

Two dimensional arrays:

Array with several rows and columns.

Array with two subscripting operators **[][]**.

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

It is implicit double pointer.

It is a $n \times n$ matrix.

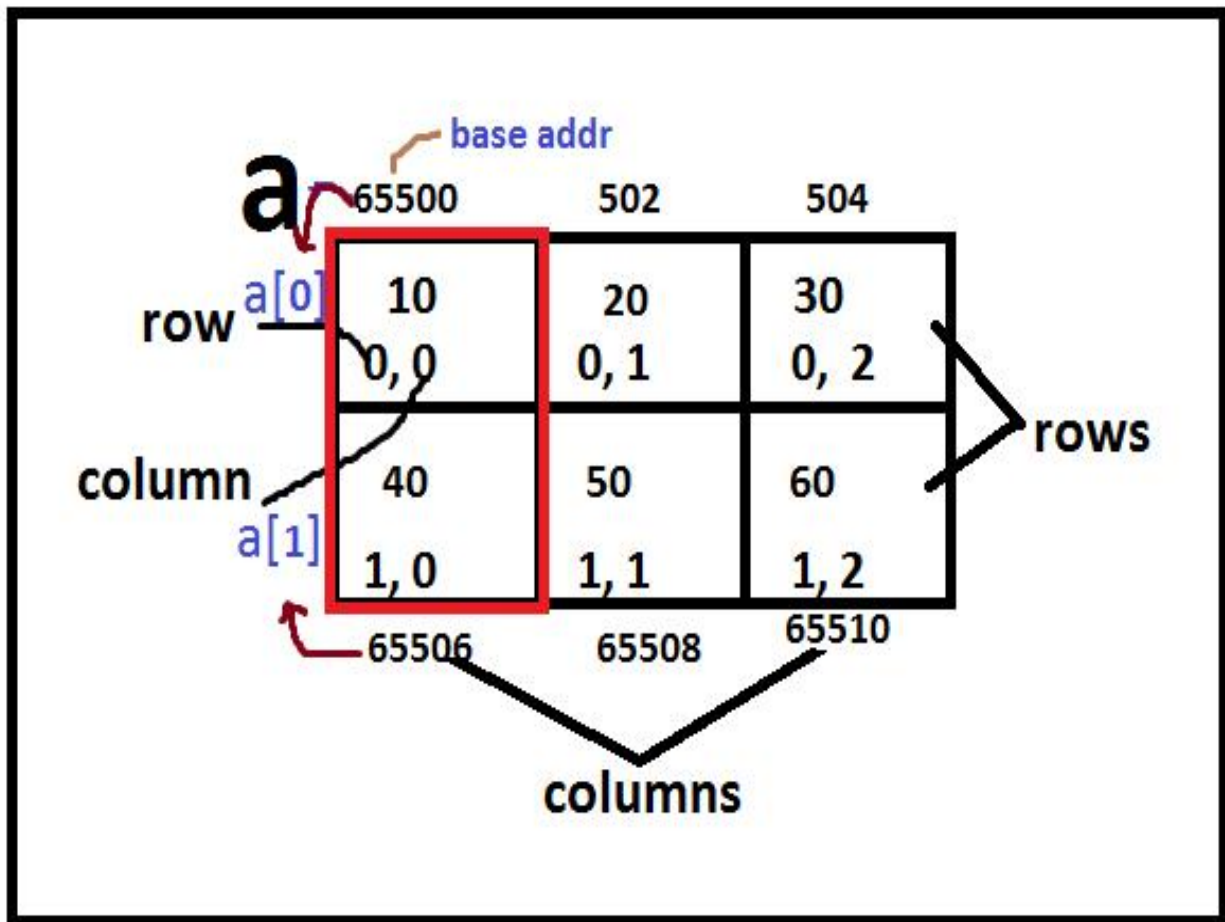
Syntax:

datatype variable [rows] [columns] = {elements} ;

Eg:

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

stack



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

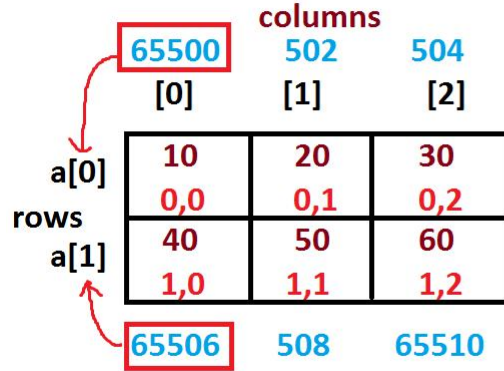
stack

<code>a[1][2]</code>	<u>60</u>	65500
<code>a[1][1]</code>	<u>50</u>	65498
<code>a[1][0]</code>	40	65496
<code>a[0][2]</code>	<u>30</u>	65494
<code>a[0][1]</code>	<u>20</u>	65492
<code>a[0][0]</code>	<u>10</u>	65490

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

<code>a[1][1]</code>	40	65496
<code>a[1][0]</code>	<u>30</u>	65494
<code>a[0][1]</code>	<u>20</u>	65492
<code>a[0][0]</code>	<u>10</u>	65490

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



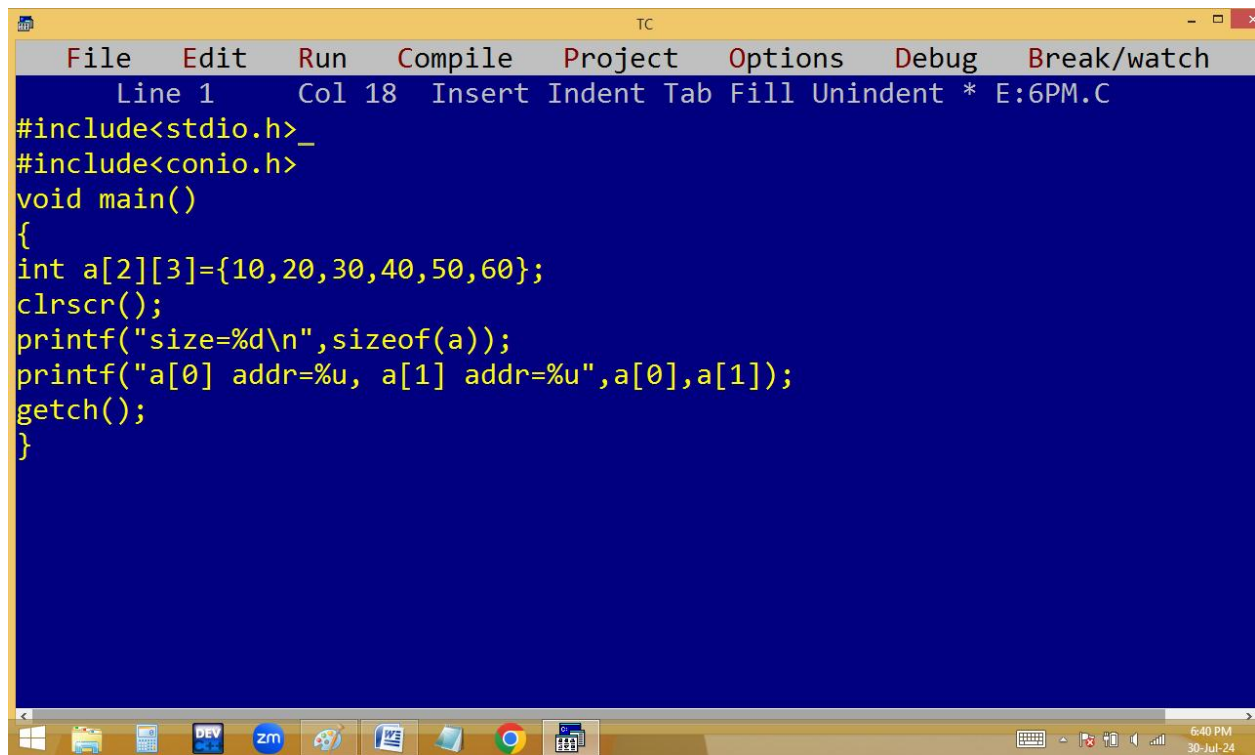
```
p("%d",a[0][0]);==>10
```

$65500 + 0 * 2 = 65500 \Rightarrow \text{value at } 65500 = 10$

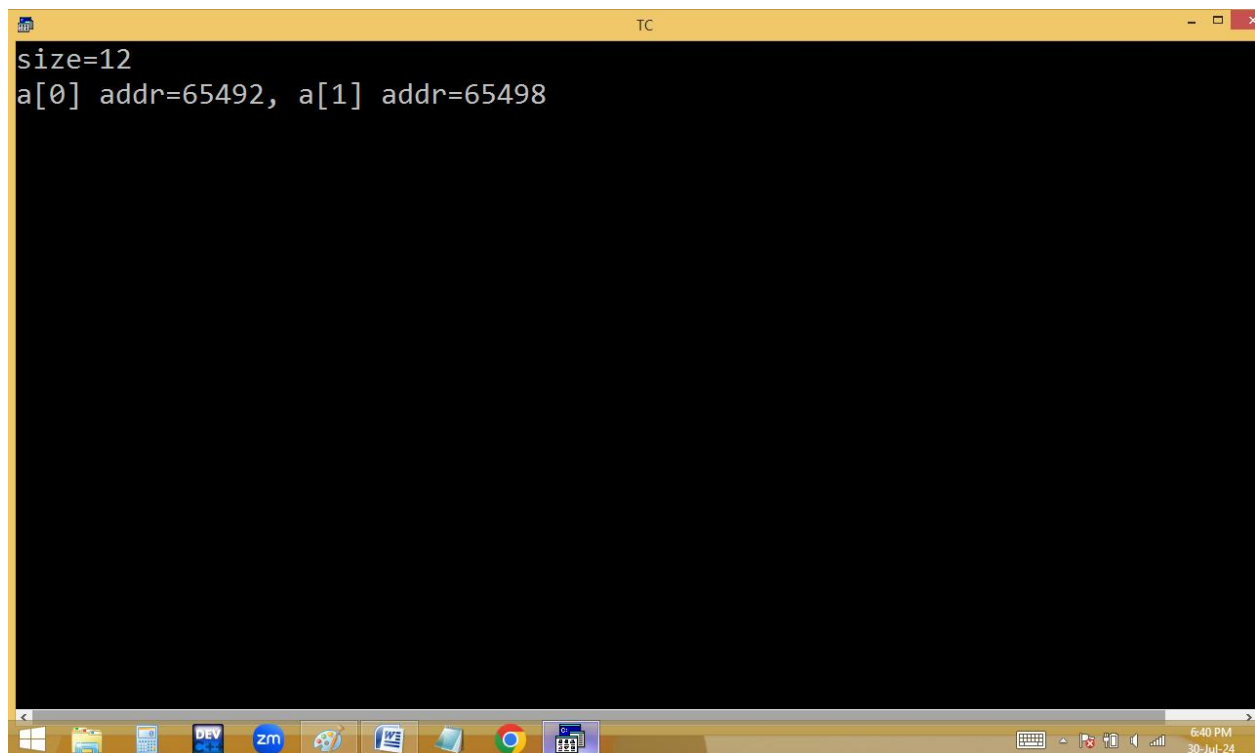
```
p("%d",a[1][2]);==>60
```

$65506 + 2 * 2 = 65510 \Rightarrow \text{value at } 65510 = 60$

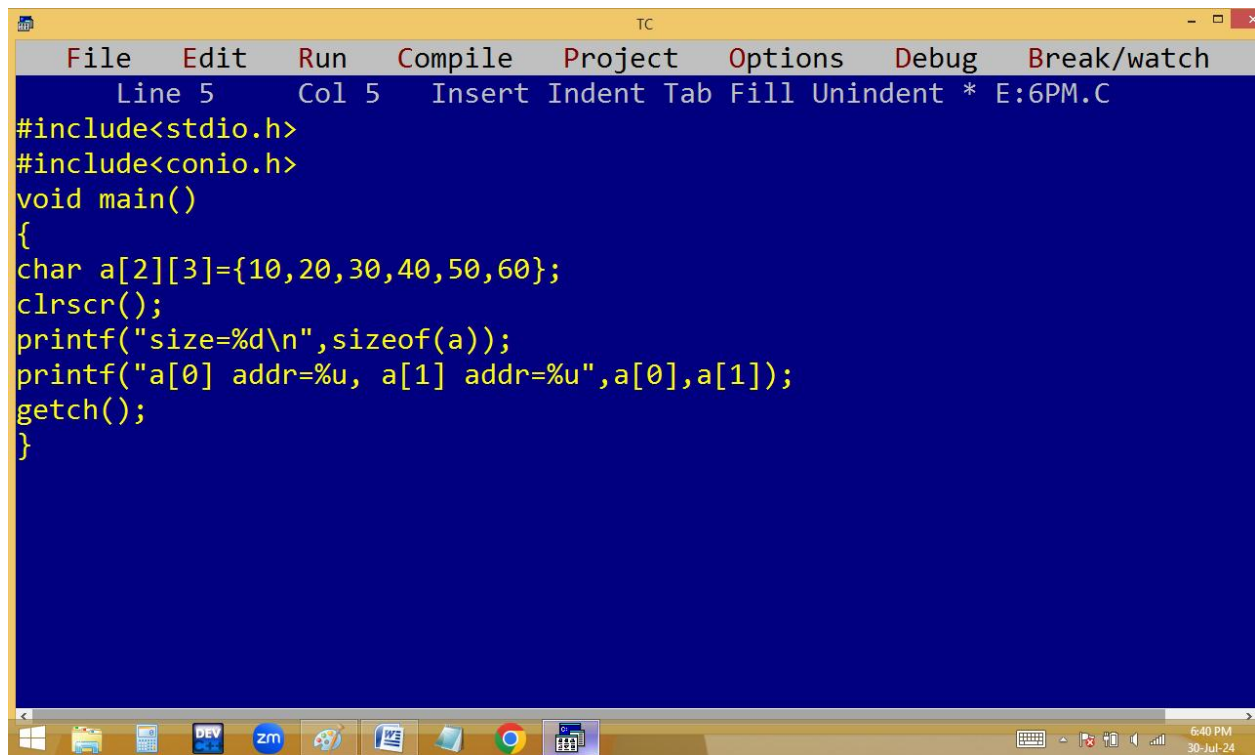
Finding array size and address:



