Program No: 01	Date: 16/07/2025

Program Title : Write programs to demonstrate the use of storage classes (local variable, global variable, static variable, register variable) in C.

```
/*Program 1 USE DIFFERENT STORAGE CLASSES (LOCAL,GLOBAL,STATIC,REGISTER)
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 16/07/2025
*/

#include <stdio.h>
int a=10;          //intialising global variable
void disp(){
        int i=3; //intialising local variable
        printf("this is a local variable : %d \n",i);
}
int main(){
        static int c;//intialising static varible
        register int p=4; //intialising register variable
        printf("this is a static variable : %d \n",c);
        printf("this is a global variable : %d \n",a);
        printf("this is a register variable : %d \n",p);
        disp();
        return 0;
}
```

Output Screenshot/Text

```
this is a static variable : 0
this is a global variable : 10
this is a register variable : 4
this is a local variable : 3
```

Program No: 02	Date: 16/07/2025

Program Title : Use a menu-driven program to insert, search, delete and sort elements in an array using functions (use global variables).

```
/*PROGRAM-2 A MENU FOR ARRAY OPERATIONS(INSERT,DELETE,DISPLAY,SEARCH,SORT)
USING GLOBAL VARIABLE
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 16/07/2025
*/

#include<stdio.h>
int stack[5];     //declaring stack
int top=-1;       //declaring variable positionof top element
int insert(int e){                  //Function to insert element into stack
        if(top+1==5){
                printf("Error : Stack is Full");
        }
        else{
                stack[++top]=e;
        }
        return top;
}
int erase() //function to delete top element
{
        if (top==-1){
                printf("Error: Stack is empty");
        }
        else{
                printf("\n %d",stack[top--]);
        }
        return top;
}
void search(int b,int a[5],int top){ //function to search elements
        int isfound=0,i;
        for (i=0;i<=top;i++){
                if(b==a[i]){
                        isfound=1;
                        printf("Element found at [%d] position. \n",i);
                }
        }
```

```
	if(isfound==0)
		printf("element not found");
}

void display(){ //function to display the elements in stack
	if (top==-1)
		printf("Empty Stack");
	else{
		int i;
		for(i=0;i<=top;i++){
			printf("%d \t",stack[i]);
		}
		printf("\n");
	}
}

void sort(){	//function to sort the stack
	int i,j,temp;
	for(i=0;i<5;i++){
		for(j=0;j<5;j++){
			if(stack[i]<stack[j]){
				temp=stack[i];
				stack[i]=stack[j];
				stack[j]=temp;
			}
		}
	}
}

int menu(){ //function for menu
	int ch;
	printf("\n INSERT-1 \n DELETE-2 \n DISPLAY-3 \n SEARCH-4 \n SORT-5 \n EXIT -6 \n
Enter your choice : ");
	scanf("%d",&ch);
	return ch;
}
void processStack(){ //working of menu
	int ch,b;
	for (ch=menu();ch!=6;ch=menu()){
		switch(ch){
			case 1: //insert
				printf("Enter the value to insert : ");
				scanf("%d",&ch);
				insert(ch);
```

```
                        break;
                case 2: //delete
                        erase();
                        break;
                case 3: //display
                        display();
                        break;
                case 4: //search
                        printf("Enter the value to search : ");
                        scanf("%d",&b);
                        search(b,stack,top);
                        break;
                case 5:// sort
                        sort();
                        break;
                default://any other options
                        printf("Error: Wrong Choice");
                        break;
                }
        }
}
int main() {
        processStack();
        return 0;
}
```

Output Screenshot/Text

```
 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 1
Enter the value to insert : 10

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 1
Enter the value to insert : 20

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 1
Enter the value to insert : 30

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 3
10      20      30

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 2
```

```
 30
 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 3
10      20

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 1
Enter the value to insert : 40

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 1
Enter the value to insert : 10

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 1
Enter the value to insert : 50

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 3
10      20      40      10      50
```

```
 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 4
Enter the value to search : 10
Element found at [0] position.
Element found at [3] position.

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 5

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 3
10      10      20      40      50

 INSERT-1
 DELETE-2
 DISPLAY-3
 SEARCH-4
 SORT-5
 EXIT -6
 Enter your choice : 6
```

