

1, write a menu driven program in C++ to perform array operations such as traversing, insertion and deletion.

### Source code

```
#include <iostream.h>
#include <process.h>
#include <conio.h>

void main()
{
    int choice, a[20], n, inspos;
    clrscr();
    cout << "In enter the size of the array : ";
    cin >> n;
    cout << "In enter the elements in the array In ";
    for (int i = 0; i < n; i++)
    {
        cin >> a[i];
    }
    do
    {
        cout << "In 1. insertion In 2. Deletion In 3. traversing
        In 4. exit InIn ";
        cout << "In enter your choice : ";
        cin >> choice;
        switch (choice)
        {
            case 1:
                cout << "In enter the position where you want to insert the element : ";
                cin >> inspos;
                cout << "In enter the element which you want to insert : ";
                cin >> element;
                for (int i = n; i > inspos; i--)
                    a[i] = a[i - 1];
                a[inspos] = element;
                n++;
                break;
            case 2:
                cout << "In enter the position where you want to delete the element : ";
                cin >> delpos;
                for (int i = delpos; i < n - 1; i++)
                    a[i] = a[i + 1];
                n--;
                break;
            case 3:
                for (int i = 0; i < n; i++)
                    cout << a[i] << " ";
                break;
            case 4:
                exit(0);
        }
    } while (choice != 4);
}
```



// insertion

case 1 :

cout << "In enter the position of the item to be inserted :";

cin >> inspos;

if (inspos < 0 || inspos > n)

{

cout << "In index is not found, we cannot insert an item to";

insertion 0;

}

cout << "In enter the item to be inserted :";

int item;

cin >> item;

for (int i = n ; i > inspos ; i--)

{

a[i] = a[i - 1];

}

a[inspos] = item;

n++;

cout << "In insertion has successfully done In";

break;

// deletion

case 2 :

cout << "In enter the position of the element to be deleted :";

```

int ddpos;
cin>>ddpos;
if (ddpos<0 || ddpos>n)
{
    cout<<"In Index is not Found , we cannot deleted an item in";
    exit(0);
}

for (int i=ddpos; i<n-1; i++)
{
    a[i] = a[i]+1;
}
n--;
cout<<"The element at position "<<ddpos<<" deleted successfully in";
break;

```

## || Traversing

case 3 :

```

cout<<"In sucessfully traversed in";
cout<<"The elements in the array are : ";
for (int i=0; i<n; i++)
{
    cout<<a[i]<<" ";
}
break;

```

case 4 :

```

exit(0);
break;

```



default :

cout << "In invalid choice ! please enter a valid option.";

}

3 while (choice != 4);

getch();

}

### Output

enter the size of the array : 3

enter the elements in the array

1

2

3

1. Insertion

2. Deletion

3. Traversing

4. exit

enter your choice : 1

enter the position of the item to be inserted : 0

enter the item to be inserted : 9

insertion has successfully done

1. Insertion

2. Deletion

3. Traversing

4. exit

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enter your choice : 3  
successfully traversed  
elements in the array are :

a 1 2 3

1. insertion

2. deletion

3. traversing

4. exit

enter your choice : 2

enter the position of the element to be inserted : 1

enter a position, deleted successfully

1. insertion

2. deletion

3. traversing

4. exit

enter your choice : 3

successfully traversed

elements in the array are :

a 1 2 3

1. insertion

2. deletion

3. traversing

4. exit

enter your choice : 4

Q) write a C++ program to perform polynomial addition.

Ans: Source code

```
#include <iostream.h>
#include <conio.h>
Void main()
{
    int a[10][10];
    int b[10][10];
    int c[10][10];
    int m, n;
    clrscr();
    cout<<" enter the number of terms for the First
Polynomial : ";
    cin>>m;
    For(int i=0; i<m; i++)
    {
        cout<<" to enter the coefficient and exponent for the First
Polynomial " << i+1 << ":" ;
        cin>> a[i][0] >> a[i][1];
    }
    cout<<" to enter the coefficient and exponent for the
Second Polynomial " << i+1 << ":" ;
    cout<<" enter the number of terms for the second
Polynomial : ";
```

```
c>>n;
```

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

{

cout << "To enter the coefficients and exponents. Enter  
the second polynomial " << i+1 << endl;

```
c>>a[i][0] >> b[i][0];
```

{

```
int i = 0, j = 0, k = 0;
```

```
while (i < m && j < n)
```

{

```
if (a[i][0] == b[j][0])
```

{

```
c[k][0] = a[i][0] + b[j][0];
```

```
c[k][1] = a[i][1];
```

```
i++;
```

```
j++;
```

```
k++;
```

{

```
else if (a[i][0] > b[j][0])
```

{

```
c[k][0] = a[i][0];
```

```
c[k][1] = a[i][1];
```

```
i++;
```

```
k++;
```

