1. Write a C++ program that asks the user to take input the marks of fifteen students and calculates and displays the average marks. Use appropriate datatype and comment your code.
   Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
	const int SIZE = 15;
	float marks[SIZE] = {};
	float sum = 0, avg;
	for (int i = 0; i < SIZE; i++)
	{
		cout << "Enter the marks of student " << i + 1 << ": ";
		cin >> marks[i];
	}
	for (int i = 0; i < SIZE; i++)
	{
		sum = sum + marks[i];
	}
	avg = sum / SIZE;
	cout << "Average marks of " << SIZE << " students is: " << avg;
	cout << endl;
	return 0;
}
```

   Output:

```
Enter the marks of student 1: 12
Enter the marks of student 2: 23
Enter the marks of student 3: 34
Enter the marks of student 4: 45
Enter the marks of student 5: 43
Enter the marks of student 6: 23
Enter the marks of student 7: 56
Enter the marks of student 8: 76
Enter the marks of student 9: 56
Enter the marks of student 10: 45
Enter the marks of student 11: 34
Enter the marks of student 12: 65
Enter the marks of student 13: 76
Enter the marks of student 14: 45
Enter the marks of student 15: 34
Average marks of 15 students is: 44.4667
```

2. Write a program in C++ that takes ten numbers from user as an input in an array and then displays the whole array with numbers in the same sequence as they were entered. Now print the whole array in reverse order i.e. last entered number comes first and first one appears at the end using loops.
   Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
	int temp = 0;
	const int SIZE = 10;
	int num[SIZE] = {};
	for (int i = 0; i < SIZE; i++)
	{
		cout << "Enter the number " << i + 1 << ": ";
```

```
            cin >> num[i];
        }
        cout << "User entered array: ";
        for (int i = 0; i < SIZE; i++)
        {
            cout << num[i] << " ";
        }
        if (!(SIZE % 2))
        {
            cout << "\nReverse array is: ";
            for (int i = 0; i < SIZE / 2; i++)
            {
                temp = num[i];
                num[i] = num[(SIZE - 1) - i ];
                num[(SIZE - 1) - i] = temp;
            }
        }
        else
        {
            cout << "\nReverse array is: ";
            for (int i = 0; i < SIZE / 2; i++)
            {
                temp = num[i];
                num[i] = num[(SIZE - 1) - i];
                num[(SIZE - 1) - i] = temp;
            }

        }
        for (int i = 0; i < SIZE; i++)
        {
            cout << num[i] << " ";
        }
        cout << endl;
        return 0;
}
```

Output:

```
Enter the number 1: 1
Enter the number 2: 2
Enter the number 3: 3
Enter the number 4: 4
Enter the number 5: 5
Enter the number 6: 6
Enter the number 7: 7
Enter the number 8: 8
Enter the number 9: 9
Enter the number 10: 10
User entered array: 1 2 3 4 5 6 7 8 9 10
Reverse array is: 10 9 8 7 6 5 4 3 2 1
```

3. Write a program in C++ that takes the temperature in Celsius of all the days of the week from user, converts them into Fahrenheit temperatures and stores them in another array. Display the contents of both arrays. Google search for the temperature conversion formula. Verify all of your results

Code:

```
#include <iostream>
using namespace std;

int main()
{
```

```
	int temp = 0;
	const int SIZE = 7;
	float temp_celsius[SIZE] = {};
	float temp_fahrenheit[SIZE] = {};
	for (int i = 0; i < SIZE; i++)
	{
		cout << "Enter the temperature of day " << i + 1 << ": ";
		cin >> temp_celsius[i];
	}
	cout << "Temperature in Celsius: ";
	for (int i = 0; i < SIZE; i++)
	{
		cout << temp_celsius[i] << " ";
	}
	for (int i = 0; i < SIZE; i++)
	{
		temp_fahrenheit[i] = (((9.0 / 5.0) * temp_celsius[i]) + 32);
	}
	cout << "\nTemperature in Fahrenheit: ";
	for (int i = 0; i < SIZE; i++)
	{
		cout << temp_fahrenheit[i] << " ";
	}
	cout << endl;
	return 0;
	}
```