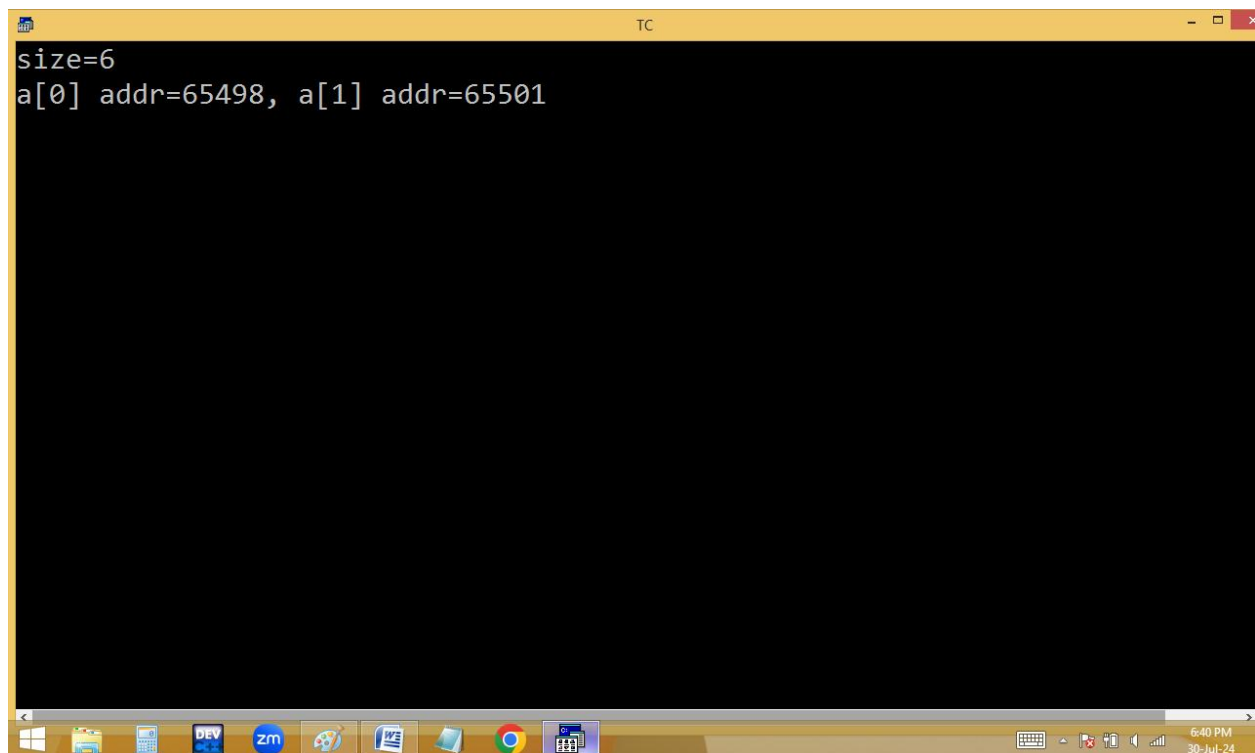
```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 1 Col 18 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>_
#include<conio.h>
void main()
{
int a[2][3]={10,20,30,40,50,60};
clrscr();
printf("size=%d\n",sizeof(a));
printf("a[0] addr=%u, a[1] addr=%u",a[0],a[1]);
getch();
}
```



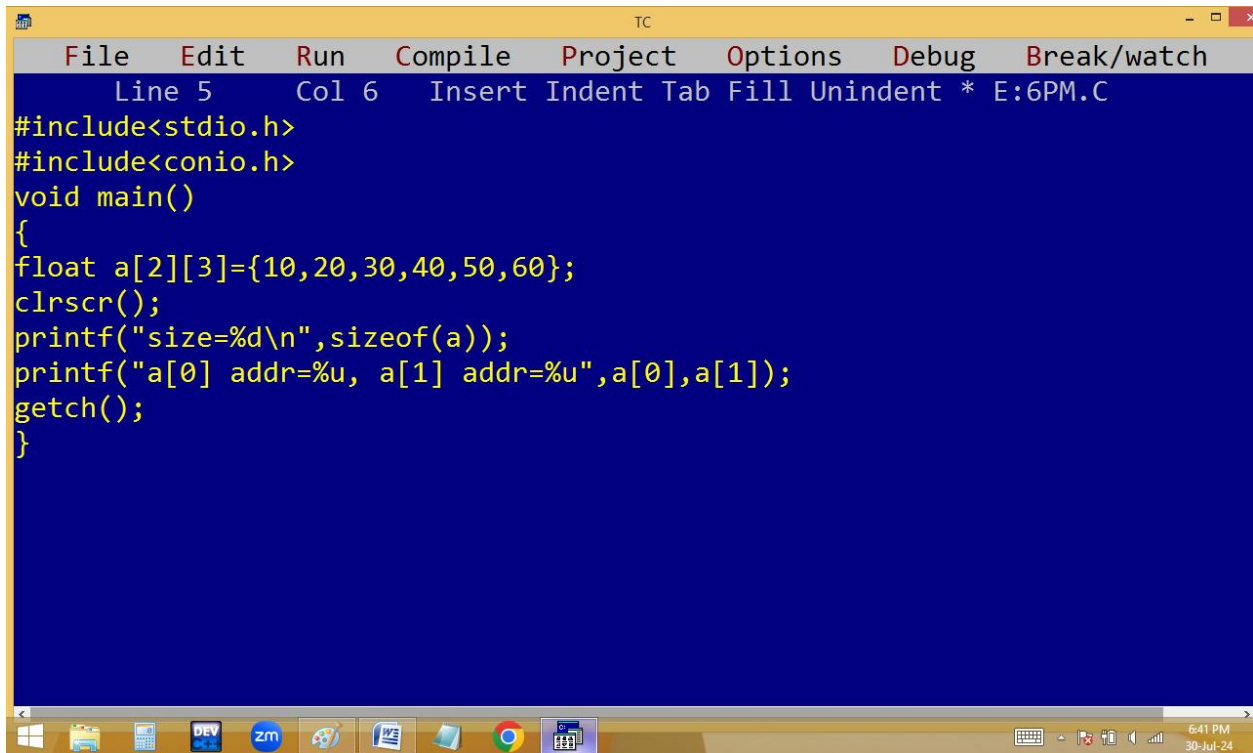
```
TC
size=12
a[0] addr=65492, a[1] addr=65498
```



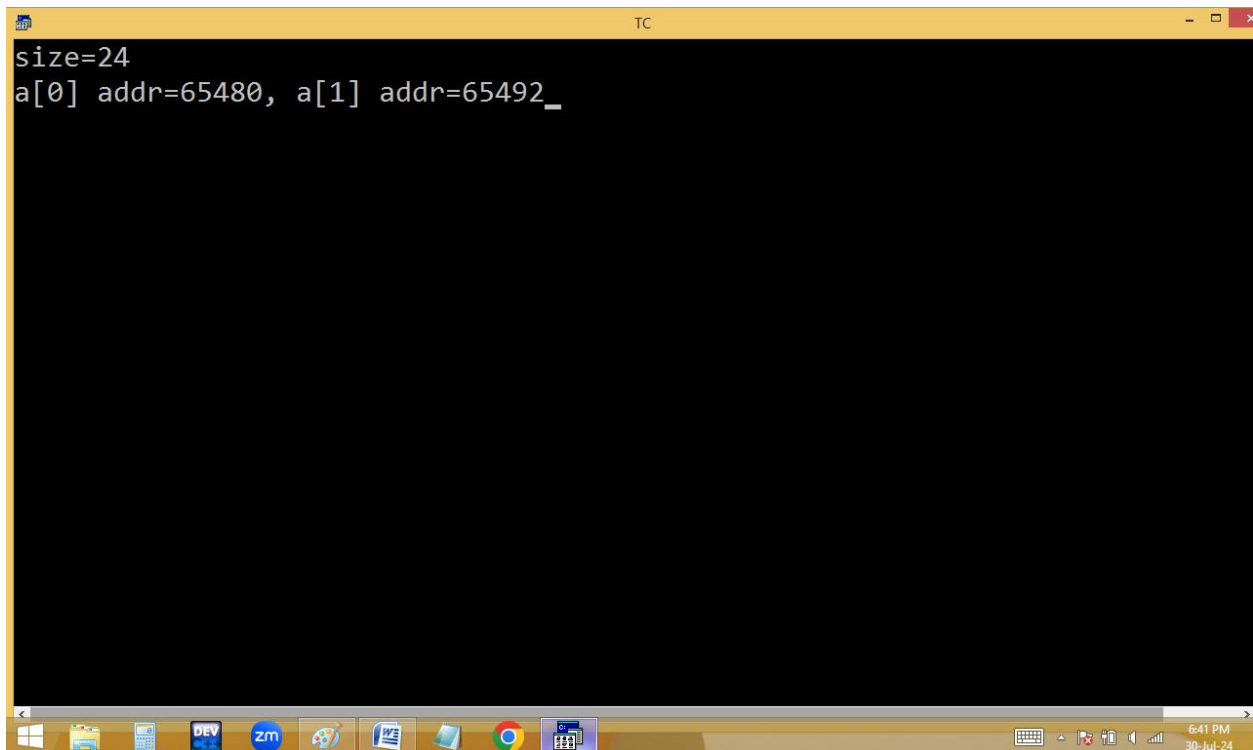
```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 5 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
char a[2][3]={10,20,30,40,50,60};
clrscr();
printf("size=%d\n",sizeof(a));
printf("a[0] addr=%u, a[1] addr=%u",a[0],a[1]);
getch();
}
```



```
TC
size=6
a[0] addr=65498, a[1] addr=65501
```

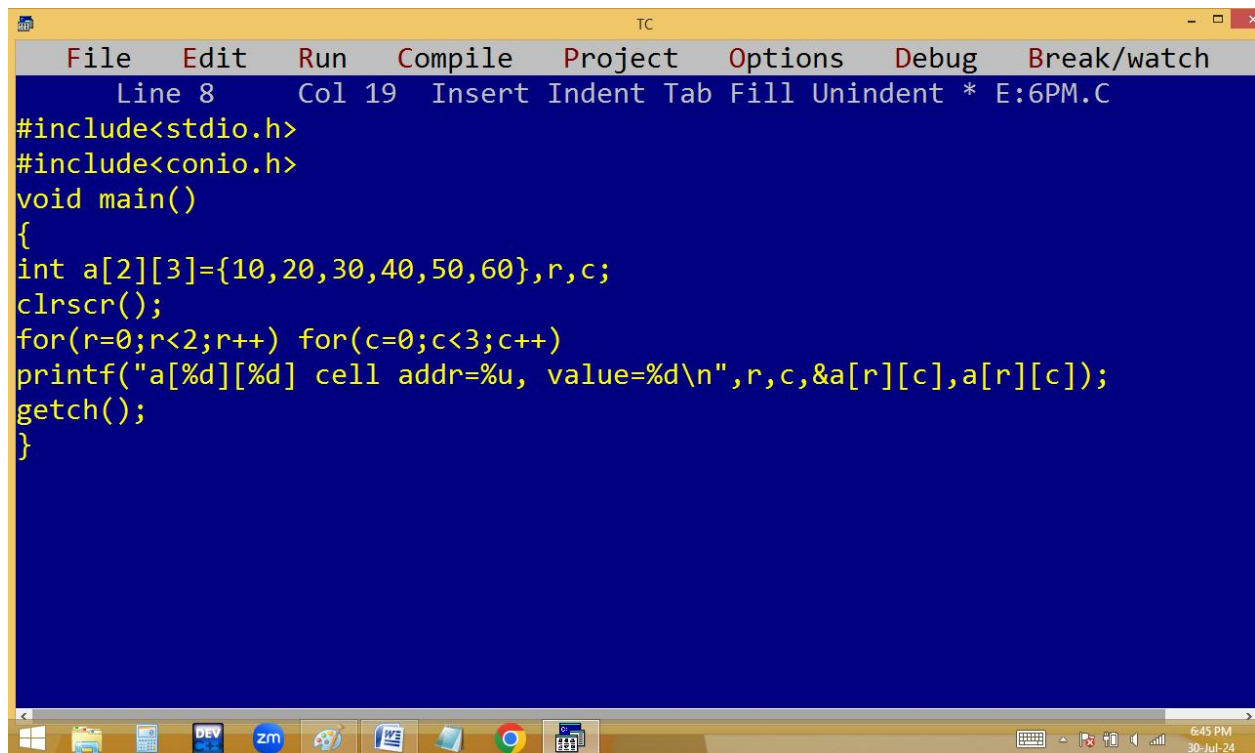


```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 6 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
float a[2][3]={10,20,30,40,50,60};
clrscr();
printf("size=%d\n",sizeof(a));
printf("a[0] addr=%u, a[1] addr=%u",a[0],a[1]);
getch();
}
```

