

Some applications concern arrays

Exercise1:

Write a C++ program to create a class **Student** with *members id, name , grade* and for *methods input, average and print*. Also **create an array of objects** and *call the methods display*.

Sample run:

```
Enter the number of students in your section:3
Enter id:111
Enter name:mohamed
Enter grade:85
Enter id:222
Enter name:salah
Enter grade:54
Enter id:333
Enter name:nasser
Enter grade:25
Student 1  111 mohamed 85
Student 2  222 salah 54
Student 3  333 nasser 25
The average is 54
The number of students that have a grade > 54 is 1
```

Answer:

```
#include<iostream>

#include<string>

using namespace std;

class Student
{
    private:
        int id;
        float grade;
        string name;
    public:
        void input()
        {
```

```
cout<<"Enter id:";
```

```
cin>>id;
```

```
cout<<"Enter name:";
```

```
cin>>name;
```

```
cout<<"Enter grade:";
```

```
cin>>grade;
```

```
}
```

```
void average (Student Stud[], int N )
```

```
{
```

```
int nb=0,s=0;
```

```
float average;
```

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

```
s=s+Stud[i].grade;
```

```
average=s/N;
```

```
cout<<"The average is"<<average<<endl ;
```

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

```
if(Stud[i].grade>average)
```

```
nb++;
```

```
cout<<"The number of students that have a grade > "<<average<<" is "<<nb;
```

```
}
```

```
void print(Student Stud[], int N )
```

```
{
```

```
int i;
```

```
for(i=0; i<N; i++)
```

```
{
```

```

        cout<<"Student"<<" "<<i+1<<" ";

        cout<<Stud[i].id<<" "<<Stud[i].name<<" "<<Stud[i].grade<<endl;

    }

}

};

int main()

{

    int size;

    cout<<"Enter the number of students in your section:";

    cin>>size;

    Student Stud[size];

    int i,N=size;

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

        Stud[i].input();

    Stud[size].print(Stud, N );

    Stud[size].average(Stud,N);

    return 0;

}

```

Exercise2:

Write a program to generate Pascal triangle 1D array.

Sample run:

```

Enter the number of lines to be printed: 7
1
1      1
1      2      1
1      3      3      1
1      4      6      4      1
1      5      10     10     5      1
1      6      15     20     15     6      1

```

Answer:

```
/* C++ Program to Generate Pascal Triangle 1 D Array */
```

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
    int N;
```

```
    cout<<"Enter the number of lines to be printed: ";
```

```
    cin>>N;
```

```
    int array[N], temp[N];    //using 2 arrays
```

```
    temp[0] = 1;
```

```
    array[0] = 1;
```

```
    for (int j = 0; j < N; j++)
```

```
        cout<<" ";
```

```
        cout<<" 1\n";
```

```
    for (int i = 1; i < N; i++)
```

```
    {
```

```
        for (int j = 0; j < i; j++)
```

```
            cout<<" ";
```

```
        for (int k = 1; k < N; k++)
```

```
        {
```

```
            array[k] = temp[k - 1] + temp[k];
```

```
        }
```

```
        array[i] = 1;
```

```

    for (int l = 0; l <= i; l++)
    {
        cout<<"\t"<< array[l];

        temp[l] = array[l];
    }

    cout<<"\n";

}

return 0;

}

```

Exercise 3:

C++ Program to Print the Number of Odd & Even Numbers in an Array:

1. Create an array, take its size from users and define its elements using a loop.
2. Take an iterator in a for loop, using which, all the elements of the array are accessed.
3. Iterator is used to reach out every position of the array, scanning the particular array element and checking whether it is divisible by 2 or not, thus sorting even and odd numbers and printing them.

Sample Run:

```

Enter the size of an array: 6
Enter the elements of the array
array[1]= 15
array[2]= 14
array[3]= 12
array[4]= 24
array[5]= 53
array[6]= 47
Even numbers in the array are:   14   12   24
Odd numbers in the array are:   15   53   47

```

Answer

```
/*C++ Program to Print the Number of Odd & Even Numbers in an Array */
```

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
    int size;
```

```
    cout<<"Enter the size of an array: ";
```

```
    cin>>size;
```

```
    int array[size];
```

```
    cout<<"Enter the elements of the array \n";
```

