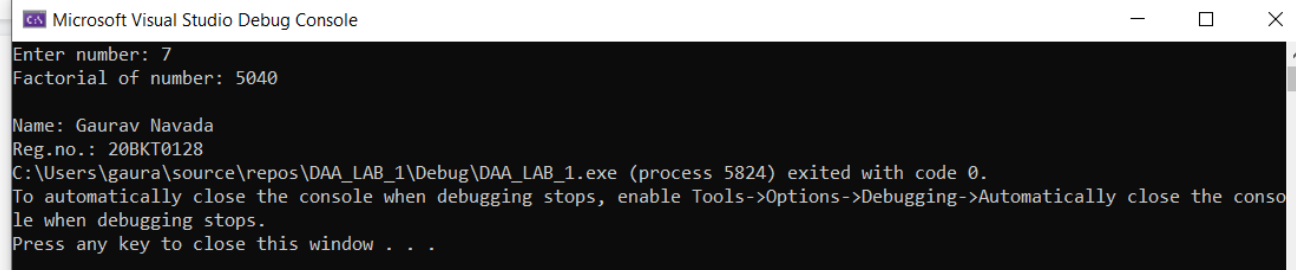
Question 2:

To find factorial of a number using recursion



The screenshot shows the Visual Studio IDE with the 'Source.cpp' file open. The code implements a recursive function to calculate the factorial of a number. The function 'factorial' takes an integer 'n' and returns its factorial. The 'main' function prompts the user to enter a number, reads the input, and prints the result. The output shows the factorial of 7 is 5040.

```
1 #include <iostream>
2 #include <vector>
3 using namespace std;
4
5 int factorial(int n) {
6     if (n == 0 || n == 1) {
7         return 1;
8     }
9     else return n*factorial(n - 1);
10 }
11
12 int main() {
13     int n;
14     cout << "Enter number: ";
15     cin >> n;
16     int fact = factorial(n);
17     cout << "Factorial of numbers: " << fact;
18     cout << "\nName: Gaurav Navada\nReg.no.: 20BK0128";
19 }
20
```



