

TWO DIMENSIONAL ARRAY

Array with several rows and columns is called two dimensional array.

It is the array with two subscripting operators [][]

It is a n*n matrix.

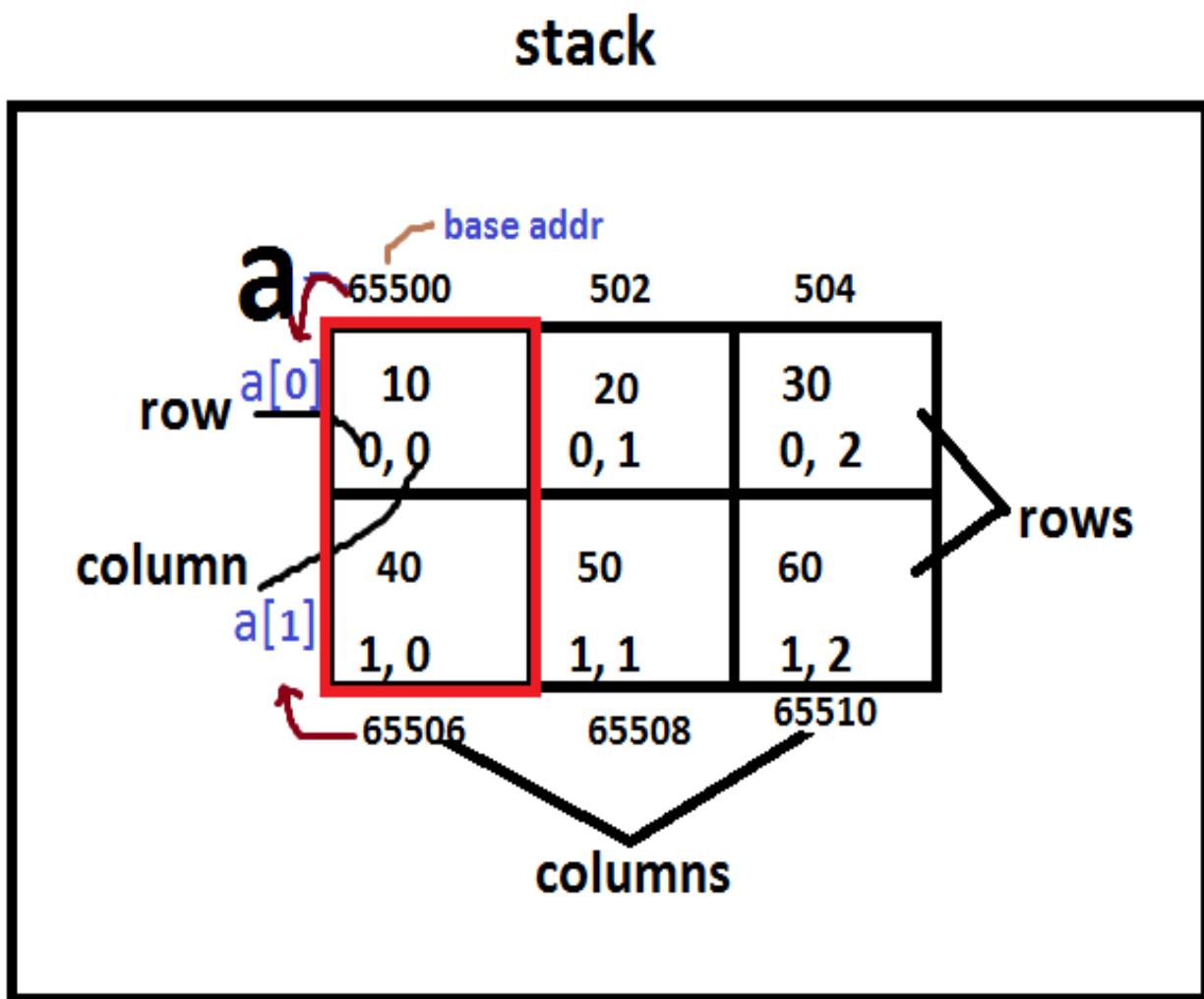
It is array of array i.e. collection of one dimensional array.