Program No: 03	Date: 16/07/2025

Program Title : Use a menu-driven program to insert, search, delete and sort elements in an array using functions (use only local variables).

```
/*PROGRAM-3 A MENU FOR ARRAY OPERATIONS(INSERT,DELETE,DISPLAY,SEARCH,SORT)
USING LOCAL VARIABLE
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 16/07/2025
*/

#include <stdio.h>
int insert(int a[5], int pos, int e) //function to insert an element
{
   if (pos + 1 == 5)
   {
      printf("Error: Array is Full\n");
   }
   else
   {
      a[++pos] = e;
   }
   return pos;
}

int erase(int a[5], int pos) //function to delete top element
{
   if (pos == -1)
   {
      printf("Error: Array is Empty\n");
   }
   else
   {
      printf("Deleted element: %d\n", a[pos--]);
   }
   return pos;
}

void display(int a[5], int pos) //function to display entire array
{
   if (pos == -1)
   {
```

```
      printf("Error: Array is Empty\n");
   }
   else
   {
         int i;
      for (i = 0; i <= pos; i++)
      {
         printf("%d\t", a[i]);
      }
      printf("\n");
   }
}

void search(int b,int a[5],int pos){ //function to search for an element throughout the array
and display its index
         int isfound=0,i;
         for (i=0;i<=pos;i++){
                  if(b==a[i]){
                           isfound=1;
                           printf("Element found at [%d] position. \n",i);
                  }
         }
         if(isfound==0)
                  printf("element not found");
}

void sort(int a[5]){      //function to sort the stack
         int i,j,temp;
         for(i=0;i<5;i++){
                  for(j=0;j<5;j++){
                           if(a[i]<a[j]){
                                    temp=a[i];
                                    a[i]=a[j];
                                    a[j]=temp;
                           }
                  }
         }
}

int menu() //function to create menu interface
{
   int ch;
   printf("\nInsert - 1\nDelete - 2\nDisplay - 3\nSearch - 4\nSort - 5\nExit - 6\nEnter your
choice: ");
```

```
   scanf("%d", &ch);
   return ch;
}

void processArray() //working of menu
{
   int a[5], pos = -1,b;
   int ch, value;
   for (ch = menu(); ch != 6; ch = menu())
   {
      switch (ch)
      {
         case 1:
            printf("Enter value to insert: ");
            scanf("%d", &value);
            pos = insert(a, pos, value);
            break;
         case 2:
            pos = erase(a, pos);
            break;
         case 3:
            display(a, pos);
            break;
         case 4:
          printf("Enter the element to search: ");
          scanf("%d",&b);
          search(b,a,pos);
          break;
         case 5:
          sort(a);
          break;
         default:
            printf("Error: Wrong Choice.\n");
      }
   }
}

int main()
{
   processArray();
   return 0;
}
```

Output Screenshot/Text

```
Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 1
Enter value to insert: 10

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 1
Enter value to insert: 20

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 1
Enter value to insert: 10

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 3
10      20      10
```

```
Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 2
Deleted element: 10

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 3
10      20

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 1
Enter value to insert: 20

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 1
Enter value to insert: 10

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 1
```

```
Enter value to insert: 10

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 3
10      20      20      10      10

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 4
Enter the element to search: 10
Element found at [0] position.
Element found at [3] position.
Element found at [4] position.

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 5

Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 3
10      10      10      20      20
```

```
Insert - 1
Delete - 2
Display - 3
Search - 4
Sort - 5
Exit - 6
Enter your choice: 6
```