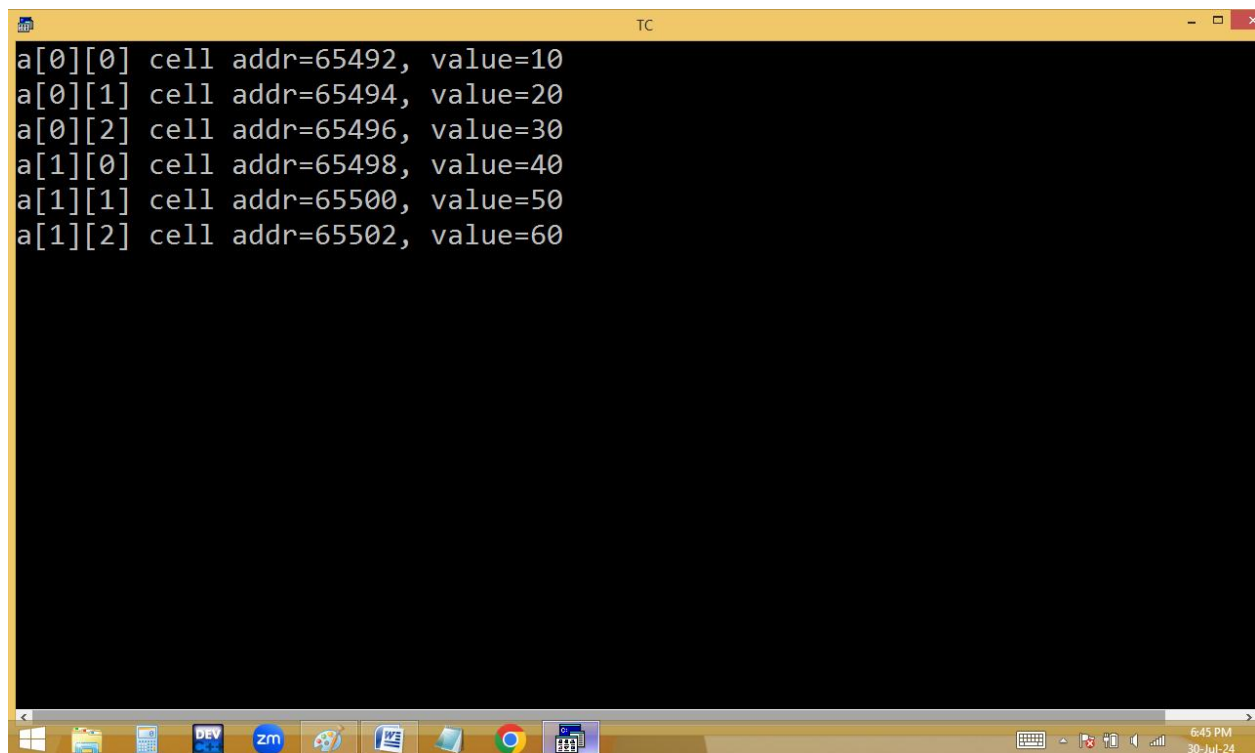


```
TC
size=24
a[0] addr=65480, a[1] addr=65492_
```

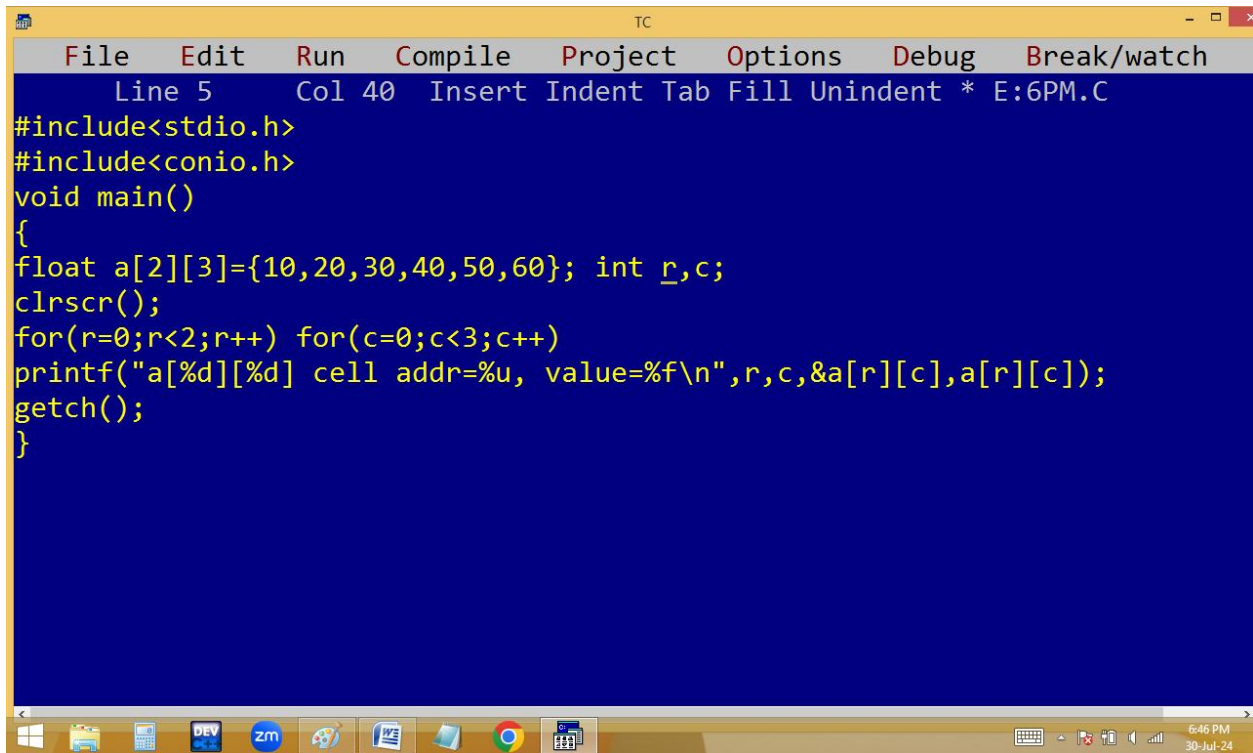
Finding each array element, cell no, address:



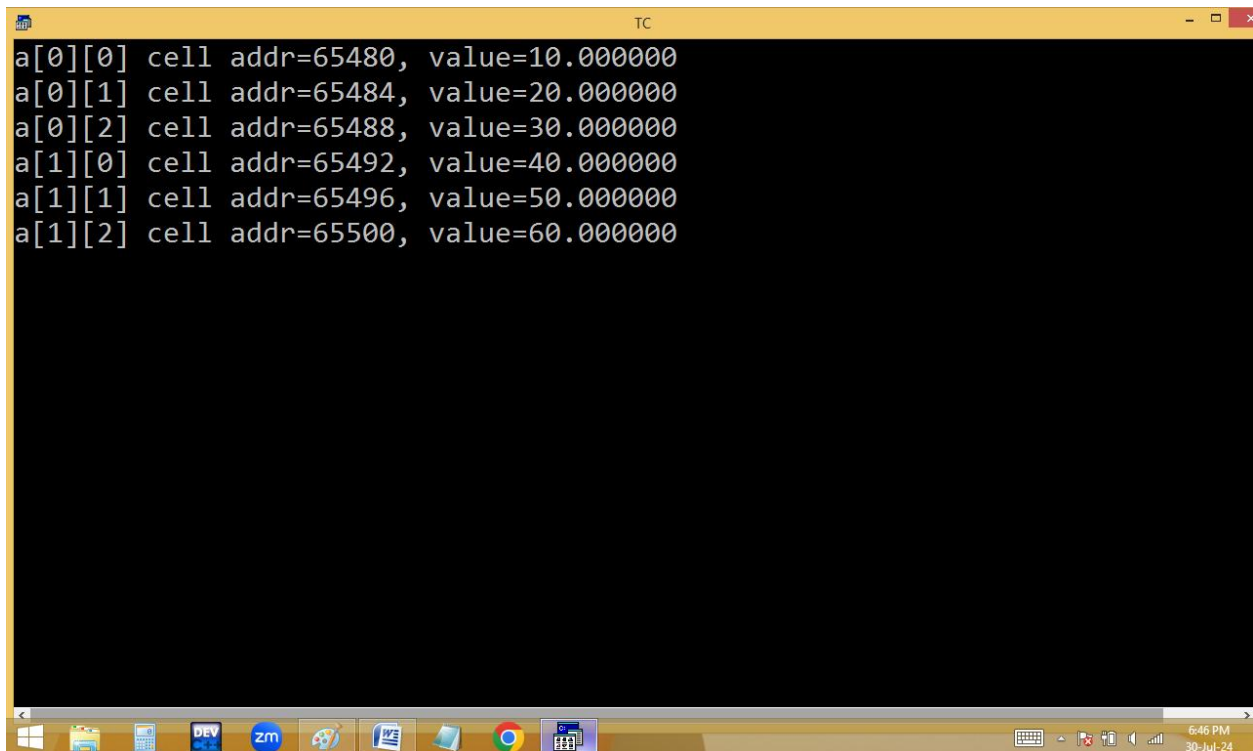
```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 8 Col 19 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,20,30,40,50,60},r,c;
clrscr();
for(r=0;r<2;r++) for(c=0;c<3;c++)
printf("a[%d][%d] cell addr=%u, value=%d\n",r,c,&a[r][c],a[r][c]);
getch();
}
```



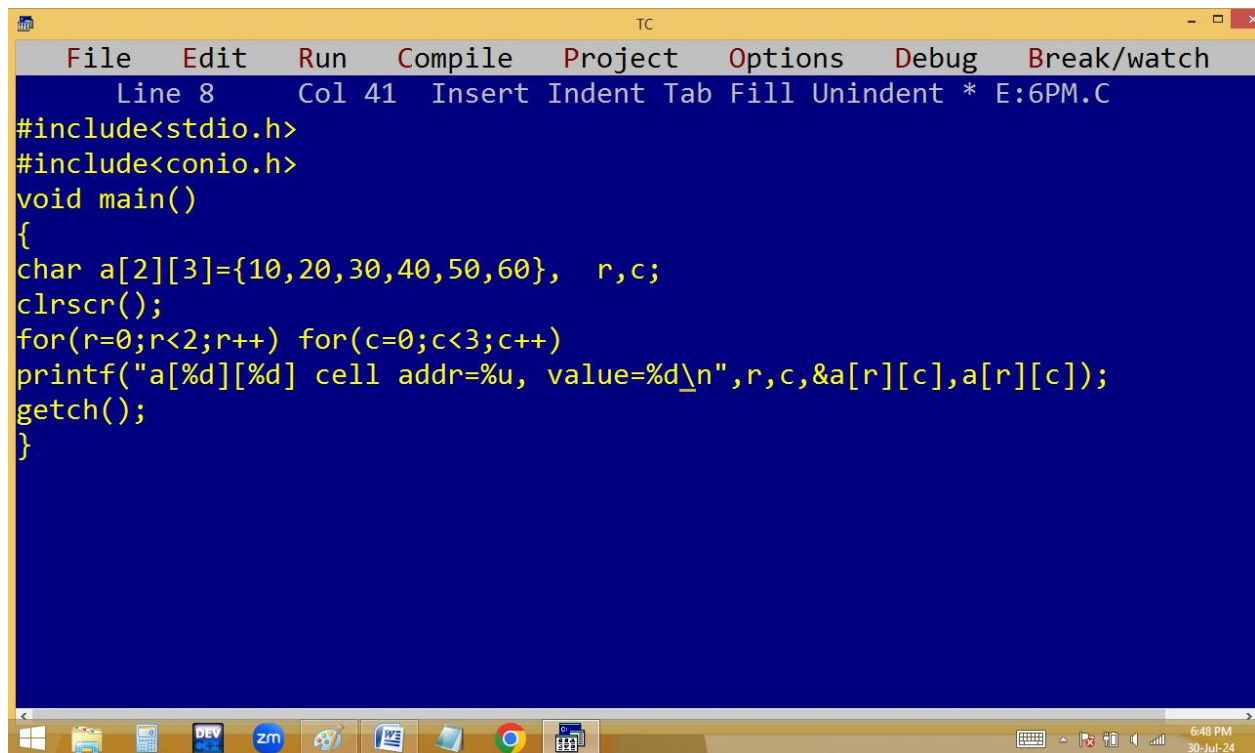
```
TC
a[0][0] cell addr=65492, value=10
a[0][1] cell addr=65494, value=20
a[0][2] cell addr=65496, value=30
a[1][0] cell addr=65498, value=40
a[1][1] cell addr=65500, value=50
a[1][2] cell addr=65502, value=60
```