{



else

{

$c[k][0] = b[j][0];$

$c[k][1] = b[j][1];$

$j++;$

$k++;$

}

{

while ( $i < m$ )

{

$c[k][0] = a[i][0];$

$c[k][1] = a[i][1];$

$i++;$

$k++;$

}

while ( $j < n$ )

{

$c[k][0] = b[j][0];$

$c[k][1] = b[j][1];$

$j++;$

$k++;$

}

cout << "In Resultant polynomial after addition : ";

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

{

if ( $c[i][0] != 0$ )

{

```

cout << c[i][0] << "x^n" << c[i][1] << " ";
if (i < m + n - 1 && c[i + 1][0] > 0)
{
    cout << "+";
}
else if (c[i][0] == 0)
{
    cout << "0";
}
getch();

```

Output

enter the number of terms for the first polynomial : 3  
 enter the coefficient and exponent for the first polynomial : 3 4  
 enter the coefficient and exponent for the first polynomial : 2 2  
 enter the coefficient and exponent for the first polynomial : 5 0  
 enter the number of terms for the second polynomial : 3  
 enter the coefficient and exponent for the second polynomial : 1 3  
 enter the coefficient and exponent for the second polynomial : 4 2  
 enter the coefficient and exponent for the second polynomial : 2 1  
 resultant polynomial after addition :

$$3x^4 + 1x^3 + 6x^2 + 2x^1 + 5x^0.$$

3) write a program in C++ to implement a sparse matrix using array?

Ans: Source code

```
#include <iostream.h>
#include <conio.h>
class Sparsematrix
{
    int a[10][10];
    int c[10][10], r, row, col;
    void insertmatrix();
    void sparseimp();
    void display();
};

void Sparsematrix :: insertmatrix()
{
    cin >> row >> col;
    cout << "To enter the elements into the matrix : \n";
    for (int i = 0; i < row; i++)
    {
        for (int j = 0; j < col; j++)
        {
            cin >> a[i][j];
        }
    }
}
```

```

void sparsematrix :: sparseimp()
{
    for(int i = 0; i < row; i++)
    {
        for(int j = 0; j < col; j++)
        {
            if(a[i][j] != 0)
            {
                c[k][0] = i;
                c[k][1] = j;
                c[k][2] = a[i][j];
                k++;
            }
        }
        c[0][0] = row;
        c[0][1] = col;
        c[0][2] = k;
    }
}

```

```

void sparsematrix :: display()
{
    for(int i = 0; i < k; i++)
    {
        for(int j = 0; j < 3; j++)
        {
            cout << c[i][j] << " ";
        }
        cout << endl;
    }
}

```

}

void main()

{

  sparse matrix obj;

  obj . n = 3;

  cout << "Enter the number of rows and columns in the  
matrix : ";

  obj. insertmatrix();

  obj. sparseimp();

  cout << "Sparse matrix of the matrix is : ";

  obj. display();

  getch();

}

### Output

enter the number of rows and columns in the matrix : 3 3

enter the elements into the matrix :

1 0 2

1 0 0

2 0 0

Sparse matrix of the matrix is :

0 0 1

0 2 2

1 0 1

2 0 2

a) write a C++ program to implement addition of two sparse matrix using array?

Ans. Source code

```
#include <iostream.h>
#include <conio.h>
#include <process.h>

class Sparsematrix
{
    int a[10][10], c[10][10], r, row, col, i, j;
    void insertmatrix();
    void Sparsematriximp();
    void display();
    void addmatrices(Sparsematrix obj1, Sparsematrix obj2);
};

void Sparsematrix :: insertmatrix()
{
    cin >> row >> col;
    cout << "Enter the elements into the matrix : \n";
    for(i = 0; i < row; i++)
    {
        for(j = 0; j < col; j++)
        {
            cin >> a[i][j];
        }
    }
}
```

```
void sparsematrix :: sparsematriximp(c)
```

```
{
```

```
K=1;
```

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

```
{
```

```
for(j=0; j<col; j++)
```

```
{
```

```
if(a[i][j] != 0)
```

```
{
```

```
c[K][0] = i;
```

```
c[K][1] = j;
```

```
c[K][2] = a[i][j];
```

```
K++;
```

```
}
```

```
{
```

```
c[0][0] = now;
```

```
c[0][1] = col;
```

```
c[0][2] = K-1;
```

```
}
```

```
void sparsematrix :: display()
```

```
{
```

```
cout << c[0][0] << " | E" ;
```

```
cout << c[0][1] << " | E" ;
```

```
cout << c[0][2] << " E" << " | O" ;
```

```
for(i=1; i<= c[0][2]; i++)
```

```
{
cout << "[" << "1t" << "]" << "1t" << "]";
<< "10";
}
```