It is an implicit double pointer.

Syntax: datatype var[rows][cols]={elements};

Eg:

Int a[2][3]={**{10,20,30},{40,50,60}**};



In two dimensional array the rows/first subscript is working as array of pointers and they stores first column address of each row. Hence it is an implicit/internal double pointer.

In the above example, To print the first row, first column value, we have to use

`printf("%d", a[0][0]); → 10`

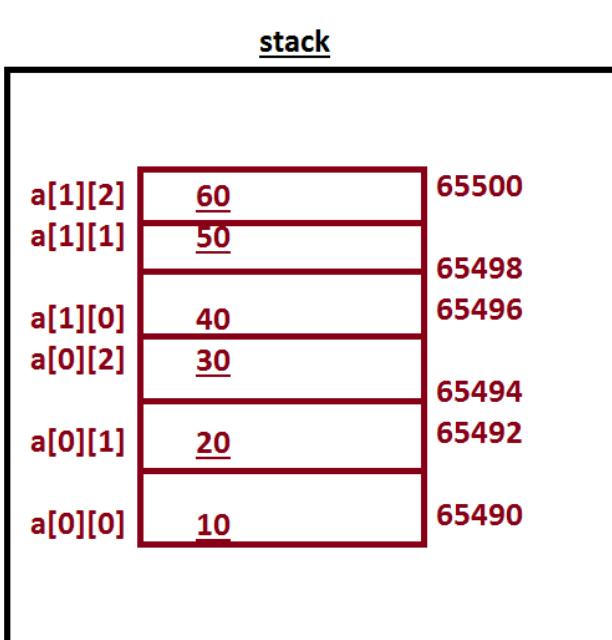
Internally how this statement is working ?

`a[0]` means value at `a[0]` i.e. 65500.

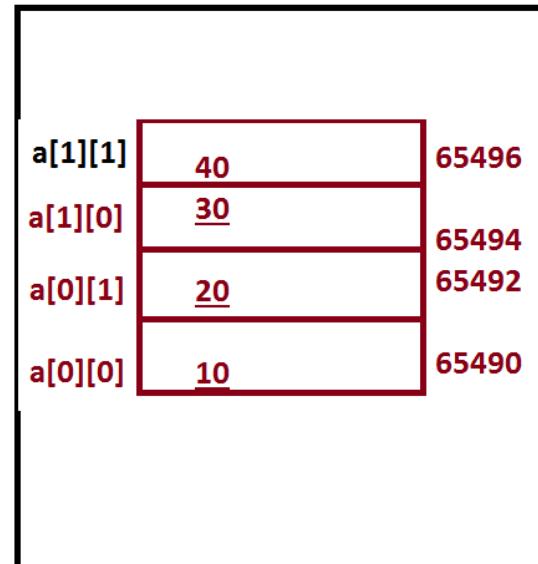
`65500 + [0] col → 65500 + 0 * 2 → 65500 →`
value at 65500 is 10.

Index no

Int size



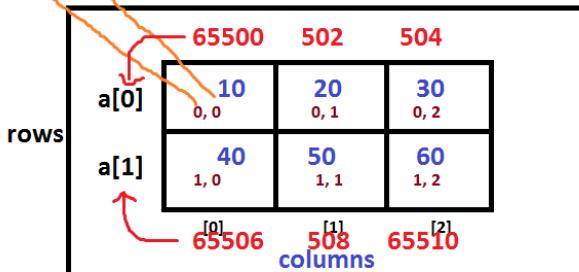
`int a[2][2]={10,20,30,40};`



```
int a[2][3]={ {10,20,30}, {40,50,60} };
```

rows , cols

stack



p(a[0][0]) ==> 10

65500+0*2=65500==> value at 65500 ==> 10 offset

p(a[1][2]);==>60

65506+2*2=65510==> value at 65510==> 60

Finding address of the rows:

TC

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Line 7 Col 61 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10,20,30},{40,50,60}};
clrscr();
printf("a[0] stored addr=%u, a[1] stored addr=%u",a[0], a[1]);
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.