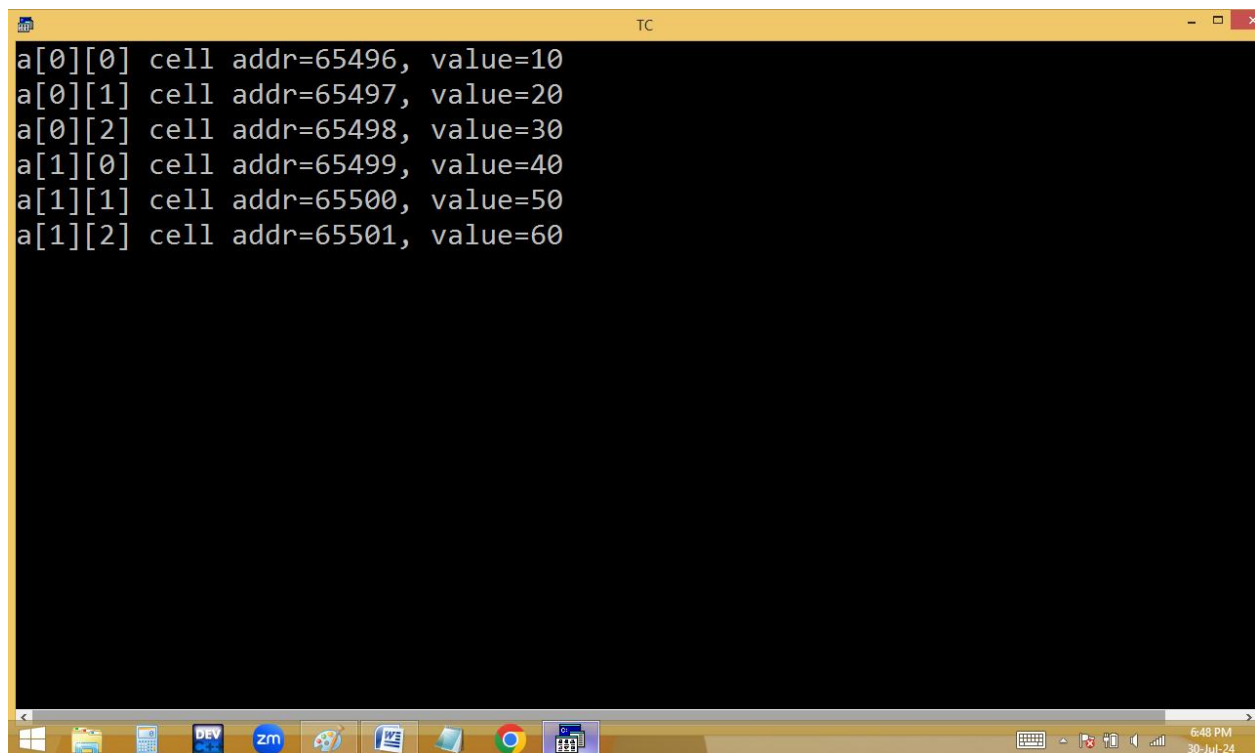
```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 40 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
float a[2][3]={10,20,30,40,50,60}; int r,c;
clrscr();
for(r=0;r<2;r++) for(c=0;c<3;c++)
printf("a[%d][%d] cell addr=%u, value=%f\n",r,c,&a[r][c],a[r][c]);
getch();
}
```



```
TC
a[0][0] cell addr=65480, value=10.000000
a[0][1] cell addr=65484, value=20.000000
a[0][2] cell addr=65488, value=30.000000
a[1][0] cell addr=65492, value=40.000000
a[1][1] cell addr=65496, value=50.000000
a[1][2] cell addr=65500, value=60.000000
```

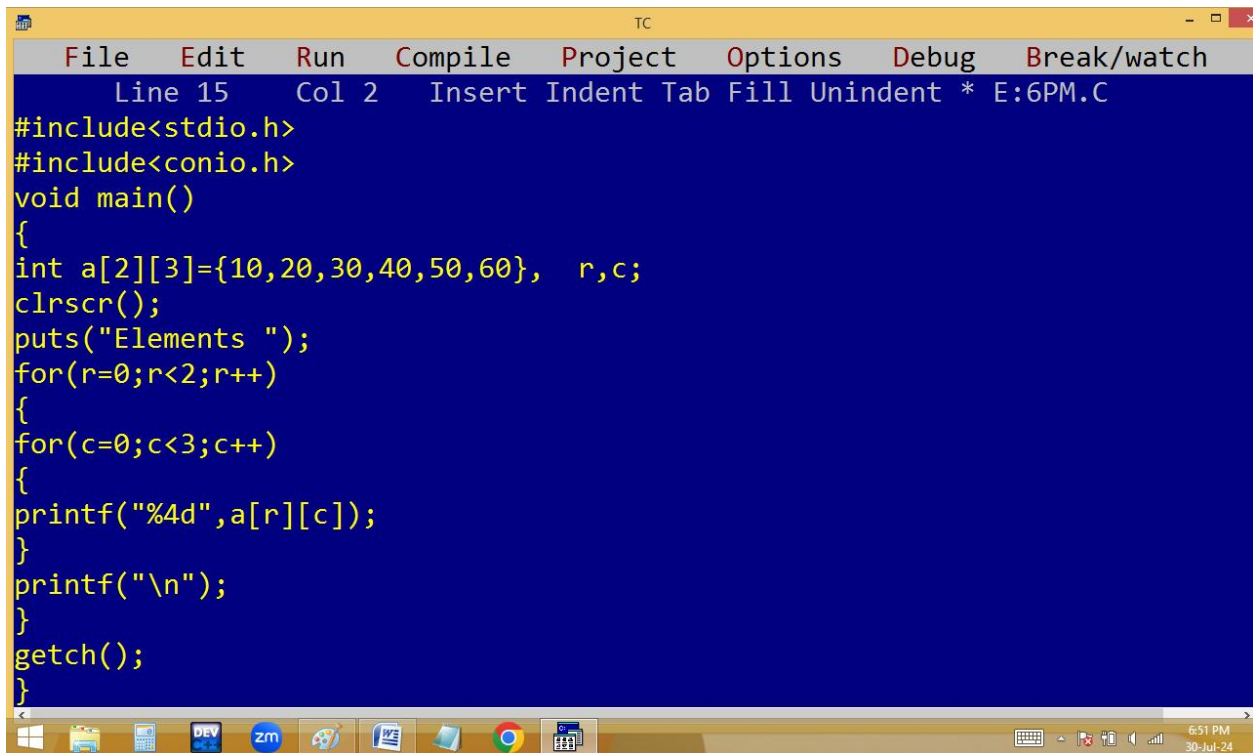


```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 8 Col 41 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
char a[2][3]={10,20,30,40,50,60}, r,c;
clrscr();
for(r=0;r<2;r++) for(c=0;c<3;c++)
printf("a[%d][%d] cell addr=%u, value=%d\n",r,c,&a[r][c],a[r][c]);
getch();
}
```

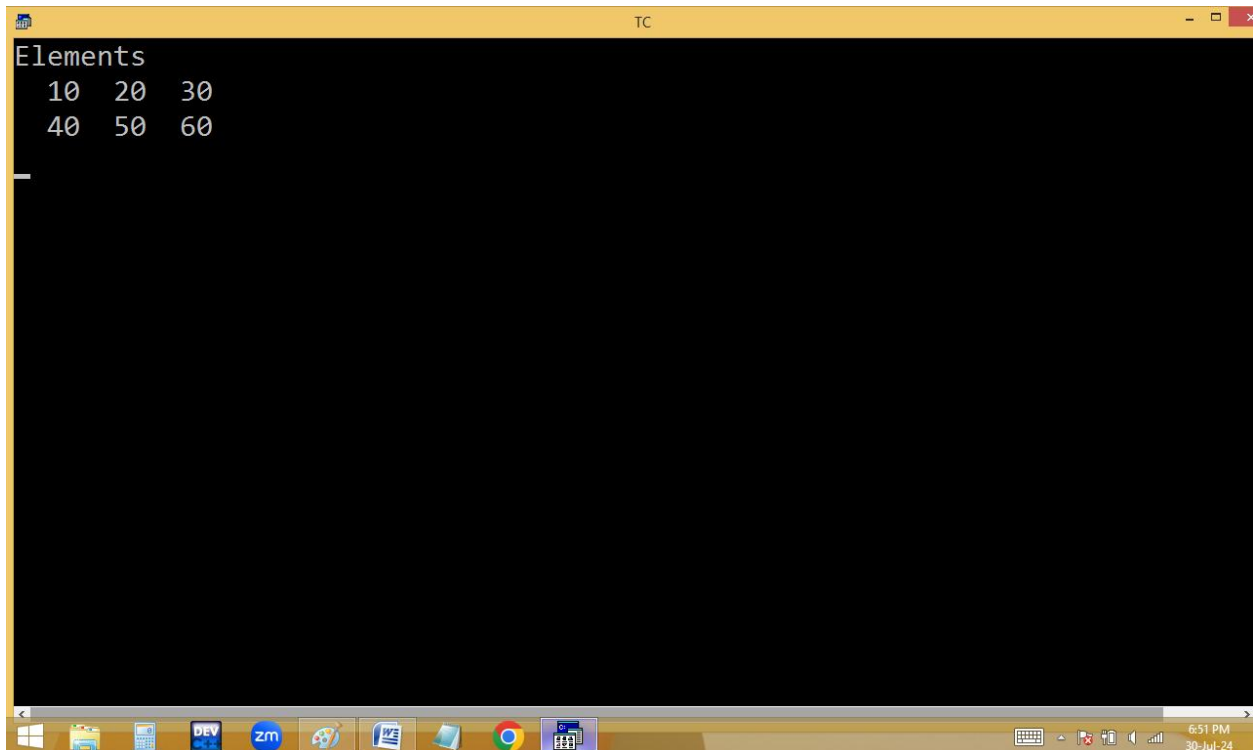


```
TC
a[0][0] cell addr=65496, value=10
a[0][1] cell addr=65497, value=20
a[0][2] cell addr=65498, value=30
a[1][0] cell addr=65499, value=40
a[1][1] cell addr=65500, value=50
a[1][2] cell addr=65501, value=60
```

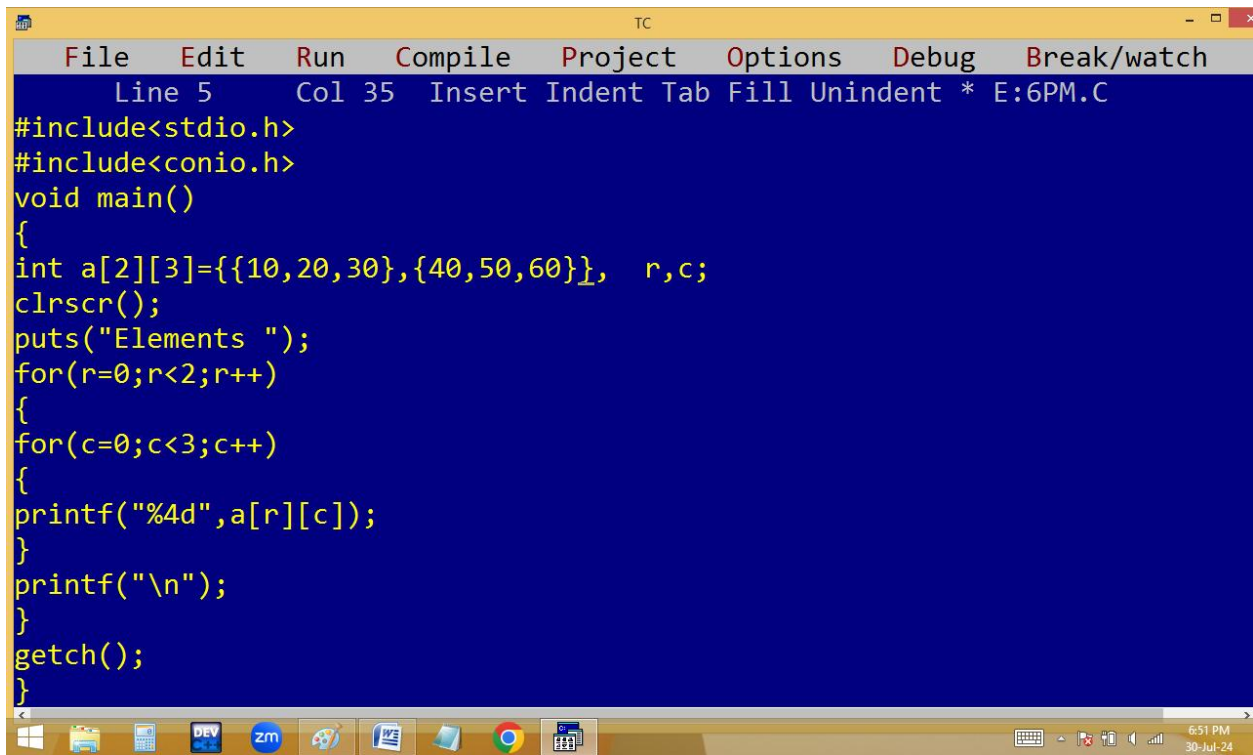
Direct initialization of array elements:



```
File Edit Run Compile Project Options Debug Break/watch
Line 15 Col 2 Insert Indent Tab Fill Unindent * E:6PM.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();
}
```