Program No: 04	Date: 16/07/2025

Program Title : Search for all the occurrences of an element in an integer array (positions).

```
/*PROGRAM-4 ARRAY SEARCH
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 16/07/2025
*/

#include<stdio.h>

void search(int b,int a[5]){ //funtion for search function
	int isfound=0,i;
	for (i=0;i<5;i++){
		if(b==a[i]){
			isfound=1;
			printf("Element found at [%d] position. \n",i); //displays index
		}
	}
	if(isfound=0)
		printf("element not found");
}
int main(){
	int a[5],ch,i;
	for (i=0;i<5;i++){
		printf("Enter the [%d] element : ",i);
		scanf("%d",&a[i]);
	}
	for (i=0;i<5;i++){
		printf("%d \t",a[i]);
	}
	printf("\n");
	printf("Enter the element to search: ");
	scanf("%d",&ch);

	search(ch,a);
	return 0;
}
```

Output Screenshot/Text

```
Enter the [0] element : 1
Enter the [1] element : 10
Enter the [2] element : 13
Enter the [3] element : 12
Enter the [4] element : 13
1       10      13      12      13
Enter the element to search: 13
Element found at [2] position.
Element found at [4] position.
```

Program No: 05	Date: 23/07/2025

Program Title : Sort the array elements in ascending order (minimum three functions: read, disp and sort).

```
/*PROGRAM-5 SORT ARRAY IN ASC WITH ALTEAST 3 FUNCTIONS - READ DISP SORT
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 23/07/2025
*/

#include<stdio.h>
void read(int n,int arr[n]){ //function to insert elements in array
	int i;
	for(i=0;i<n;i++){
		printf("Enter the value for %d :",i);
		scanf("%d",&arr[i]);
	}
}

void disp(int n,int arr[n]){ //function to display all elemenyts in array
	int i;
	for (i=0;i<n;i++){
		printf("%d\t",arr[i]);
	}
}

void sort(int n,int arr[n]){ //function for sorting the elements in array in ascending order
	int i,j,temp;
	for(i=0;i<n;i++){
		for(j=0;j<n;j++){
			if(arr[i]<arr[j]){
				temp=arr[i];
				arr[i]=arr[j];
				arr[j]=temp;
			}
		}
	}
}

int menu(){ //funtion for menu interface
```

```
	int ch;
	printf("\nREAD-1\nSORT-2\nDISPLAY-3\nEXIT-4\nENTER YOUR CHOICE : ");
	scanf("%d",&ch);
	return ch;
}

void processArray(int n,int arr[n]){ //working of menu
	int ch;
	for (ch=menu();ch!=4;ch=menu()){
		switch(ch) {
			case 1:
				read(n,arr);
				break;
			case 2:
				sort(n,arr);
				break;
			case 3:
				disp(n,arr);
				break;
			default:
				printf("Errror: Wrong Choice\n");
				break;
		}
	}
}
int main(){
	int n;
	printf("Enter limit of Array:");
	scanf("%d",&n);
	int arr[n];
	processArray(n,arr);
	return 0;
}
```

Output Screenshot/Text

```
Enter limit of Array:8

READ-1
SORT-2
DISPLAY-3
EXIT-4
ENTER YOUR CHOICE : 1
Enter the value for 0 :2
Enter the value for 1 :3
Enter the value for 2 :4
Enter the value for 3 :4
Enter the value for 4 :1
Enter the value for 5 :1
Enter the value for 6 :6
Enter the value for 7 :8

READ-1
SORT-2
DISPLAY-3
EXIT-4
ENTER YOUR CHOICE : 3
2       3       4       4       1       1       6       8
READ-1
SORT-2
DISPLAY-3
EXIT-4
ENTER YOUR CHOICE : 2

READ-1
SORT-2
DISPLAY-3
EXIT-4
ENTER YOUR CHOICE : 3
1       1       2       3       4       4       6       8
READ-1
SORT-2
DISPLAY-3
EXIT-4
ENTER YOUR CHOICE : 4
```