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

```
    { cout<<"array["<<i+1<<"]=" ";
```

```
        cin>>array[i];
```

```
    }
```

```
    cout<<"Even numbers in the array are: ";
```

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

```
    {
```

```
        if (array[i] % 2 == 0)
```

```
            cout<<"\t" << array[i];
```

```
        }
```

```
    cout<<"\n Odd numbers in the array are:";
```

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

```

    {
        if (array[i] % 2 != 0)
        {
            cout<<" \t"<<array[i];
        }
    }

return 0;

}

```

Exercise 4

Write a C++ Program to Increment every Element of the Array by one & Print Incremented Array:

1. Create an array of some size and define its elements.
2. Create a function in which the array created will be passed as parameter.
3. Inside this function, using for loop, access each element of the array, add 1 to the element and store this new value in the same place.
4. Print the array.

Sample Run:

```

Enter the size of an array:5

Enter the elements of the array:
a[1]= 7
a[2]= 14
a[3]= 12
a[4]= 9
a[5]= 0
The new elements of the array are:      8      15      13      10      1

```

Answer:

// C++ Program to Increment every Element of the Array by one & Print Incremented Array

```

#include <iostream>

using namespace std;

void incrementArray(int arr[],int size)

{

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

        arr[i]++; // this alters values in array in main()

```

```

    }
int main()
{
    int N;

    cout<<"Enter the size of an array:";

    cin>>N;

    int array[N];

    cout<<"Enter the elements of the array: "<<endl;

    for(int i=0;i<N;i++)
    { cout<<"a["<<i+1<<"]= ";
      cin>>array[i];
    }

    incrementArray(array,N); //calling function

    cout<<"The new elements of the array are : ";

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

        cout<<"\t"<< array[i];

    return 0;

}

```

Exercise 5

Write a C++ program to cyclically permute the elements of an array:

1. Create a one-dimensional array of some size fixed by user (lets say N), defining all its elements.
2. Reserve the first element of the array by assigning its value to the Nth position of the array.
3. Now using for loop from 0 to size-1, with iterator i, each value at (i+1) th position is assigned to the i th position of array.
4. Because the Nth position holds the value of 0th position, therefore the last element will have the value which was earlier the first element.

Sample Run:

```
Enter the number of entries in your array N = 5
Enter the values of an array
array[0]= 1
array[1]= 2
array[2]= 3
array[3]= 4
array[4]= 5
Cyclically permuted numbers are given below:
2
3
4
5
2
```

Answer:

```
#include <iostream>

using namespace std;

int main ()

{

    int N;

    cout<<"Enter the number of entries in your array N = ";

    cin>>N;

    int array[N];

    cout<<"Enter the values of an array\n";

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

    {

        cout<<"array["<<i<<"]=" ";

        cin>>array[i];

    }

    array[N] = array[0];

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

    {
```

```

        array[i] = array[i + 1];
    }

    cout<<"Cyclically permuted numbers are given below: \n";

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

        cout<<array[i]<<endl;

    return 0;
}

```

Exercise 6

Write on C++ a program to check for a given value: is it an element in array or not? by using a function.

Sample run:

<pre> Enter the number of entries in your array N = 4 Enter the values of an array array[1]= 20 array[2]= 30 array[3]= 40 array[4]= 10 Enter a value: 15 Data Not Found in the array </pre>	<pre> Enter the number of entries in your array N = 4 Enter the values of an array array[1]= 15 array[2]= 19 array[3]= 7 array[4]= 56 Enter a value: 7 Data Found at : 3 </pre>
---	---

Answer:

```

#include <iostream>

using namespace std;

void lsearch(int A[], int n, int data)

{

    int i;

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

    {

        if(A[i]==data)

        {

            cout<<"Data Found at : "<<i+1;

```

```
        return; //to exit when it finds data
    }
}
cout<<"Data Not Found in the array"<<endl;
}
int main ()
{
    int N;

    cout<<"Enter the number of entries in your array N = ";

    cin>>N;

    int array[N];

    cout<<"Enter the values of an array\n";

    for (int i = 0; i < N; ++i)
    {
        cout<<"array["<<i+1<<"]=" ";

        cin>>array[i];

    }

    int value;

    cout<<"Enter a value: ";

    cin>>value;

    lsearch(array,N,value); //calling function

    return 0;

}
```