2:46 PM
29-Sep-23

TC

```
a[0] stored addr=65492, a[1] stored addr=65498
```

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2:46 PM
29-Sep-23

Finding elements position, cell no and addr:

TC

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Line 8 Col 61 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10,20,30},{40,50,60}},r,c;
clrscr();
for(r=0;r<2;r++) for( c=0; c<3;c++)
printf("a[%d][%d] value=%d, addr=%u\n",r,c,a[r][c], &a[r][c]);
getch();
}
```

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2:48 PM
29-Sep-23

TC

```
a[0][0] value=10, addr=65492
a[0][1] value=20, addr=65494
a[0][2] value=30, addr=65496
a[1][0] value=40, addr=65498
a[1][1] value=50, addr=65500
a[1][2] value=60, addr=65502
```

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2:48 PM
29-Sep-23

TC

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Line 8 Col 25 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
char a[2][3]={{10,20,30},{40,50,60}},r,c;
clrscr();
for(r=0;r<2;r++) for( c=0; c<3;c++)
printf("a[%d][%d] value=%d, addr=%u\n",r,c,a[r][c], &a[r][c]);
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.



2:49 PM
29-Sep-23

TC

```
a[0][0] value=10, addr=65496
a[0][1] value=20, addr=65497
a[0][2] value=30, addr=65498
a[1][0] value=40, addr=65499
a[1][1] value=50, addr=65500
a[1][2] value=60, addr=65501
```

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2:49 PM
29-Sep-23

TC

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Line 8 Col 29 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
float a[2][3]={ {10,20,30}, {40,50,60} }; int r,c;
clrscr();
for(r=0;r<2;r++) for( c=0; c<3;c++)
printf("a[%d][%d] value=% .2f, addr=%u\n",r,c,a[r][c], &a[r][c]);
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

2:50 PM
29-Sep-23

TC

```
a[0][0] value=10.00, addr=65480
a[0][1] value=20.00, addr=65484
a[0][2] value=30.00, addr=65488
a[1][0] value=40.00, addr=65492
a[1][1] value=50.00, addr=65496
a[1][2] value=60.00, addr=65500
```

Activate Windows
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2:50 PM
29-Sep-23

Direct initialization of 2*3 matrix:

A screenshot of a Windows desktop environment. In the center is a code editor window titled "TC" with a dark blue background. The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". Below the menu, status text reads "Line 7 Col 37 Insert Indent Tab Fill Unindent * E:2PM.C". The code itself initializes a 2x3 matrix "a" with values 10, 20, 30 in the first row and 40, 50, 60 in the second row. It then prints the matrix elements. A message "Activate Windows Go to PC settings to activate Windows." is visible in the bottom right corner of the code editor. The taskbar at the bottom shows various pinned icons, and the system tray indicates the date and time as 2:52 PM 29-Sep-23.

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10,20,30},{40,50,60}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

A screenshot of the same Windows desktop environment, focusing on a terminal window titled "TC". The window displays the output of the previously run C program, which prints "Elements" followed by the 2x3 matrix values: 10 20 30 and 40 50 60. The terminal window has a black background. The "Activate Windows" message is also present in the bottom right corner. The taskbar and system tray are identical to the code editor window above.