Program No: 06	Date: 23/07/2025

Program Title : Display the array elements in the same order using a recursive function.

```
/*PROGRAM-6 DISPLAY ARRAY USING RECURSIVE FUNCTION
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 23/07/2025
*/


#include<stdio.h>
int j=0,arr[10];
void display(){ //display function as a recursive function
        if(j<10){
                printf("%d\t",arr[j]);
                j++;
                display();
        if(j==10)
                j=0;
        }
}

int main(){
        int i=0;
        for(i=0;i<10;i++){
                printf("Enter the value for %d :",i);
                scanf("%d",&arr[i]);
        }
        display();
        return 0;
}
```

Output Screenshot/Text

```
Enter the value for 0 :1
Enter the value for 1 :2
Enter the value for 2 :3
Enter the value for 3 :4
Enter the value for 4 :5
Enter the value for 5 :6
Enter the value for 6 :7
Enter the value for 7 :8
Enter the value for 8 :9
Enter the value for 9 :10
1       2       3       4       5       6       7       8       9       10
```

Program No: 07	Date: 23/07/2025

Program Title : Display array elements in reverse order using a recursive function.

```
/*PROGRAM-7 DISPLAY ARRAY INN REVERSE USING RECURSIVE FUNCTION
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 23/07/2025
*/

#include<stdio.h>
int j=10,arr[10];
void display(){ //function to display elements in reverese order using recursive function
        if(j>0){
                j--;
                printf("%d\t",arr[j]);
                display();
        if(j==0)
                j=10;
        }
}

int main(){
        int i=0;
        for(i=0;i<10;i++){
                printf("Enter the value for %d :",i);
                scanf("%d",&arr[i]);
        }
        display();
        return 0;
}
```

Output Screenshot/Text

```
Enter the value for 0 :1
Enter the value for 1 :2
Enter the value for 2 :3
Enter the value for 3 :4
Enter the value for 4 :5
Enter the value for 5 :6
Enter the value for 6 :7
Enter the value for 7 :8
Enter the value for 8 :9
Enter the value for 9 :10
10      9       8       7       6       5       4       3       2       1
```

Program No: 08	Date: 23/07/2025

Program Title : Write a program to Perform the addition of two matrix and Subtraction of one matrix from another.

```
/*PROGRAM-8 MATRIX ADDITION AND SUBTRACTION
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 23/07/2025
*/

#include<stdio.h>
int a[10][10],b[10][10],m,n;

void insert(int e[10][10],int m,int n){ //function to insert values into the  matrix
          int i,j;
          for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         printf("Enter the value of [%d] [%d] : ",i,j);
                     scanf("%d",&e[i][j]);
      }
   }
}

void print(int p[10][10],int m,int n){ //function to print a matrix
          int i,j;
          for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         printf("%d\t",p[i][j]);
      }
          printf("\n");
   }
}

void add(){ //funtion to add two matrices
          int sum[10][10],i,j;
   for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         sum[i][j]=a[i][j]+b[i][j];
      }
   }
   print(sum,m,n);
}
```

```
void diffn(){ //function to subract a mtrix from another
          int dif[10][10],i,j;
   for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         dif[i][j]=a[i][j]-b[i][j];
      }
   }
   print(dif,m,n);
}


int main(){
   printf("Enter the dimensions of the Matrix: ");
   scanf("%d%d",&m,&n);
   printf("Enter the First matrix :\n");
   insert(a,m,n);
   printf("Enter the Second matrix : \n");
   insert(b,m,n);
   printf("The first matrix is : \n");
   print(a,m,n);
   printf("The Second matrix is : \n");
   print(b,m,n);
   printf("The sum of matrices is : \n");
   add(m,n);
   printf("The difference of matrices is : \n");
   diffn(m,n);
   return 0;
}
```