{}

{}

```
void sparsematrix :: addmatrices(sparsematrix obj1,
sparsematrix obj2)
```

{}

```
if (obj1.row != obj2.row || obj1.col != obj2.col)
```

{}

```
cout << "matrix cannot be added";
```

```
return;
```

{}

```
K = 1;
```

```
for (i = 0; i < obj1.row; i++)
```

{}

```
for (j = 0; j < obj1.col; j++)
```

{}

```
if (a[i][j] != 0)
```

{}

```
c[K][0] = i;
```

```
c[K][1] = j;
```

```
c[X][2] = a[i][j];
```

```
K++;
```

{}

{}

```

c[0][0] = obj1.row
c[0][1] = obj1.col
c[0][2] = 1<-1;
}

void main()
{
    sparse matrix obj1, obj2, result;
    clrscr();
    cout << "Enter the no. of rows and columns in the first
matrix : ";
    obj1.insertmatrix();
    obj1. new sparsematriximp();
    cout << "In sparse matrix of the matrix first is : 10";
    obj1.display();
    cout << "Enter the no. of rows and columns in the second
matrix : ";
    obj2.insertmatrix();
    obj2. sparsematrix();
    cout << "In sparse matrix of the second matrix is : 10";
    obj2.display();
    result.addmatrices(obj1, obj2);
    cout << "10 sparse matrix after addition is : 10";
    result.display();
    getch();
}

```

Output

enter the number of rows and columns of the first matrix:

3 3

enter the elements into the matrix:

1 0 0  
0 0 0  
0 0 0

Sparse matrix of the first matrix are:

3 3 3  
0 0 1  
1 0 2  
0 0 3

enter the no. of rows and columns in the second matrix:

3 3

enter the elements into the matrix:

3 0 0  
4 0 0  
5 0 0

Sparse matrix of the second matrix is:

3 3 3  
0 0 3  
1 0 4  
0 0 5

Sparse matrix after addition is :

$$\begin{matrix} 3 & 3 & 3 \\ 0 & 0 & 4 \\ 1 & 0 & 6 \\ 2 & 0 & 8 \end{matrix}$$

5. write a program to find the transpose of a matrix -

Ans. Source code

```
#include <iostream.h>
#include <conio.h>
class Sparsematrix
{
public:
    int a[10][10];
    int c[10][3];
    int k;
    int row, col;
    void insertmatrix();
    void Sparsematrix();
    void display();
    void transpose();
};

void Sparsematrix :: insertmatrix()
{
    cout << "Enter the number of rows and columns in the matrix : ";
    cin >> row >> col;
    cout << "\nEnter the elements into the matrix : ";
    for(int i=0; i<row; i++)
    {
        for(int j=0; j<col; j++)
    }
```

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```

    {
        cin >> a[i][j];
    }
}

void sparsematrix :: sparsematriximp()
{
    for (int i = 0; i < rows; i++)
    {
        for (int j = 0; j < cols; j++)
        {
            if (a[i][j] != 0)
            {
                c[k][0] = i;
                c[k][1] = j;
                c[k][2] = a[i][j];
                k++;
            }
        }
    }
}

```

$$c[0][0] = \text{rows}$$

$$c[0][1] = \text{cols}$$

$$c[0][2] = K-1$$

{}

```
void sparsematrix :: display()
```

{}

```
cout << "In sparse matrix of the matrix is : In"
```

```

for(int i=1; i<=c[0][2]; i++)
{
    cout<<c[i][0]<<"\t" <<c[i][1]<<"\t" <<c[i][2]
    <<"\n";
}

void Sparsematrix :: transpose()
{
    for(int i = 0; i<c[0][2]; i++)
    {
        cout<<"\n";
        for(int j = 1; j<=c[0][2]; j++)
        {
            cout<<c[j][i]<<"\t";
        }
    }
}

void main()
{
    Sparse matrix x .obj;
    clrscr();
    obj1 .R = 1;
    cout<<"Enter the number of rows and columns in
the matrix x : ";
    obj1 .Sparsematrix imp();
}

```



```
obj.display();
cout << "The transpose of the matrix is : In";
obj.transpose();
getch();
```

{

### Output

Enter the number of rows and columns in the matrix

3 3

Enter the elements into the matrix :

1	0	0
2	0	0
3	0	0

Sparse matrix of the matrix is :

0	0	1
1	0	3
2	0	4

Transpose of the matrix is :

0	1	2
0	0	0
1	3	4

Q) write a c++ program to implement linear search?

Ans: Source code

