**How to access two dimensional array using pointers in C programming?**

How to access two dimensional array using pointers in C programming? Write a C program to input and print elements of a two dimensional array using pointers and functions.

**Example**

**Input**

Input elements in 3x3 matrix:

1 2 3

4 5 6

7 8 9

**Output**

Elements of 3x3 matrix:

1 2 3

4 5 6

7 8 9

**How to access two dimensional array using pointers?**

To access a two dimensional array using pointer, let us recall basics from [one dimensional array](https://codeforwin.org/2017/11/c-program-input-print-array-elements-using-pointers.html). Since it is just an array of one dimensional array.

Suppose I have a pointer array\_ptr pointing at base address of one dimensional array. To access nth element of array using pointer we use \*(array\_ptr + n) (where array\_ptr points to 0th element of array, n is the nth element to access and nth element starts from 0).

Now we know two dimensional array is array of one dimensional array. Hence let us see how to access a two dimensional array through pointer.

Let us suppose a two-dimensional array

int matrix[3][3];

For the above array,

matrix => Points to base address of two-dimensional array.

Since array decays to pointer.

\*(matrix) => Points to first row of two-dimensional array.

\*(matrix + 0) => Points to first row of two-dimensional array.

\*(matrix + 1) => Points to second row of two-dimensional array.

\*\*matrix => Points to matrix[0][0]

\*(\*(matrix + 0)) => Points to matrix[0][0]

\*(\*(matrix + 0) + 0) => Points to matrix[0][0]

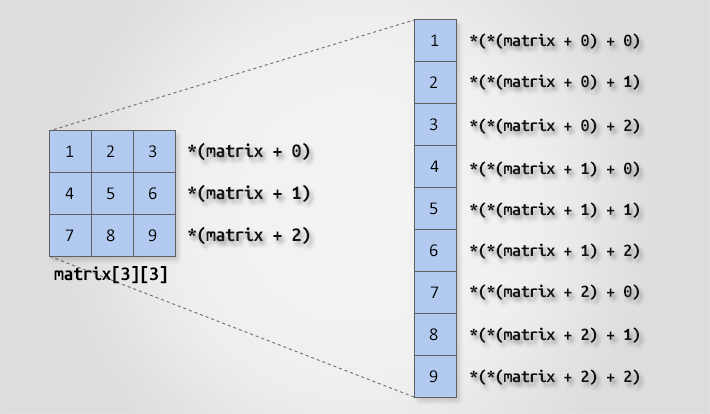
\*(\*matrix + 1) => Points to matrix[0][1]

\*(\*(matrix + 0) + 1) => Points to matrix[0][1]

\*(\*(matrix + 2) + 2) => Points to matrix[2][2]

***Note:****If you are not familiar with*\*(matrix + 2)*syntax then please give yourself time and*[*learn pointer arithmetic in C*](https://codeforwin.org/2017/10/c-pointer-arithmetic.html)*.*

I have tried to summarize two dimensional array access using pointer in below image.

Two dimensional array access using pointer

**Program to access a two dimensional array using pointer**

/\*\*

\* C program to access two dimensional array using pointer.

\*/

#include <stdio.h>

#define ROWS 3

#define COLS 3

/\* Function declaration to input and print two dimensional array \*/

void inputMatrix(int matrix[][COLS], int rows, int cols);

void printMatrix(int matrix[][COLS], int rows, int cols);

int main()

{

int matrix[ROWS][COLS];

int i, j;

/\* Input elements in matrix \*/

printf("Enter elements in %dx%d matrix.\n", ROWS, COLS);

inputMatrix(matrix, ROWS, COLS);

/\* Print elements in matrix \*/

printf("Elements of %dx%d matrix.\n", ROWS, COLS);

printMatrix(matrix, ROWS, COLS);

return 0;

}

/\*\*

\* Function to take input in two dimensional array (matrix)

\* from user.

\*

\* @matrix 2D array to store input.

\* @rows Total rows in 2D matrix.

\* @cols Total columns in 2D matrix.

\*/

void inputMatrix(int matrix[][COLS], int rows, int cols)

{

int i, j;

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

{

for(j = 0; j < cols; j++)

{

// (\*(matrix + i) + j is equivalent to &matrix[i][j]

scanf("%d", (\*(matrix + i) + j));

}

}

}

/\*\*

\* Function to display elements of two dimensional array (matrix)

\* on console.

\*

\* @matrix 2D array to display as output.

\* @rows Total rows in 2D matrix.

\* @cols Total columns in 2D matrix.

\*/

void printMatrix(int (\*matrix)[COLS], int rows, int cols)

{

int i, j;

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

{

for (j = 0; j < cols; j++)

{

// \*(\*(matrix + i) + j) is equivalent to matrix[i][j]

printf("%d ", \*(\*(matrix + i) + j));

}

printf("\n");

}

}

***Note:****You can use any of the two notations*int matrix[][COLS]*or*int (\*matrix)[COLS]*, to access two dimensional array using pointers. The first*int matrix[][COLS]*is general array notation. Whereas*int (\*matrix)[COLS]*is a pointer to array.*

Output

Enter elements in 3x3 matrix.

1 2 3

4 5 6

7 8 9

Elements of 3x3 matrix.

1 2 3

4 5 6

7 8 9