```
Elements
10 20 30
40 50 60
```

TC

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Line 5 Col 14 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,20,30,40,50,60},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

2:53 PM
29-Sep-23

TC

```
Elements
 10  20  30
 40  50  60
```

Activate Windows
Go to PC settings to activate Windows.

2:53 PM
29-Sep-23

TC

File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 19 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,20},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.



2:54 PM
29-Sep-23

TC

```
Elements
10 20 0
0 0 0
```

Activate Windows
Go to PC settings to activate Windows.

TC

```
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 23 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10},{20}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
```

Activate Windows
Go to PC settings to activate Windows.

2:55 PM 29-Sep-23

2:57 PM 29-Sep-23

TC

```
Elements
10 0 0
20 0 0
```

Activate Windows
Go to PC settings to activate Windows.

TC

```
Error: Too many initializers in function main
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10},{20},{30}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
/* Error */
```

Activate Windows
Go to PC settings to activate Windows.

TC

```
Error: Too many initializers in function main
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10,20,30,40}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
/* Error */
```

Activate Windows
Go to PC settings to activate Windows.



2:59 PM
29-Sep-23

```
Line 18 Col 1 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,20,30,40},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

TC

Activate Windows
Go to PC settings to activate Windows.

2:59 PM
29-Sep-23

```
Elements
 10  20  30
 40  0   0
```

TC

Activate Windows
Go to PC settings to activate Windows.

3:00 PM
29-Sep-23

TC

File Edit Run Compile Project Options Debug Break/watch
Line 7 Col 20 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10},20,30,40},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

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3:00 PM
29-Sep-23

TC

Elements

10 0 0
20 30 40

Activate Windows
Go to PC settings to activate Windows.

3:00 PM
29-Sep-23

TC

File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 18 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