```
#include <iostream.h>
#include <conio.h>
#include <process.h>

void main()
{
    int a[10], i, n, key;
    clrscr();
    cout << "n enter the limit of the array : 10";
    cin >> n;
    cout << "n enter the elements into the array : 10";
    for(i=0; i<n; i++)
    {
        cin >> a[i];
    }
    cout << "n elements in the array are : 10";
    for(i=0; i<n; i++)
    {
        cout << a[i] << " ";
    }
    cout << "n enter the element to be searched : ";
    cin >> key;
    for(i=0; i<n; i++)
    {
    }
```

2

if(key == arr[i])

{  
cout << "The element is found at index " << i;

return;

3

}{  
cout << "The element is not found in the array";

getch();

3

Output

enter the limit of the array: 6

enter the element into the array: 8 1 9 & 3 & 7

elements in the array are: 8 1 9 & 3 & 7

enter the element to be searched: 3

element is found at index 2.

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7) Write a C++ program to implement Binary search?

Frob. Source code

```
#include <process.h>
#include <iostream.h>
#include <conio.h>

void main()
{
    int a[20], n, key, choice;
    clrscr();
    cout << "Enter the size of the array : ";
    cin >> n;
    cout << "Enter the elements into the array : ";
    for(int i=0; i<n; i++)
    {
        cin >> a[i];
    }
    cout << "Elements before sorting : ";
    for(int i=0; i<n; i++)
    {
        cout << a[i] << " ";
    }
    for(int i=0; i<n-1; i++)
    {
        for(int j=0; j<n-1-i; j++)
        {
            if(a[j]>a[j+1])
            {
                . . .
            }
        }
    }
}
```



int temp = a[j];  
 a[j] = a[j+1];  
 a[j+1] = temp;

}  
 }  
 }  
 cout << "n elements before sorting : In";  
 for (int i=0; i<n; i++)  
 {  
 cout << a[i] << " ";
 }
 int left = 0, right = n-1;  
 cout << "n enter the value to be searched : ";  
 cin >> key;  
 int mid = 0;  
 while (left <= right)  
 {  
 mid = (left + right) / 2;  
 if (a[mid] == key)  
 {  
 cout << "n n element found at index " << mid;  
 exit(0);
 }
 else if (a[mid] < key)
 {
 left = mid + 1;
 }
 }

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```
else
{
    right = mid - 1;
}
if (count << "In element not found");
getch();
}
```

### Output

enter the size of the array : 4  
enter the elements into the array :

6

38

2

5

elements before sorting :

6 38 2 5

elements after sorting :

2 5 6 38

enter the value to be searched : 5

element is Found at index 1 .

g) write a C++ program to implement Selection Sort

Ans: Source code

```
#include <iostream.h>
#include <conio.h>

void main()
{
    int a[10], n, i, j;
    clrscr();
    cout << "To enter the size of the array : ";
    cin >> n;
    cout << "To enter the elements into the array : 10";
    for (i = 0; i < n; i++)
    {
        cin >> a[i];
    }
    cout << "To before sorting : 10";
    for (i = 0; i < n; i++)
    {
        cout << a[i] << " ";
    }
    int min_index;
    for (i = 0; i < n - 1; i++)
    {
        min_index = i;
```

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```
for(j = i+1; j < n; j++)
```

```
{  
    if(a[j] < a[min-index])
```

```
{  
    min-index = j;
```

```
{  
}
```

```
if(min-index != i)
```

```
{  
}
```

```
int temp = a[i];  
a[i] = a[min-index];  
a[min-index] = temp;
```

```
{  
}
```

```
{  
cout << "In after sorting : \n";
```

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

```
{  
}
```

```
cout << a[i] << "\n";
```

```
{  
}
```

```
getch();
```

```
{  
}
```

Output

enter the size of the array : 5

enter the elements into the array :

5  
1  
7  
2  
9

Before sorting :

5 1 7 2 9

After sorting

1 2 5 7 9.

Q) write a C++ program to implement insertion sort?

Ans: Source code

```
#include <iostream.h>
#include <conio.h>
void main()
{
    int a[10], n, i;
    cout << "Enter the number of elements : ";
    cin >> n;
    cout << "Enter the elements into the array : ";
    for (i = 0; i < n; i++)
    {
        cout << a[i] << " ";
    }
}
```

```
for (i = 1; i < n; i++)
{
    int key = a[i];
    int j = i - 1;
```

```
    while (j >= 0 & & a[j] > key)
```

```
{
```

```
    a[j + 1] = a[j];
```

```
    j = j - 1;
```

```
}
```

```
a[j + 1] = key;
```

```
}
```



```
cout<<"\n after insertion sort : ";
for(i=0; i<n; i++)
{
    cout<<a[i]<<"\t";
}
getch();
```

### Output

enter the number of elements : 4

enter the elements into the array :

1  
6  
3  
7

Before insertion sort : 1 6 3 7

After insertion sort : 1 3 6 7