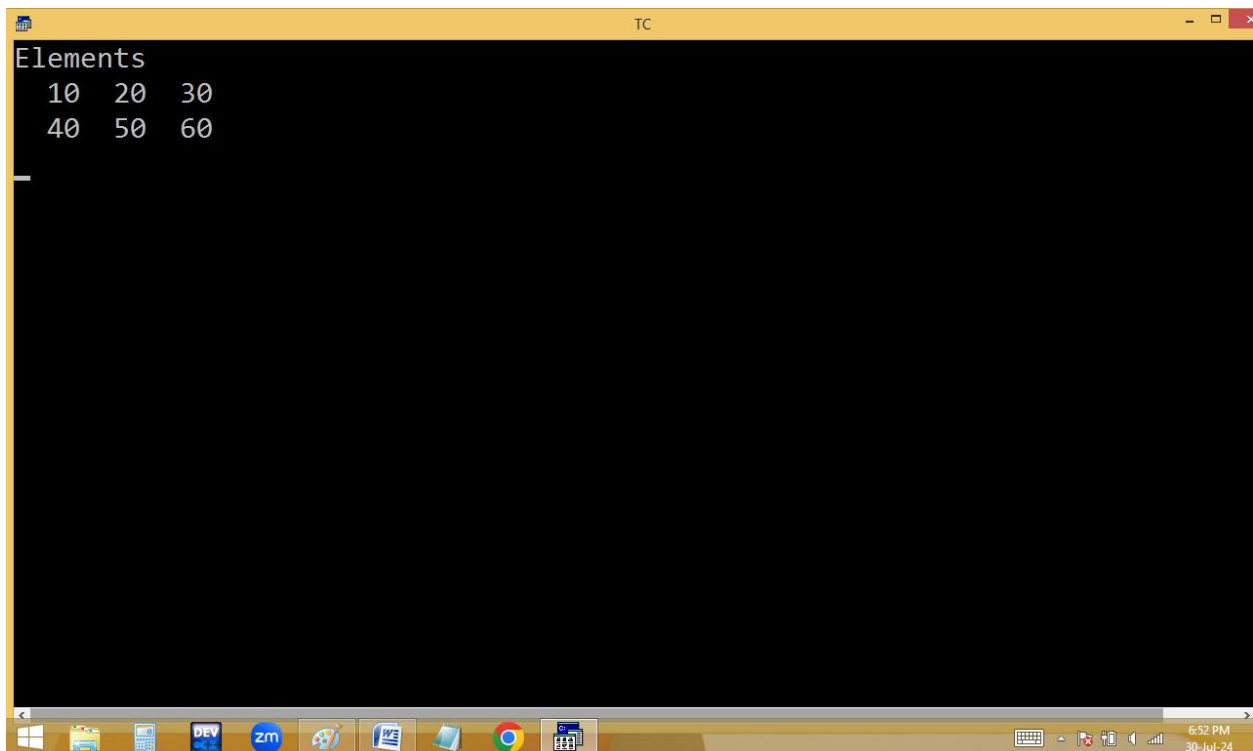


```
Elements
10  20  30
40  50  60
```



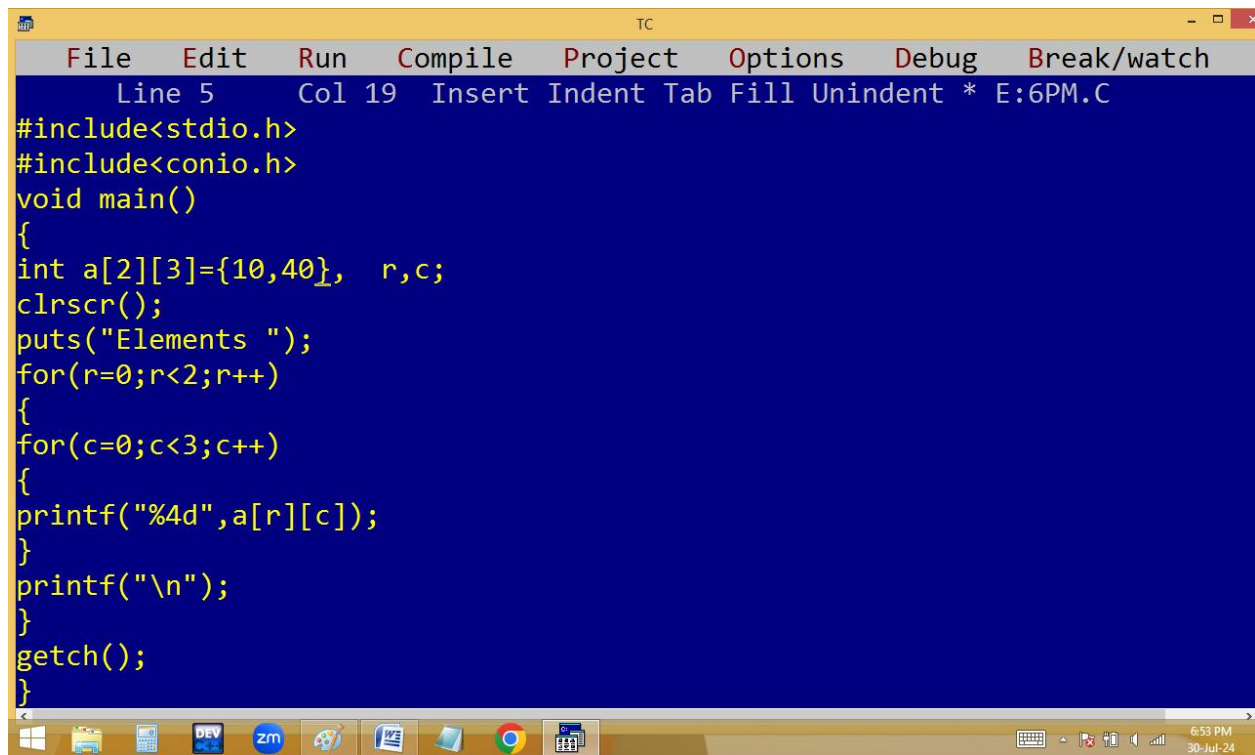
The screenshot shows the Turbo C++ (TC) IDE with a blue background. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the bottom indicates 'Line 5', 'Col 35', and 'Insert Indent Tab Fill Unindent * E:6PM.C'. The code is as follows:

```
#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();
}
```

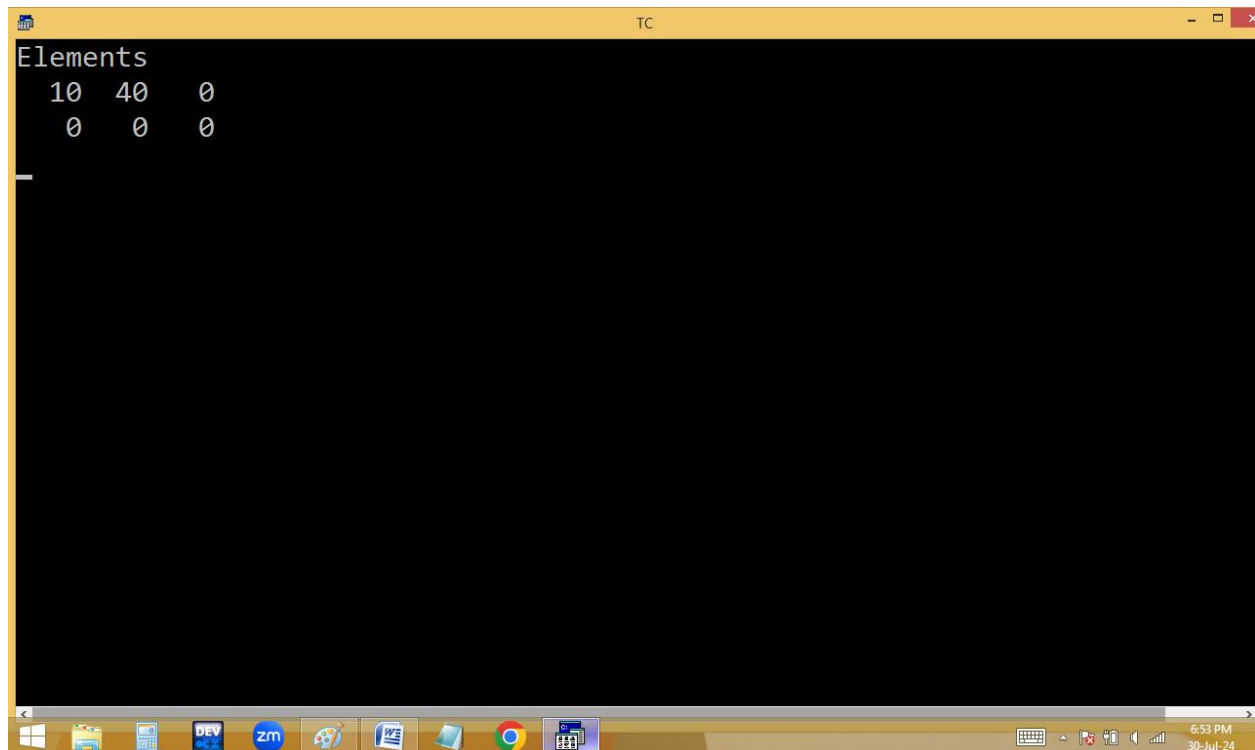


The screenshot shows the Turbo C++ (TC) IDE with a black background, displaying the output of the program. The text 'Elements' is printed on the first line. Below it, the elements of the 2x3 array are printed in two rows, with each element right-aligned and separated by spaces. The status bar at the bottom indicates '6:52 PM' and '30-Jul-24'.

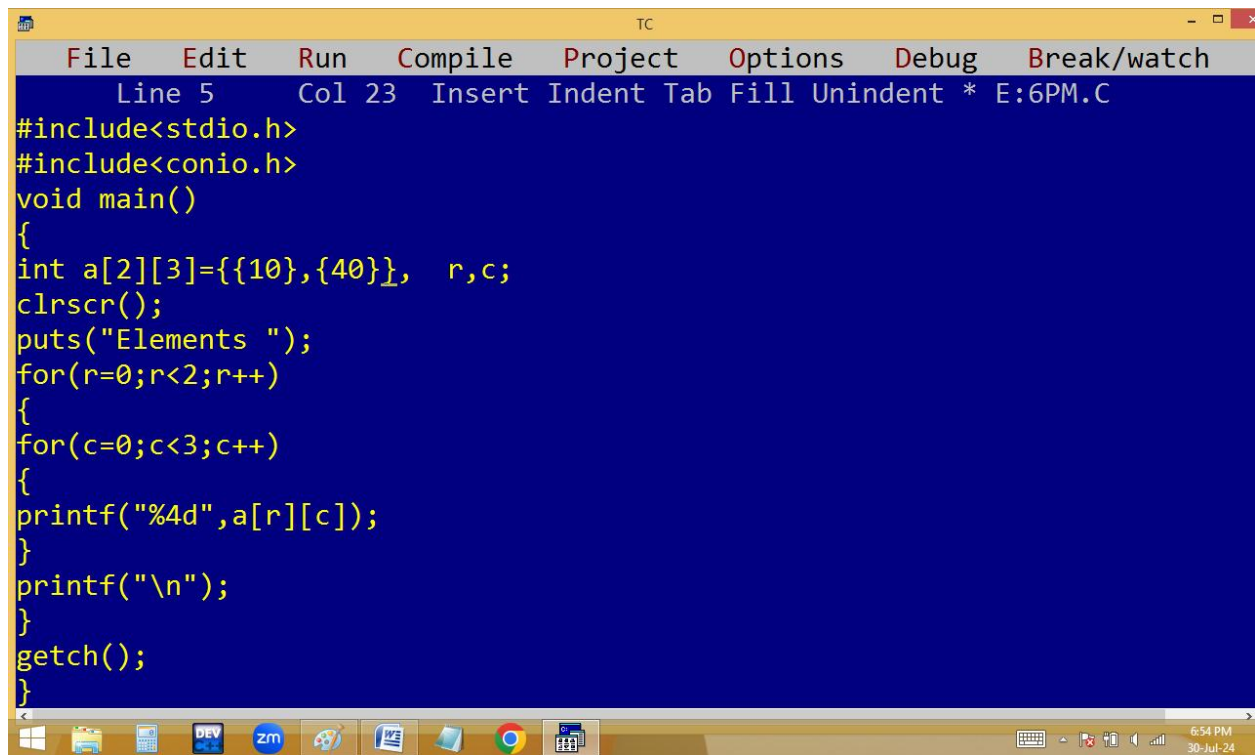
```
Elements
 10  20  30
 40  50  60
```