3:01 PM
29-Sep-23

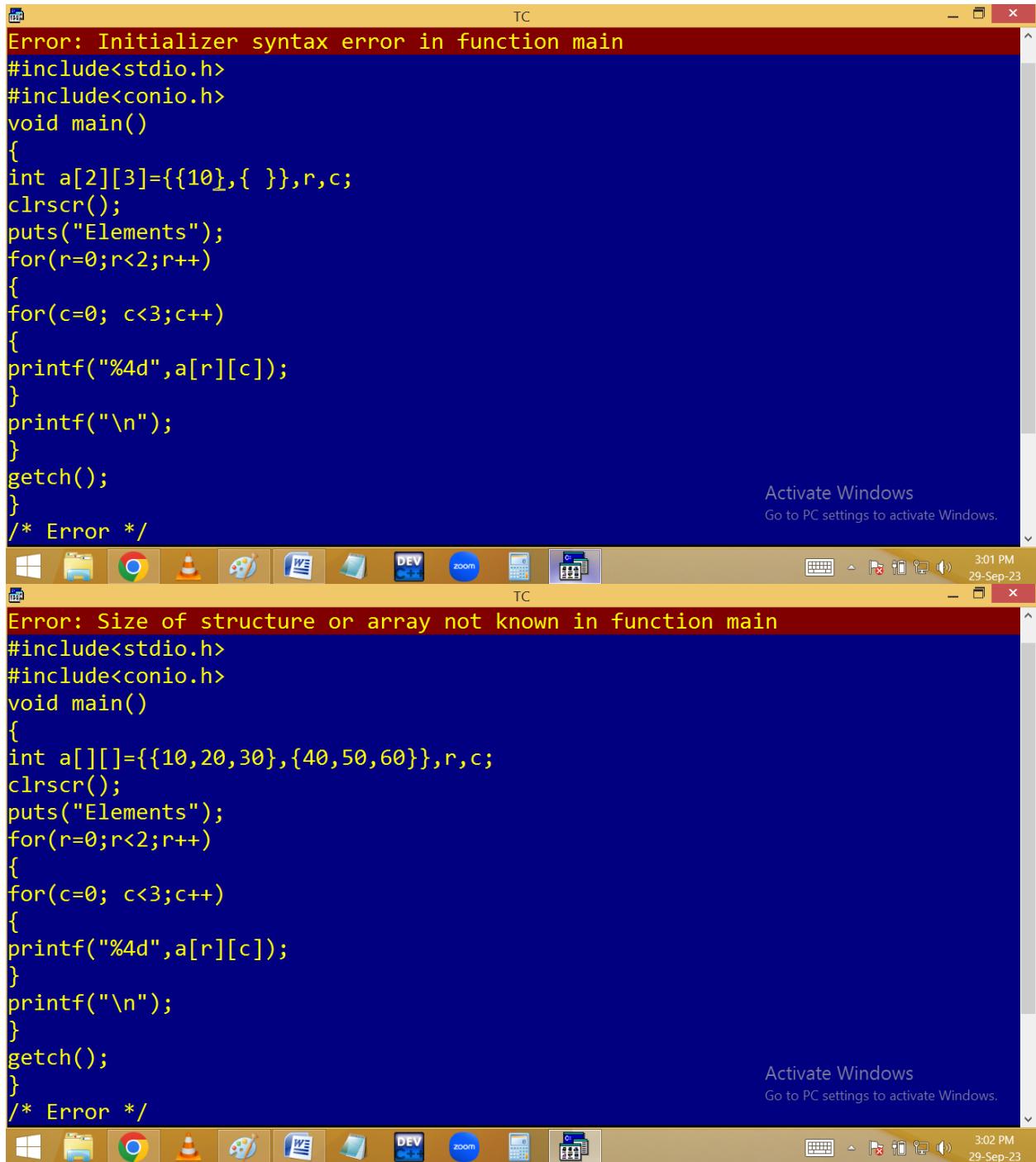
TC

Elements

```
10  0  0
 0  0  0
```

Activate Windows
Go to PC settings to activate Windows.

3:01 PM
29-Sep-23



The image shows two side-by-side windows on a Windows operating system. Both windows have a dark blue header bar with white text. The top window's header bar says "TC" and the bottom window's says "TC". The top window displays the following C code:

```
Error: Initializer syntax error in function main
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10},{ }},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
/* Error */
```

The bottom window displays the same C code, but with a different error message:

```
Error: Size of structure or array not known in function main
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][]={{10,20,30},{40,50,60}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
/* Error */
```

Both windows have a status bar at the bottom showing the date and time. The top window shows "3:01 PM 29-Sep-23" and the bottom window shows "3:02 PM 29-Sep-23". A "Activate Windows" watermark is visible in the bottom right corner of both windows.

TC

```
Error: Size of structure or array not known in function main
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][]={{10,20,30},{40,50,60}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
/* Error */

```

Activate Windows
Go to PC settings to activate Windows.

TC

```
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 10 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][3]={{10,20,30},{40,50,60}},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

3:02 PM
29-Sep-23

3:03 PM
29-Sep-23

The screenshot shows a Windows desktop with two windows side-by-side, both titled "TC".

The top window displays the output of a C program. The text "Elements" is printed, followed by a 2x3 matrix of integers:

```
Elements
10 20 30
40 50 60
```

The bottom window shows the source code of the C program:

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[][3]={10,20,30},r,c;
    clrscr();
    puts("Elements");
    for(r=0;r<2;r++)
    {
        for(c=0; c<3;c++)
        {
            printf("%4d",a[r][c]);
        }
        printf("\n");
    }
    getch();
}
```

A watermark message "Activate Windows Go to PC settings to activate Windows." is visible in the bottom right corner of both windows.

TC

```
Elements
 10  20  30
 -20 285   1
```

Activate Windows
Go to PC settings to activate Windows.