Output Screenshot/Text

```
Enter the dimensions of the Matrix: 2 3
Enter the First matrix :
Enter the value of [0] [0] : 1
Enter the value of [0] [1] : 2
Enter the value of [0] [2] : 3
Enter the value of [1] [0] : 4
Enter the value of [1] [1] : 5
Enter the value of [1] [2] : 6
Enter the Second matrix :
Enter the value of [0] [0] : 0
Enter the value of [0] [1] : 10
Enter the value of [0] [2] : 0
Enter the value of [1] [0] : 20
Enter the value of [1] [1] : 0
Enter the value of [1] [2] : 30
The first matrix is :
1       2       3
4       5       6
The Second matrix is :
0       10      0
20      0       30
The sum of matrices is :
1       12      3
24      5       36
The difference of matrices is :
1       -8      3
-16     5       -24
```

Program No: 09	Date: 29/07/2025

Program Title : Write a program to perform multiplication of two matrix.

```
/*PROGRAM-9 MATRIX MULTIPLICATION
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include<stdio.h>
int a[10][10],b[10][10],m,n,p;

void insert(int e[10][10],int m,int n){ //function to insert values in the matrix
          int i,j;
          for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         printf("Enter the value of [%d] [%d] : ",i,j);
                    scanf("%d",&e[i][j]);
      }
   }
}

void print(int p[10][10],int m,int n){ //funtion to display the matrix
          int i,j;
          for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         printf("%d\t",p[i][j]);
      }
          printf("\n");
   }
}

void multi(){ //function to multipy two matrices
          int prod[10][10],i,j,k;
   for(i=0;i<m;i++){ //declaring intial value of elements of product to be zero
      for(j=0;j<p;j++){
         prod[i][j]=0;
          }
   }

   for(i = 0; i < m; i++) {
```

```
      for(j = 0; j < p; j++) {
         for(k = 0; k < n; k++) {
            prod[i][j] += a[i][k] * b[k][j];
         }
      }
   }
   print(prod,m,p);
}


int main(){
   printf("Enter the dimensions of first Matrix: ");
   scanf("%d%d",&m,&n);
   printf("Enter the First matrix :\n");
   insert(a,m,n);
   printf("Enter the number of columns for the Second Matrix: ");
   scanf("%d", &p);
   printf("Enter the Second matrix : \n");
   insert(b,n,p);
   printf("The first matrix is : \n");
   print(a,m,n);
   printf("The Second matrix is : \n");
   print(b,n,p);
   printf("The product of matrices is : \n");
   multi();

          return 0;
}
```

Output Screenshot/Text

```
Enter the value of [0] [1] : 2
Enter the value of [0] [2] : 3
Enter the value of [1] [0] : 4
Enter the value of [1] [1] : 5
Enter the value of [1] [2] : 6
Enter the number of columns for the Second Matrix: 3
Enter the Second matrix :
Enter the value of [0] [0] : 2
Enter the value of [0] [1] : 4
Enter the value of [0] [2] : 6
Enter the value of [1] [0] : 8
Enter the value of [1] [1] : 10
Enter the value of [1] [2] : 12
Enter the value of [2] [0] : 14
Enter the value of [2] [1] : 16
Enter the value of [2] [2] : 18
The first matrix is :
1       2       3
4       5       6
The Second matrix is :
2       4       6
8       10      12
14      16      18
The product of matrices is :
60      72      84
132     162     192
```

Program No: 10	Date: 29/07/2025

Program Title : Write a program to find the transpose of a matrix.

```
/*PROGRAM-10 MATRIX TRANSPOSE
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include<stdio.h>
int a[10][10],t[10][10];
void print(int e[10][10],int m,int n){ //function to print the matrix.
          int i,j;
          for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         printf("%d\t",e[i][j]);
      }
          printf("\n");
   }
}
void transpose(int m,int n){ //function to find transpose of matrix
          int i,j;
          for(i = 0; i < m; i++) {
      for(j = 0; j < n; j++) {
         t[j][i] = a[i][j];
      }
   }
   printf("The Transpose of the matrix is : \n");
   print(t,n,m);
}

int main(){
          int m,n;
          printf("Enter the dimensions of the Matrix :");
          scanf("%d%d",&m,&n);
          int i,j;
          for(i=0;i<m;i++){
      for(j=0;j<n;j++){
         printf("Enter the value of [%d] [%d] : ",i,j);
                  scanf("%d",&a[i][j]);
      }
```

```
    }
    printf("The matrix is : \n");
    print(a,m,n);
    transpose(m,n);
    return 0;
}
```