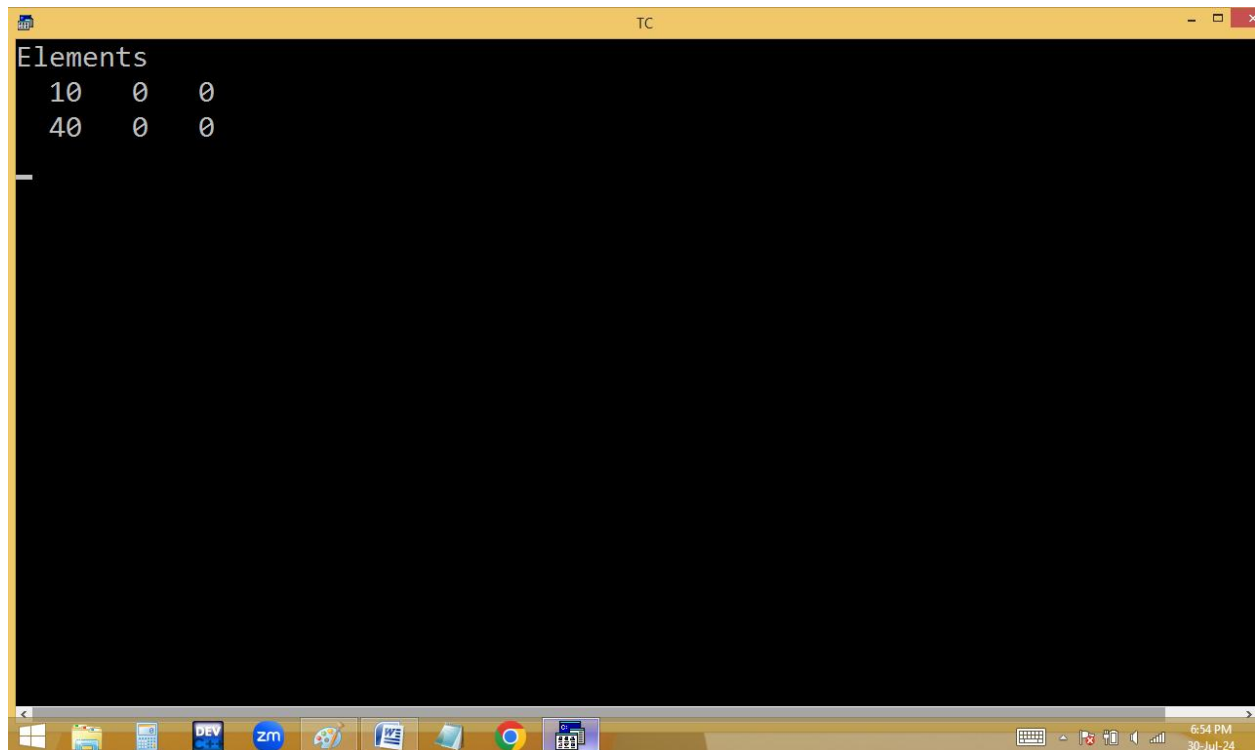
```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 19 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,40}, r,c;
clrscr();
puts("Elements ");
for(r=0;r<2;r++)
{
for(c=0;c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```



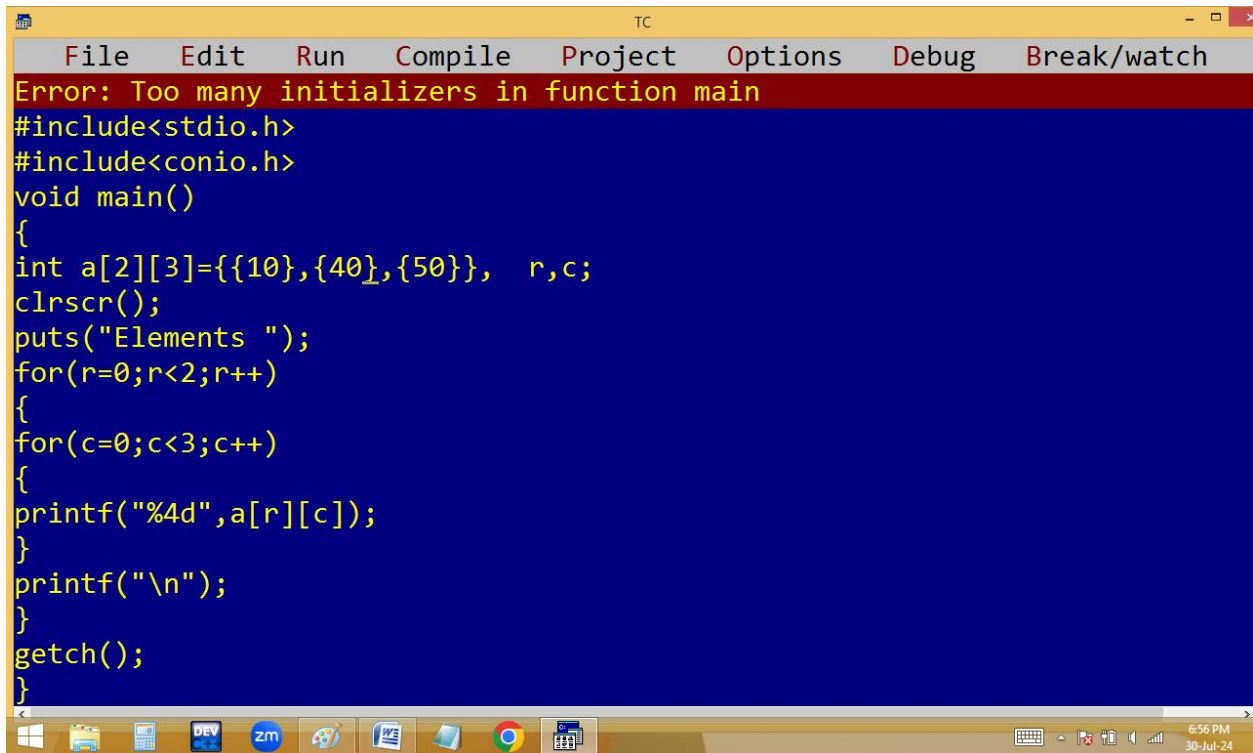
```
TC
Elements
10  40  0
0   0  0
```



```
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 23 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={{10},{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();
}
```



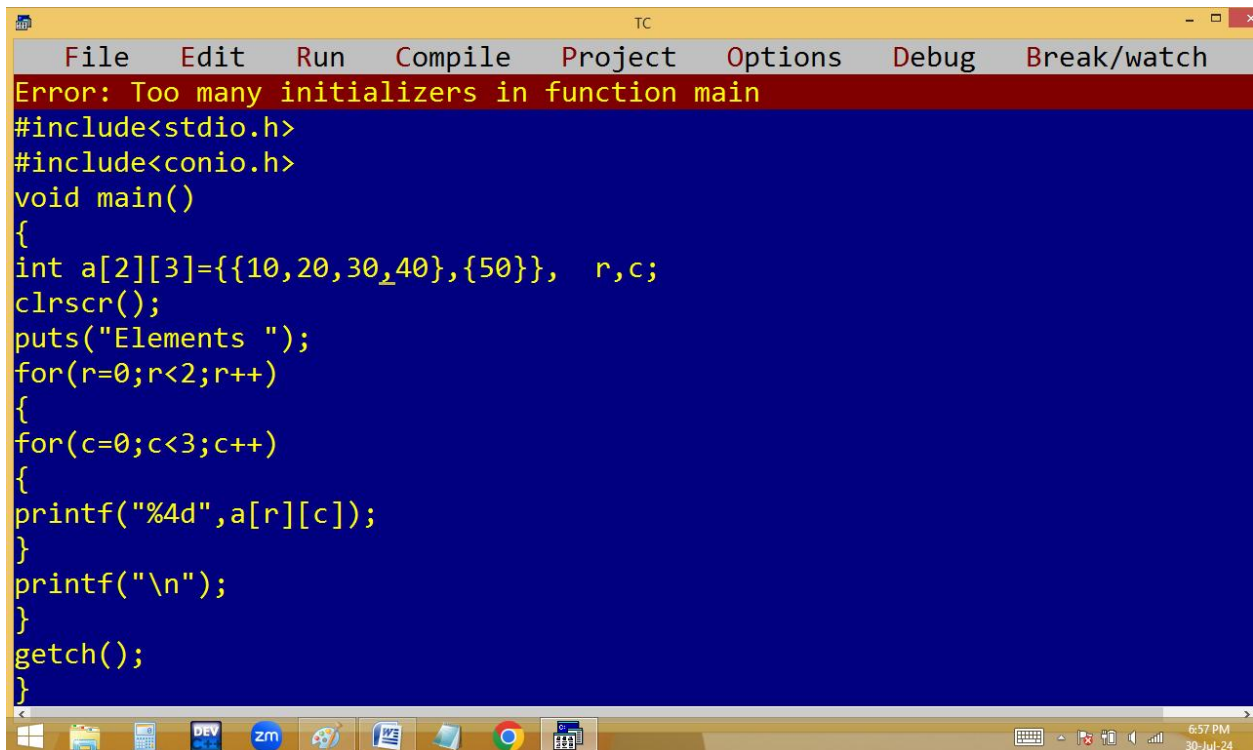
```
Elements
10  0  0
40  0  0
```

The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a dark blue editor area. A red error message banner at the top reads "Error: Too many initializers in function main". The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10},{40},{50}}, 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();
}
```

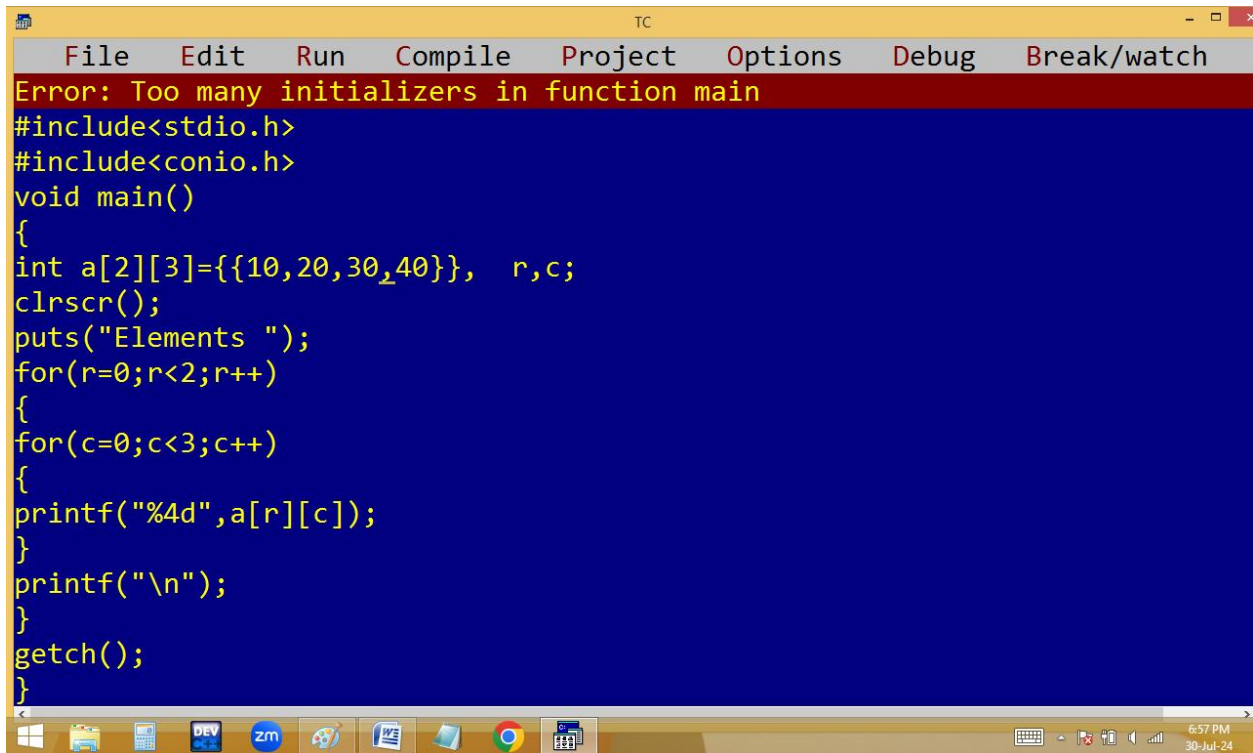
The Windows taskbar at the bottom shows the time as 6:56 PM on 30-Jul-24.



The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a dark blue editor area. A red error message banner at the top reads "Error: Too many initializers in function main". The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,20,30,40},{50}}, 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();
}
```

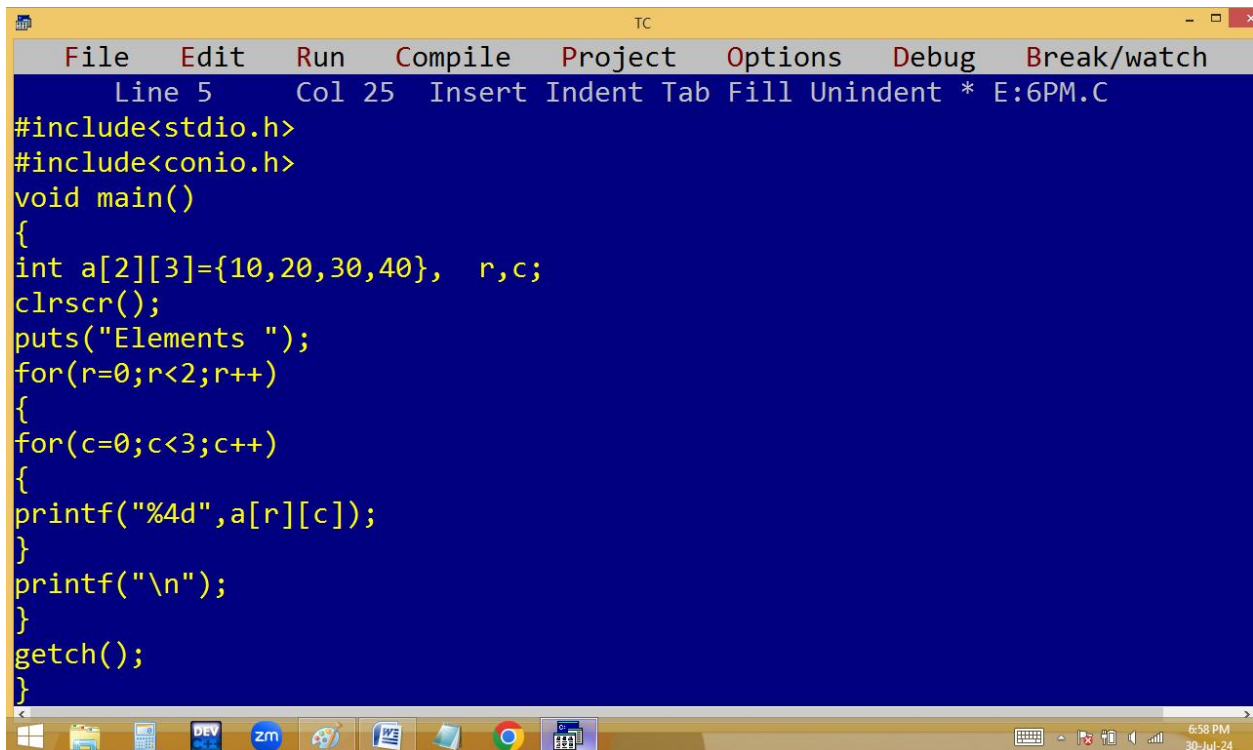
The Windows taskbar at the bottom shows the time as 6:57 PM on 30-Jul-24.



The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a dark blue editor area. A red error message banner at the top reads "Error: Too many initializers in function main". The code in the editor is as follows:

```
#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();
}
```

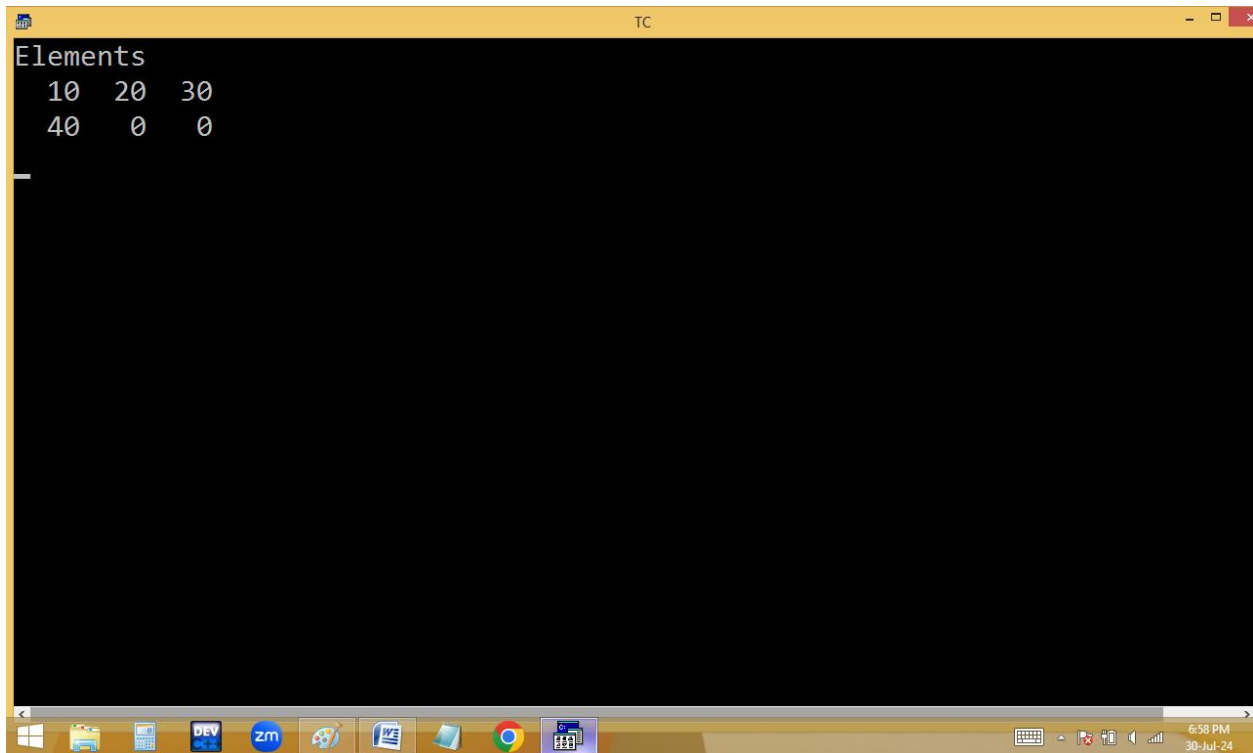
The Windows taskbar at the bottom shows the time as 6:57 PM on 30-Jul-24.



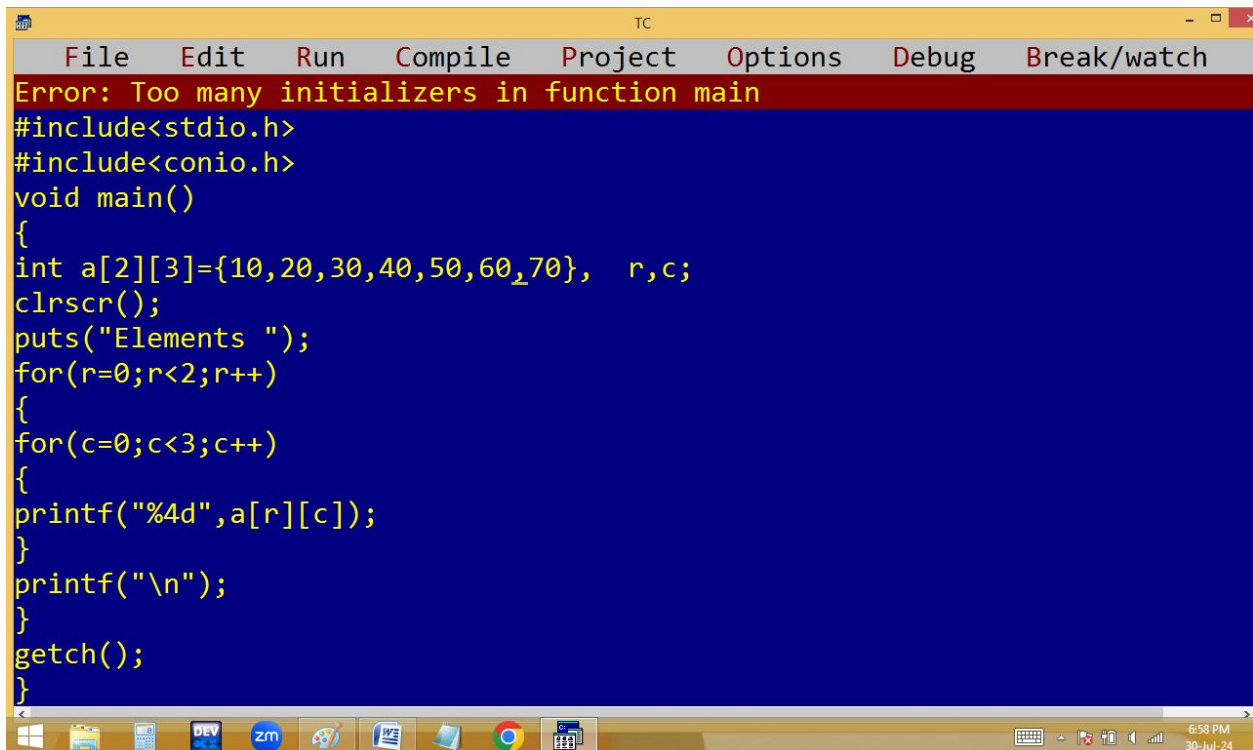
The screenshot shows the Turbo C++ (TC) IDE with the same menu bar. The editor area now displays the corrected code, with a status bar at the top indicating "Line 5 Col 25 Insert Indent Tab Fill Unindent * E:6PM.C". The code is as follows:

```
#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();
}
```

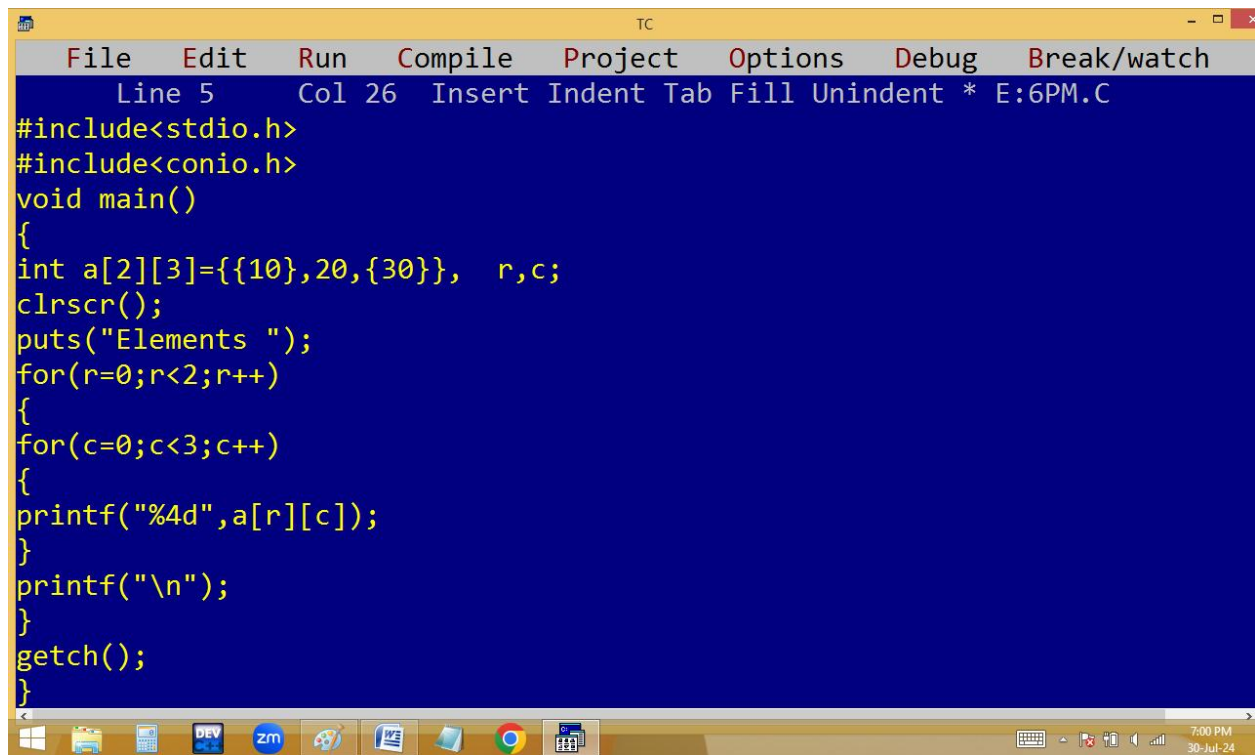
The Windows taskbar at the bottom shows the time as 6:58 PM on 30-Jul-24.



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

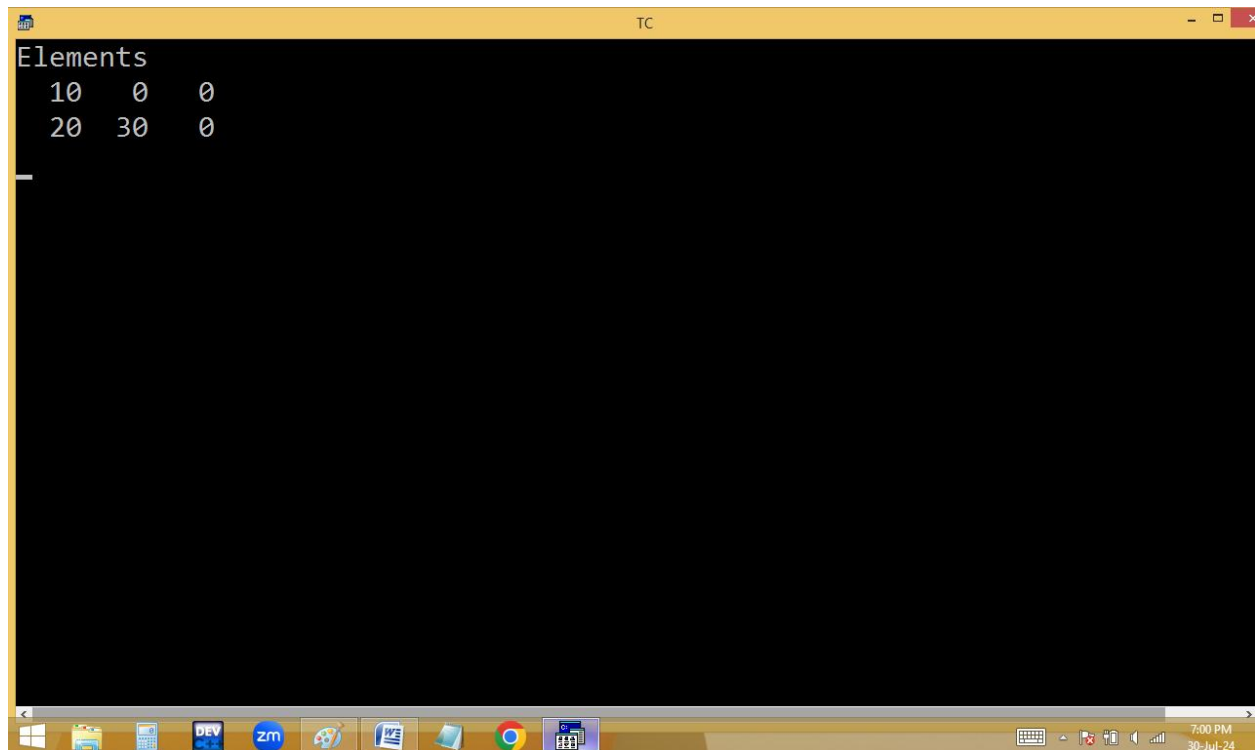