TC

```
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 15 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][3]={10},r,c;
clrscr();
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

3:05 PM
29-Sep-23

3:06 PM
29-Sep-23

The image shows a Windows desktop environment with two terminal windows open. Both windows have a yellow title bar with the text 'TC'.

Top Terminal Window:

```
Elements
10 0 0
-20 285 1
```

Bottom Terminal Window:

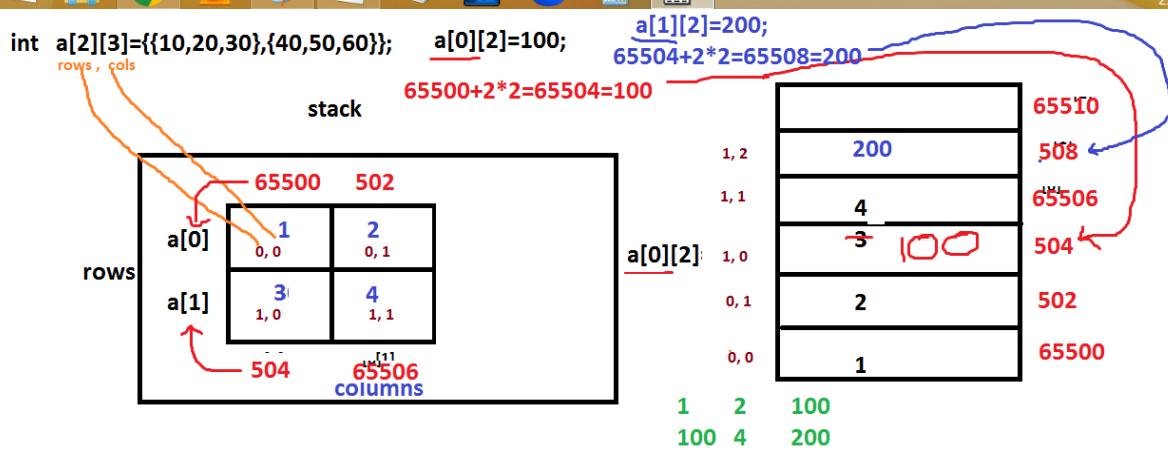
```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][2]={1,2,3,4},r,c;
clrscr();
a[0][2]=100;
a[1][2]=200;
puts("Elements");
for(r=0;r<2;r++)
{
for(c=0; c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
```

Both windows show a watermark in the bottom right corner: "Activate Windows Go to PC settings to activate Windows." The taskbar at the bottom of the screen contains icons for File Explorer, Google Chrome, VLC, Paint, FileZilla, DEV, Zoom, and Task View. The system tray shows the date and time as 3:06 PM, 29-Sep-23.

TC

```
Elements
1 2 100
100 4 200
```

Activate Windows
Go to PC settings to activate Windows.



Reading and printing elements of n*n matrix:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[10][10],nr,nc,r,c; clrscr();
printf("Enter no of rows and columns "); scanf("%d %d",&nr, &nc);
printf("Enter %d elements \n", nr*nc);
for(r=0;r<nr;r++)for(c=0;c<nc;c++)scanf("%d",&a[r][c]);
puts("Elements");
for(r=0;r<nr;r++)
{
for(c=0; c<nc;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

TC

Activate Windows
Go to PC settings to activate Windows.

3:22 PM
29-Sep-23

```
Enter no of rows and columns 2 3
Enter 6 elements
4 0 2
5 9 2
Elements
 4   0   2
 5   9   2
```

TC

Activate Windows
Go to PC settings to activate Windows.

3:22 PM
29-Sep-23

TC

```
Enter no of rows and columns 3 3
Enter 9 elements
1 2 3 4 5 0 9 8 4
Elements
 1   2   3
 4   5   0
 9   8   4
```

Activate Windows
Go to PC settings to activate Windows.

Windows Start button | File Explorer | Google Chrome | VLC | Paint | FileZilla | DEV | Zoom | Calculator | Task View | 3:23 PM | 29-Sep-23

Transpose of a n*n matrix:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[10][10],nr,nc,r,c; clrscr();
printf("Enter no of rows and columns "); scanf("%d %d",&nr, &nc);
printf("Enter %d elements \n", nr*nc);
for(r=0;r<nr;r++)for(c=0;c<nc;c++)scanf("%d",&a[r][c]);
puts("Transposed Elements");
for(c=0; c<nc;c++)
{
for(r=0;r<nr;r++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

3:30 PM
29-Sep-23