Output Screenshot/Text

```
Enter the dimensions of the Matrix :2 4
Enter the value of [0] [0] : 1
Enter the value of [0] [1] : 2
Enter the value of [0] [2] : 3
Enter the value of [0] [3] : 4
Enter the value of [1] [0] : 5
Enter the value of [1] [1] : 6
Enter the value of [1] [2] : 7
Enter the value of [1] [3] : 8
The matrix is :
1       2       3       4
5       6       7       8
The Transpose of the matrix is :
1       5
2       6
3       7
4       8
```

Program No: 11	Date: 29/07/2025

Program Title : Write a program to find the Determinant of a matrix (2x2 and 3x3).

```
/* PROGRAM-11 DETERMINANT OF A MATRIX
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include <stdio.h>

int main() {
   int size,a[3][3],i,j;
   float det;
   printf("Enter the size of the square matrix (2 or 3): ");
   scanf("%d",&size);

   if (size!=2 && size!=3) {
      printf("Only 2x2 and 3x3 matrices are supported.\n");
      return 1;
   }

   printf("Enter the elements of the matrix:\n");
   for (i=0;i<size;i++) {
      for (j =0;j<size;j++) {
         printf("a[%d][%d]: ",i,j);
         scanf("%d",&a[i][j]);
      }
   }

   printf("The matrix is:\n");
   for (i=0;i<size;i++) {
      for (j=0;j<size;j++) {
         printf("%d\t",a[i][j]);
      }
      printf("\n");
   }

   if (size==2) {
      det=a[0][0]*a[1][1] - a[0][1]*a[1][0]; // For 2x2: |A| = ad - bc
   } else if (size==3) {
      det =  a[0][0]*(a[1][1]*a[2][2] - a[1][2]*a[2][1]) //expansion of  formula
```

```
        - a[0][1]*(a[1][0]*a[2][2] - a[1][2]*a[2][0])
        + a[0][2]*(a[1][0]*a[2][1] - a[1][1]*a[2][0]);
    }

    printf("Determinant of the matrix = %.2f\n", det);

    return 0;
}
```

Output Screenshot/Text

```
Enter the size of the square matrix (2 or 3): 3
Enter the elements of the matrix:
a[0][0]: 2
a[0][1]: -3
a[0][2]: 1
a[1][0]: 2
a[1][1]: 0
a[1][2]: -1
a[2][0]: 1
a[2][1]: 4
a[2][2]: 5
The matrix is:
2       -3      1
2       0       -1
1       4       5
Determinant of the matrix = 49.00
```

```
Enter the size of the square matrix (2 or 3): 2
Enter the elements of the matrix:
a[0][0]: 1
a[0][1]: 2
a[1][0]: 3
a[1][1]: 4
The matrix is:
1       2
3       4
Determinant of the matrix = -2.00
```