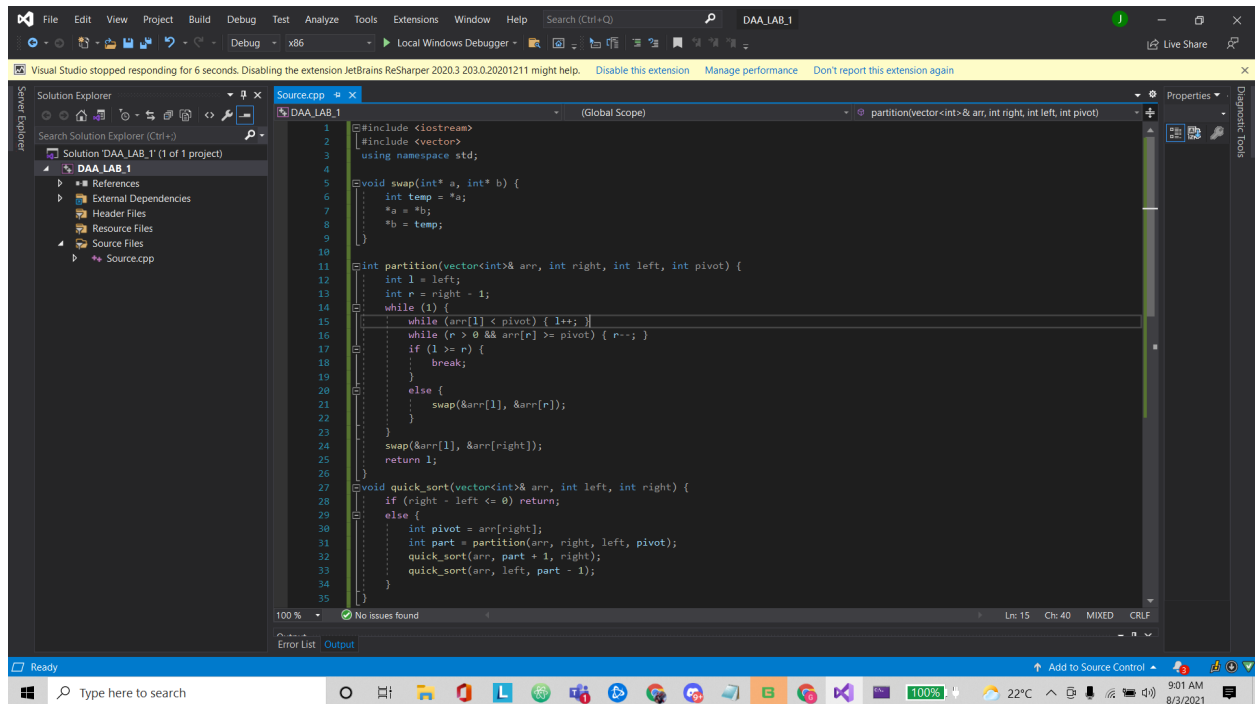
The screenshot shows the Microsoft Visual Studio Debug Console. It displays the output of the program, including the user input '7', the calculated factorial '5040', and the user's name and registration number. The console also shows the program's exit status and a message to close the console when debugging stops.

```
Enter number: 7
Factorial of number: 5040

Name: Gaurav Navada
Reg.no.: 20BK0128
C:\Users\gaura\source\repos\DAA_LAB_1\Debug\DAA_LAB_1.exe (process 5824) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

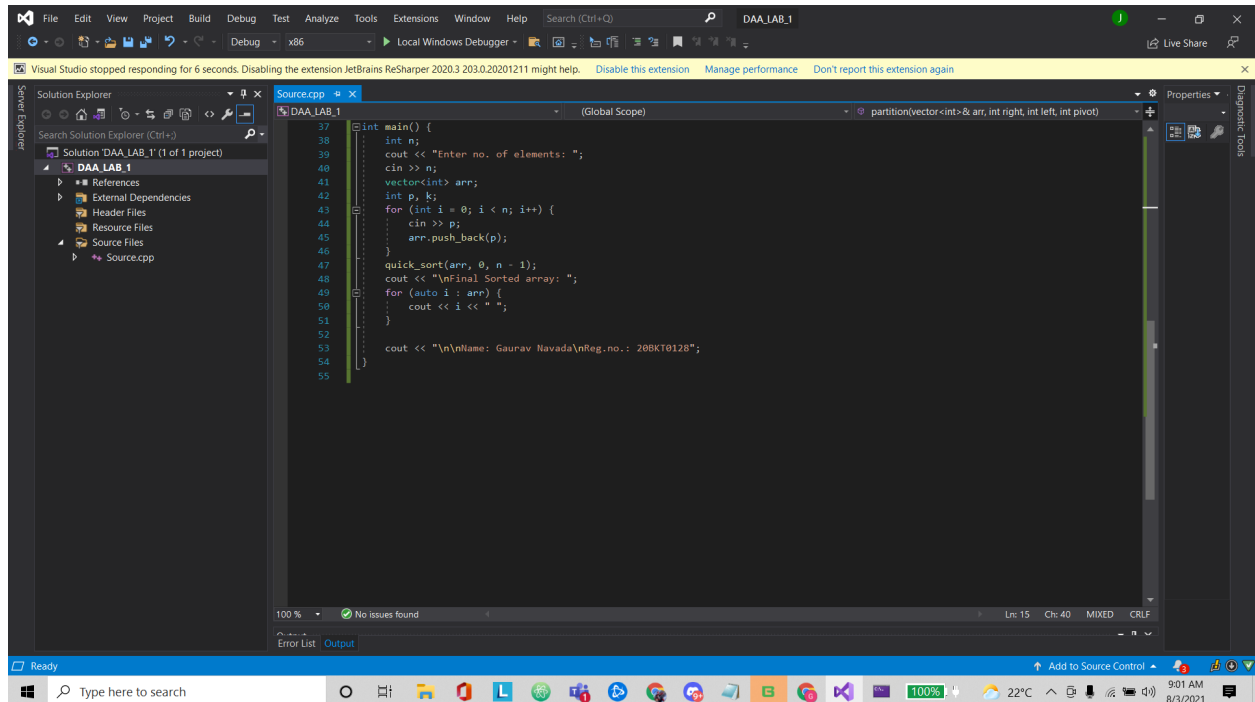
Question 3:

To write a code for Quick Sort



The screenshot shows the Visual Studio IDE with a C++ project named 'DAA_LAB_1'. The 'Source.cpp' file is open, displaying the implementation of the partition function and the quick_sort function. The partition function uses a while loop to find the pivot element and swap it with the last element. The quick_sort function uses recursion to sort the array.

```
1 #include <iostream>
2 #include <vector>
3 using namespace std;
4
5 void swap(int* a, int* b) {
6     int temp = *a;
7     *a = *b;
8     *b = temp;
9 }
10
11 int partition(vector<int>& arr, int right, int left, int pivot) {
12     int l = left;
13     int r = right - 1;
14     while (1) {
15         while (arr[l] < pivot) { l++; }
16         while (r > 0 && arr[r] >= pivot) { r--; }
17         if (l >= r) {
18             break;
19         }
20         else {
21             swap(&arr[l], &arr[r]);
22         }
23     }
24     swap(&arr[l], &arr[right]);
25     return l;
26 }
27
28 void quick_sort(vector<int>& arr, int left, int right) {
29     if (right - left <= 0) return;
30     else {
31         int pivot = arr[right];
32         int part = partition(arr, right, left, pivot);
33         quick_sort(arr, part + 1, right);
34         quick_sort(arr, left, part - 1);
35     }
36 }
```



The screenshot shows the Visual Studio IDE with the same C++ project. The 'Source.cpp' file is open, displaying the main function. The main function takes input from the user, creates a vector, and calls the quick_sort function to sort the array. It then prints the sorted array.