```
TC
```

Enter no of rows and columns 2 3
Enter 6 elements
1 2 3
4 5 6
Transposed Elements
1 4
2 5
3 6

Activate Windows
Go to PC settings to activate Windows.

3:30 PM
29-Sep-23

```
TC
```

```

for(c=0;c<3;c++)
{
    for(r=0;r<2;r++)
    {
        p(a[r][c]);
    }
    p("\n");
}

```

~~1 | 2 | 3~~
~~4 | 5 | 6~~
~~7 | 8 | 9~~

1 0,0	2 0,1	3 0,2
4 1,0	5 1,1	6 1,2

1	4
2	5
3	6

Method 2:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[10][10],nr,nc,r,c; clrscr();
printf("Enter no of rows and columns "); scanf("%d %d",&nr, &nc);
printf("Enter %d elements \n", nr*nc);
for(r=0;r<nr;r++)for(c=0;c<nc;c++)scanf("%d",&a[r][c]);
puts("Transposed Elements");
for(r=0;r<nc;r++)
{
for(c=0; c<nr;c++)
{
printf("%4d",a[c][r]);
}
printf("\n");
}
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

Enter no of rows and columns 5 2

Enter 10 elements

1 2

3 4

5 6

7 8

9 0

Transposed Elements

1 3 5 7 9

2 4 6 8 0

Activate Windows
Go to PC settings to activate Windows.

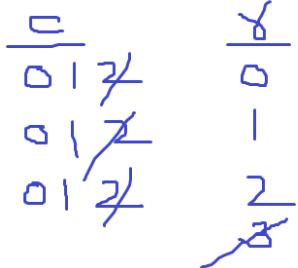


3:35 PM
29-Sep-23

```

for(r=0;r<3;r++)
{
    for(c=0;c<2;c++)
    {
        p(a[c][r]);
    }
    p("\n"); ✓
}

```



_{0,0} 1	_{0,1} 2	_{0,2} 3
_{1,0} 4	_{1,1} 5	_{1,2} 6

1	4
2	5
3	6

Finding Trace of n*n matrix:

Sum of principle diagonal elements is called trace

_{0,0} 1	_{0,1} 2	_{0,2} 3
_{1,0} 4	_{1,1} 5	_{1,2} 6
_{2,0} 9	_{2,1} 3	_{2,2} 0

Trace=6

TC

File Edit Run Compile Project Options Debug Break/watch

Line 16 Col 1 Insert Indent Tab Fill Unindent * E:2PM.C

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[10][10],nr,nc,r,c,s=0; clrscr();
printf("Enter no of rows and columns "); scanf("%d %d",&nr, &nc);
if(nr==nc)
{
printf("Enter %d elements \n", nr*nc);
for(r=0;r<nr;r++)for(c=0;c<nc;c++){scanf("%d",&a[r][c]);if(r==c)s+=a[r][c];}
printf("Trace=%d",s);
}
else printf("rows and columns should be same");
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

TC

Windows File Explorer Google Chrome VLC Media Player Paint Notepad DEV zoom

3:43 PM 29-Sep-23

```
Enter no of rows and columns 3 3
Enter 9 elements
3 0 9
1 4 5
3 0 1
Trace=8
```

Activate Windows
Go to PC settings to activate Windows.

Windows File Explorer Google Chrome VLC Media Player Paint Notepad DEV zoom

3:43 PM 29-Sep-23

TC

```
Enter no of rows and columns 2 3
rows and columns should be same_
```

Activate Windows
Go to PC settings to activate Windows.



3:44 PM
29-Sep-23

trace of right diagonal elements

1 0,0	2 0,1	3 0, 2
4 1,0	5 1,1	6 1,2
9 2,0	3 2,1	0 2,2

trace=17

Finding row and columns sum

1 0,0	2 0,1	3 0, 2	= 6
4 1,0	5 1,1	6 1,2	≈ 15
9 2,0	3 2,1	0 2,2	

14 10