Output:

```
Enter the temperature of day 1: 34
Enter the temperature of day 2: 35
Enter the temperature of day 3: 31
Enter the temperature of day 4: 30
Enter the temperature of day 5: 33
Enter the temperature of day 6: 37
Enter the temperature of day 7: 39
Temperature in Celsius: 34 35 31 30 33 37 39
Temperature in Fahrenheit: 93.2 95 87.8 86 91.4 98.6 102.2
```

4. Write a program in C++ that takes input of the number of coronavirus patients from twelve different cities of the world and displays the total count of patients. Also, your program should have the capability to perform analysis and detect the highest and lowest number of patients among these cities. Note: Add comments in your code.

Code:

```
#include <iostream>
using namespace std;

int main()
{
	const int LEN = 12;
	int patients[LEN] = { 0 };
	string cities[LEN] = { "Karachi", "Makkah",
"Madina","Tehran","Damascus","Dubai","New York",

"London","Sydney","Barcelona","Istanbul","Moscow" };
	for (int i = 0; i < LEN; i++)
	{
		cout << "Enter the number of covid patients in " << cities[i]
<< ": ";
		cin >> patients[i];
```

```
	}
	int min, max, temp1 = 0, temp2 = 0;
	min = patients[0];
	max = patients[0];
	for (int i = 0; i < LEN; i++)
	{
		if (min > patients[i])
		{
			min = patients[i];
			temp1 = i;
		}
		if (max < patients[i])
		{
			max = patients[i];
			temp2 = i;
		}
	}
	cout << "The lowest number of patients in " << cities[temp1] << " is
:" << min;
	cout << "\nThe highest number of patients in " << cities[temp2] << "
is :" << max;
	cout << endl;
	return 0;
}
```

Output:

```
Enter the number of covid patients in Karachi: 113456
Enter the number of covid patients in Makkah: 23435
Enter the number of covid patients in Madina: 123231
Enter the number of covid patients in Tehran: 65432
Enter the number of covid patients in Damascus: 54657
Enter the number of covid patients in Dubai: 87565
Enter the number of covid patients in New York: 54656
Enter the number of covid patients in London: 76768
Enter the number of covid patients in Sydney: 97876
Enter the number of covid patients in Barcelona: 546574
Enter the number of covid patients in Istanbul: 344531
Enter the number of covid patients in Moscow: 458975
The lowest number of patients in Makkah is :23435
The highest number of patients in Barcelona is :546574
```

5. Write a C++ program to find the least occurring element in an array of integers.

Code:

```
#include <iostream>
using namespace std;

int main()
{
	const int LEN = 12;
	int min;
	int arr[LEN] = {4,2,2,4,8,9,7,9,4,9,9,7};
	int count[10] = { 0 };
	for (int c = 0; c < 10; c++)
	{
		for (int i = 0; i < LEN; i++)
		{
			if (arr[i] == c)
			{
				count[c] = count[c] + 1;
			}
		}
	}
	for (int i = 0; i < 10; i++)
```

```
	{
		if (count[i] != 0)
		{
			min = count[i];
			break;
		}
	}
	int temp;
	for (int i = 0; i < 10; i++)
	{
		if (count[i] != 0)
		{
			if (min > count[i])
			{
				min = count[i];
				temp = i;
			}
		}
	}
	cout << "\nThe least number of occuring digit is " << temp << "
having occurance: " << min;
	cout << endl;
	return 0;
}
```

Output:

```
The least number of occuring digit is 8 having occurance: 1
```

6. Write a C++ program to compare two arrays element wise and create third array store value 1 if equal and 0 if not equal.