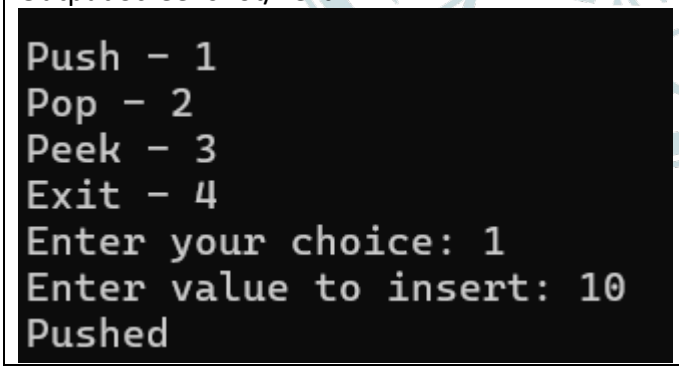
Program No: 12	Date: 23/07/2025

Program Title : Implement stack operations using arrays.

```
/*PROGRAM-12 STACK OPERATIONS USING ARRAY
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 23/07/2025
*/

#include <stdio.h>
int push(int stack[5], int top, int e){ //function to push elements onto stack
   if (top + 1 == 5){
      printf("Error: Stack is Full\n");
   } else {
      stack[++top] = e;
      printf("Pushed\n");
   }
   return top;
}

int pop(int stack[5], int top){ //function to pop the top element from stack
   if (top == -1){
      printf("Error: Stack is Empty\n");
   }else{
      printf("Popped element: %d\n", stack[top--]);
   }
   return top;
}

void peek(int stack[5], int top){ //function to peek the top element in stack
   if (top ==-1){
         printf("Stack is Empty\n");
         }else{
                  printf("Top element: %d \n",stack[top]);
         }
}

int menu() { //function for menu interface
   int ch;
   printf("\nPush - 1\nPop - 2\nPeek - 3\nExit - 4\nEnter your choice: ");
   scanf("%d", &ch);
   return ch;
```

```
}

void processStack() { //working of menu
   int stack[5], top = -1;
   int ch, value;
   for (ch = menu(); ch != 4; ch = menu()) {
      switch (ch) {
         case 1:
            printf("Enter value to insert: ");
            scanf("%d", &value);
            top = push(stack, top, value);
            break;
         case 2:
            top = pop(stack, top);
            break;
         case 3:
            peek(stack, top);
            break;
         default:
            printf("Error: Wrong Choice.\n");
      }
   }
}
int main() {
   processStack();
   return 0;
}
```

Output Screenshot/Text



```
Push - 1
Pop - 2
Peek - 3
Exit - 4
Enter your choice: 1
Enter value to insert: 20
Pushed

Push - 1
Pop - 2
Peek - 3
Exit - 4
Enter your choice: 1
Enter value to insert: 3
Pushed

Push - 1
Pop - 2
Peek - 3
Exit - 4
Enter your choice: 3
Top element: 3

Push - 1
Pop - 2
Peek - 3
Exit - 4
Enter your choice: 2
Popped element: 3

Push - 1
Pop - 2
Peek - 3
Exit - 4
Enter your choice: 3
Top element: 20

Push - 1
Pop - 2
Peek - 3
Exit - 4
Enter your choice: 4
```

Program No: 13	Date: 29/07/2025

Program Title : Read a String and Just print it in the reverse order.

```
/* PROGRAM-13 STRING REVERSAL
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include<stdio.h>

void str_rev(char a[20]){  //program to reverse a string
        int i=0;
        while (a[i] != '\0') {
      i++;
   }
        for (;i>=0;i--){
                printf("%c",a[i]);
        }
}

int main(){
        char a[20];
        printf("Enter a String: ");
        gets(a);
        str_rev(a);
        return 0;
}
```

Output Screenshot/Text

```
Enter a String: Hello World
dlroW olleH
```

Program No: 14	Date: 29/07/2025

Program Title : Read a String and Reverse the string in the same array itself.

```
/* PROGRAM-14 STRING REVERSAL IN THE SAME ARRRAY
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include <stdio.h>
#include <string.h>
void reverse(char str[20]) { //function to reverse the string
   int i = 0, j;
   char temp;
   j = strlen(str) - 1;
   while (i < j) { //swaping end characters
      temp = str[i];
      str[i] = str[j];
      str[j] = temp;
      i++;
      j--;
   }
}

int main() {
   char str[20];
   printf("Enter a string: ");
   fgets(str, sizeof(str), stdin);
         printf("String is %s",str);
   reverse(str);
   printf("Reversed string : %s\n", str);
   return 0;
}
```