```
37 int main() {
38     int n;
39     cout << "Enter no. of elements: ";
40     cin >> n;
41     vector<int> arr;
42     int p, k;
43     for (int i = 0; i < n; i++) {
44         cin >> p;
45         arr.push_back(p);
46     }
47     quick_sort(arr, 0, n - 1);
48     cout << "\nFinal Sorted array: ";
49     for (auto i : arr) {
50         cout << i << " ";
51     }
52
53     cout << "\nName: Gaurav Navada\nReg.no.: 288KT0128";
54 }
55 }
```

```
Microsoft Visual Studio Debug Console

Enter no. of elements: 10
5
3
6
4
8
7
9
1
4
3

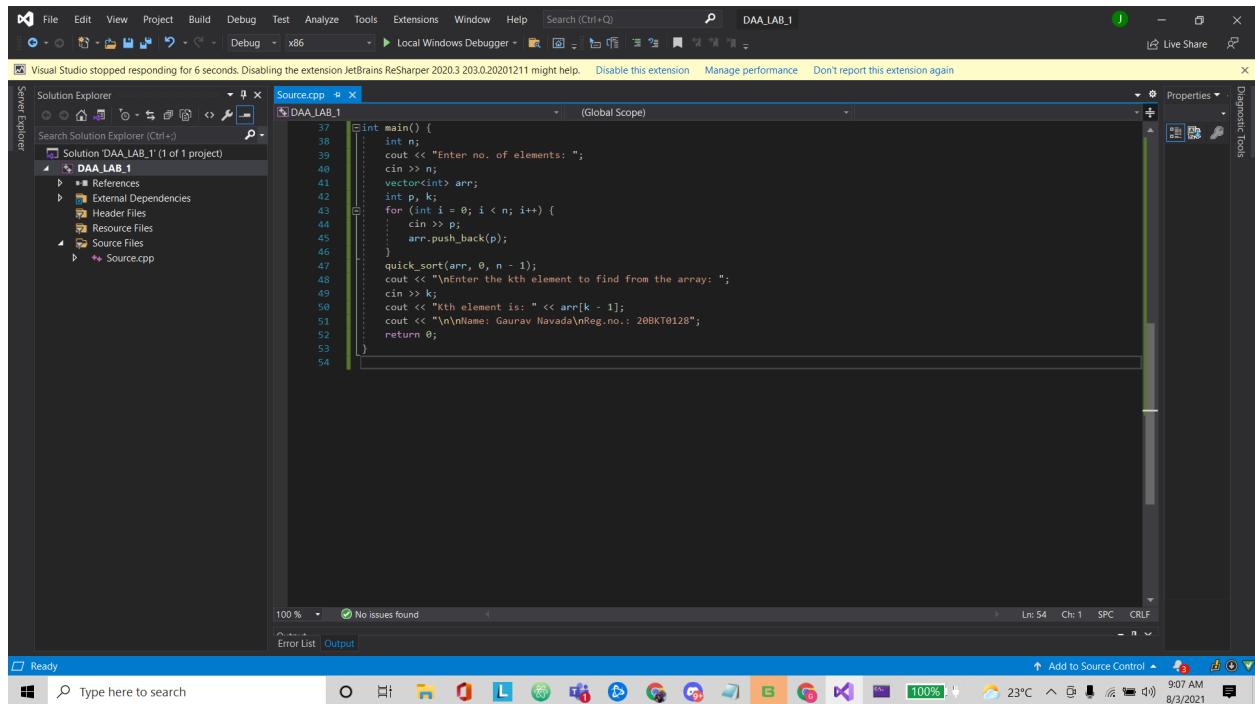
Final Sorted array: 1 3 3 4 4 5 6 7 8 9

Name: Gaurav Navada
Reg.no.: 20BKT0128
C:\Users\gaura\source\repos\DAA_LAB_1\Debug\DAA_LAB_1.exe (process 22712) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```

Question 4:

To find the kth smallest no. from a given array (optimized solution) - using quick sort

```
1 #include <iostream>
2 #include <vector>
3 using namespace std;
4
5 void swap(int* a, int* b) {
6     int temp = *a;
7     *a = *b;
8     *b = temp;
9 }
10
11 int partition(vector<int>& arr, int right, int left, int pivot) {
12     int l = left;
13     int r = right - 1;
14     while (1) {
15         while (arr[l] < pivot) { l++; }
16         while (r > 0 && arr[r] >= pivot) { r--; }
17         if (l >= r) { break; }
18         swap(&arr[l], &arr[r]);
19     }
20     swap(&arr[l], &arr[right]);
21     return l;
22 }
23
24 void quick_sort(vector<int>& arr, int left, int right) {
25     if (right - left <= 0) return;
26     else {
27         int pivot = arr[right];
28         int part = partition(arr, right, left, pivot);
29         quick_sort(arr, part + 1, right);
30         quick_sort(arr, left, part - 1);
31     }
32 }
```



Microsoft Visual Studio Debug Console

```
Enter no. of elements: 6
30
20
10
60
50
40

Enter the kth element to find from the array: 3
Kth element is: 30

Name: Gaurav Navada
Reg.no.: 20BKT0128
C:\Users\gaura\source\repos\DAA_LAB_1\Debug\DAA_LAB_1.exe (process 17812) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```