   E.g. int array1 = [4,5,6,4,3]; int array2 = [4,3,6,3,3];

   in this case resultant array should be [1,0,1,0,1]

   Code:

```
#include <iostream>
using namespace std;

int main()
{
const int SIZE = 5;
int arr1[SIZE] = { 1,5,6,3,2 };
int arr2[SIZE] = { 4,5,8,3,1 };
int result[SIZE] = {};
cout << "The 1st array is: ";
for (int i = 0; i < SIZE; i++)
{
	cout << arr1[i] << " ";
}
cout << "\nThe 2nd array is: ";
for (int i = 0; i < SIZE; i++)
{
	cout << arr2[i] << " ";
}
for (int i = 0; i < SIZE; i++)
{
```

```
        if (arr1[i] == arr2[i])
        {
                result[i] = 1;
        }
        else
        {
                result[i] = 0;
        }
}
cout << "\nThe resultant array is: ";
for (int i = 0; i < SIZE; i++)
{
        cout << result[i] << " ";
}
cout << endl;
return 0;
}
```

Output:

```
The 1st array is: 1 5 6 3 2
The 2nd array is: 4 5 8 3 1
The resultant array is: 0 1 0 1 0
```

7. Write a C++ program that takes 20 integer inputs from user and calculates and displays the following:
   - Number of positive numbers
   - Number of negative numbers
   - Number of odd numbers
   - Number of even numbers
   - Number of zeros

   Code:

```
#include <iostream>
using namespace std;

int main()
{
        const int SIZE = 20;
        int arr[SIZE] = {};
        string name[] = { "even","odd","positive","negative","zero" };
        int count[5] = { 0 };
        for (int i = 0; i < SIZE; i++)
        {
                cout << "Enter the " << i+1 << " of array: ";
                cin >> arr[i];
        }
        for (int i = 0; i < SIZE; i++)
        {
                if (arr[i] % 2 == 0)
                {
                        count[0]++;
                        if (arr[i] == 0)
                        {
                                count[4]++;
                        }
                        else
```

```
                {
                        if (arr[i] > 0)
                        {
                                count[2]++;
                        }
                        else
                        {
                                count[3]++;
                        }
                }
        }
        else
        {
                count[1]++;
                if (arr[i] > 0)
                {
                        count[2]++;
                }
                else
                {
                        count[3]++;
                }
        }

    }
    for (int i = 0; i < 5; i++)
    {
            cout << "The number of " << name[i] << " is: " << count[i] <<
endl;
    }
    cout << endl;
    return 0;
    }
```

Output:

```
Enter the 1 of array: -43
Enter the 2 of array: -36
Enter the 3 of array: -47
Enter the 4 of array: 12
Enter the 5 of array: 54
Enter the 6 of array: 65
Enter the 7 of array: -65
Enter the 8 of array: 0
Enter the 9 of array: 43
Enter the 10 of array: 6
Enter the 11 of array: 7
Enter the 12 of array: 8
Enter the 13 of array: 9
Enter the 14 of array: -32
Enter the 15 of array: 0
Enter the 16 of array: -12
Enter the 17 of array: 65
Enter the 18 of array: 3
Enter the 19 of array: 4
Enter the 20 of array: 6
The number of even is: 11
The number of odd is: 9
The number of positive is: 12
The number of negative is: 6
The number of zero is: 2
```

8. Write a C++ program to find the second and third smallest elements in a given array of integers.

   Code:

```
#include <iostream>
using namespace std;
```

```cpp
int main()
{
	const int SIZE = 6;
	int arr[SIZE] = {};
	for (int i = 0; i < SIZE; i++)
	{
		cout << "Enter the " << i+1 << " of array: ";
		cin >> arr[i];
	}
	int temp, min;
	for (int i = 0; i < SIZE; i++)
	{
		for (int j = 1; j < SIZE-i; j++)
		{
			if (arr[i] > arr[j+i])
			{
				temp = arr[i];
				arr[i] = arr[j+i];
				arr[j+i] = temp;
			}
		}
	}
	cout << "The second smallest number in the array: " << arr[1];
	cout << "\nThe third smallest number in the array: " << arr[2];

	cout << endl;
	return 0;
	}
```

Output:

```
Enter the 1 of array: 8
Enter the 2 of array: 9
Enter the 3 of array: 12
Enter the 4 of array: 4
Enter the 5 of array: 3
Enter the 6 of array: 1
The second smallest number in the array: 3
The third smallest number in the array: 4
```