Output Screenshot/Text

```
Enter a string: HELLO world!
String is HELLO world!
Reversed string :
!dlrow OLLEH
```

Program No: 15	Date: 29/07/2025

Program Title : Read n Strings and display them in the ascending order.

```
/* PROGRAM-15 SORTING N STRINGS
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include <stdio.h>
#include <string.h>
int main() {
   int n, i, j;
   char str[20][100], temp[100];

   printf("Enter the number of strings: ");
   scanf("%d", &n);
   getchar(); // to consume the newline after scanf

   for (i = 0; i < n; i++) {
      printf("Enter string %d: ", i + 1);
      fgets(str[i], sizeof(str[i]), stdin);
      str[i][strcspn(str[i], "\n")] = '\0';  // remove newline
   }

   for (i = 0; i < n - 1; i++) {  // Sort strings using bubble sort
      for (j = i + 1; j < n; j++) {
         if (strcmp(str[i], str[j]) > 0) {
            strcpy(temp, str[i]);
            strcpy(str[i], str[j]);
            strcpy(str[j], temp);
         }
      }
   }

   printf("\nStrings in ascending order:\n");
   for (i = 0; i < n; i++) {
      printf("%s\n", str[i]);
   }

   return 0;
}
```

Output Screenshot/Text

```
Enter the number of strings: 6
Enter string 1: Albin
Enter string 2: Shyam
Enter string 3: Febin
Enter string 4: Anandhu
Enter string 5: Tom
Enter string 6: Sharvin

Strings in ascending order:
Albin
Anandhu
Febin
Sharvin
Shyam
Tom
```

Program No: 16	Date: 29/07/2025
Program Title : Reverse a string using Stack.	

```
/* PROGRAM-16 STRING REVERSAL USING STACK
@ALBIN MAMMEN MATHEW
Roll No: 08
Date: 29/07/2025
*/

#include <stdio.h>
char stack[100];
int top=-1;
void push(char e) //function to push elements onto stack
{
   if (top + 1 == 100)
   {
      printf("Error: Stack is Full\n");
   }
   else
   {
      stack[++top] = e;
      printf("%c",e);
   }
}

void pop() //function to top pop element from stack
{
   if (top == -1)
   {
      printf("Error: Stack is Empty\n");
   }
   else
   {
      printf("%c", stack[top--]);
   }
}

void peek() //function to display the top element of the stack
{
   int i;
   if (top ==-1){
```

```
        printf("Stack is Empty\n");
        }
        else{
                printf("%c \n",stack[top]);
        }
}

int menu()
{
   int ch;
   printf("\nPush - 1\nPop - 2\nPeek - 3\nReverse - 4\nExit - 5\nEnter your choice: ");
   scanf("%d", &ch);
   return ch;
}

void processArray()
{
   int ch;
         char value;
   for (ch = menu(); ch != 5; ch = menu())
   {
      switch (ch)
      {
         case 1:
            printf("Enter value to insert: ");
            scanf(" %c",&value);
            push(value);
            break;
         case 2:
            pop();
            break;
         case 3:
            peek();
            break;
         case 4:
          while (top!=-1){        //function to pop all elements to print reverse
                pop();
                                  }
                                  break;
                        default:
            printf("Error: Wrong Choice.\n");
      }
   }
}
```

```
int main()
{
   processArray();
   return 0;
}
```

Output Screenshot/Text

```
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 1
Enter value to insert: H
H
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 1
Enter value to insert: e
e
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 1
Enter value to insert: l
l
```

```
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 1
Enter value to insert: l
l
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 1
Enter value to insert: o
o
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 1
Enter value to insert: !
!
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 4
!olleH
Push - 1
Pop - 2
Peek - 3
Reverse - 4
Exit - 5
Enter your choice: 5
```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