```
TC
File Edit Run Compile Project Options Debug Break/watch
Error: Too many initializers in function main
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,20,30,40,50,60,70}, r,c;
clrscr();
puts("Elements ");
for(r=0;r<2;r++)
{
for(c=0;c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```



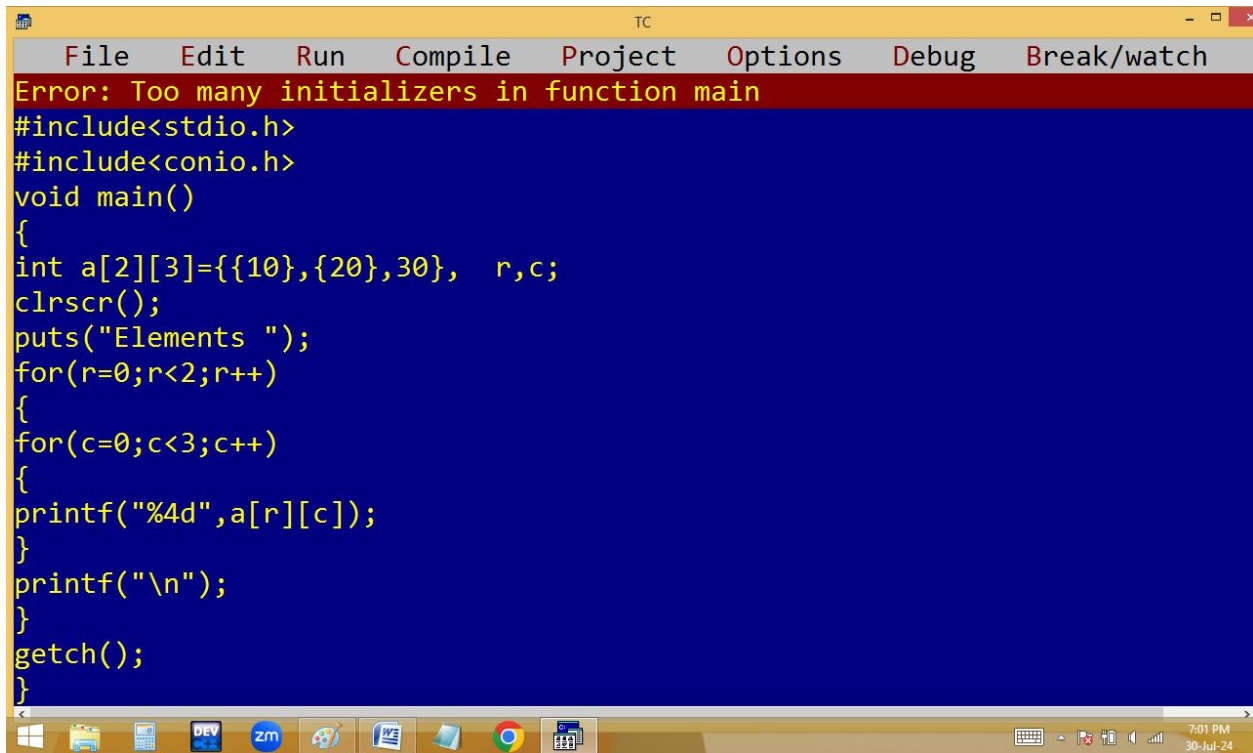
The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar and a menu bar containing File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 5', 'Col 26', and 'E:6PM.C'. The code is written in a blue editor window with yellow text. The code defines a 2x3 integer array 'a' with values {{10}, 20, {30}}, prints the header 'Elements', and uses nested loops to print each element followed by a newline. The Windows taskbar at the bottom shows various icons including DEV, zm, and a clock showing 7:00 PM on 30-Jul-24.

```
File Edit Run Compile Project Options Debug Break/watch
Line 5 Col 26 Insert Indent Tab Fill Unindent * E:6PM.C
#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();
}
```



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar. The output window displays the result of the program execution. It prints the word 'Elements' followed by two rows of three numbers each, separated by spaces. The first row contains '10', '0', and '0', and the second row contains '20', '30', and '0'. The Windows taskbar at the bottom is identical to the first screenshot, showing a clock of 7:00 PM on 30-Jul-24.

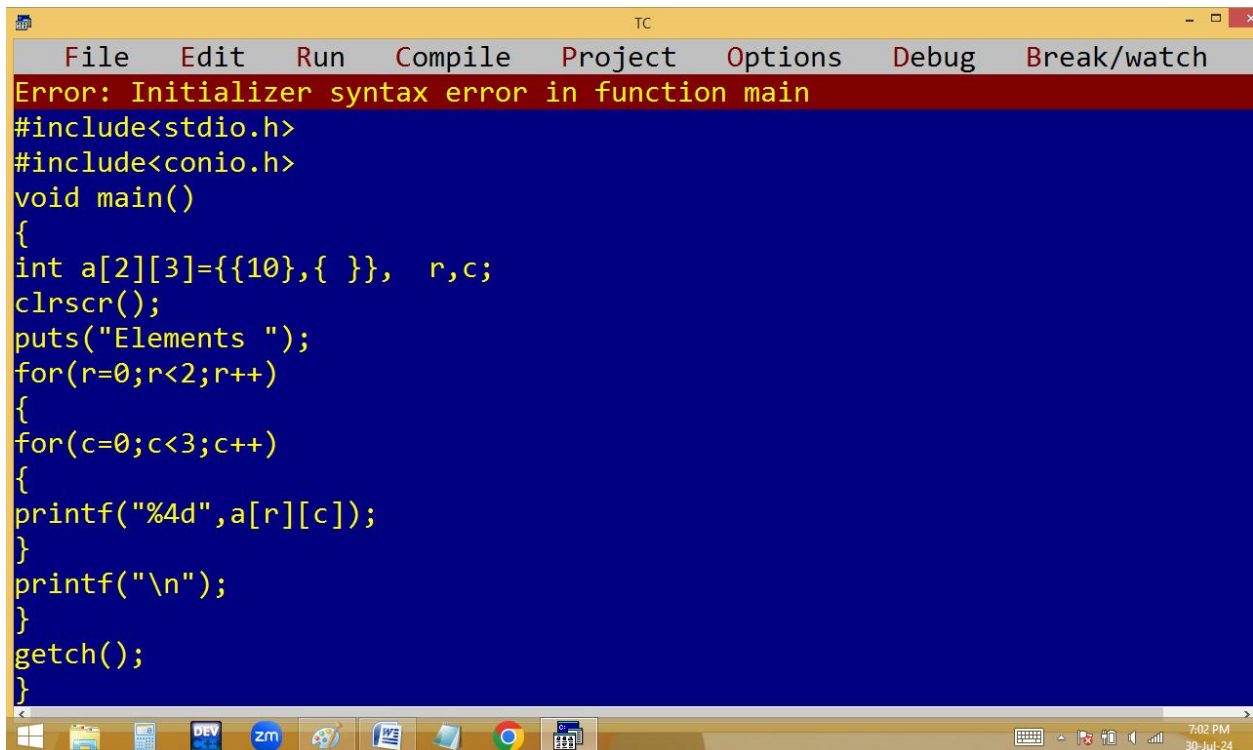
```
Elements
10  0  0
20 30  0
```



The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a dark blue editor area. A red error message banner at the top reads "Error: Too many initializers in function main". The code in the editor is as follows:

```
#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();
}
```

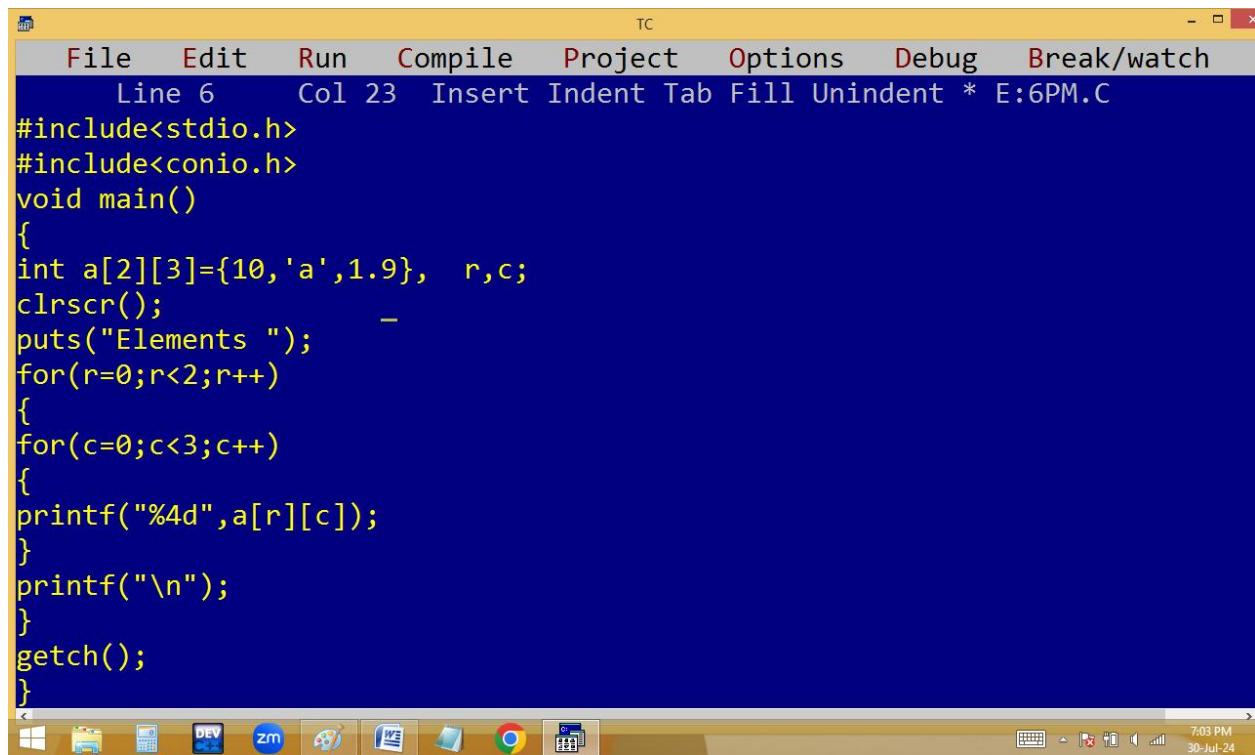
The Windows taskbar at the bottom shows the time as 7:01 PM on 30-Jul-24.



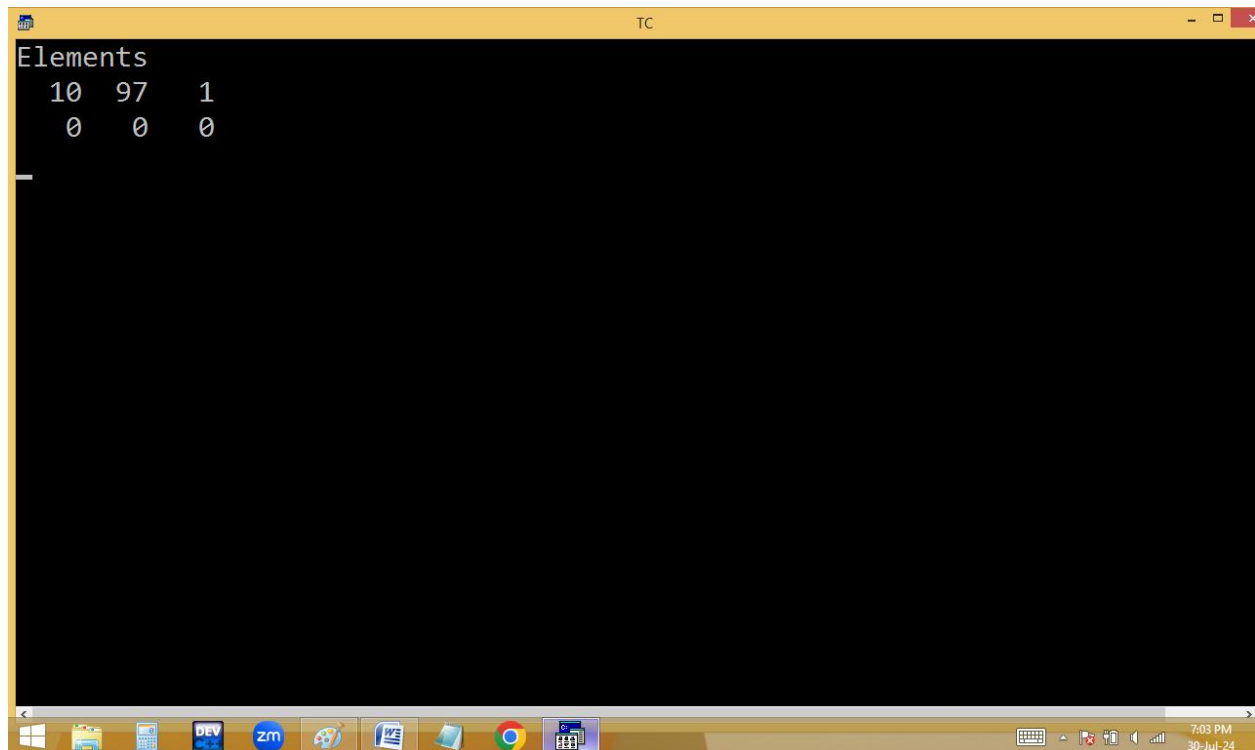
The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a dark blue editor area. A red error message banner at the top reads "Error: Initializer syntax error in function main". The code in the editor is as follows:

```
#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();
}
```

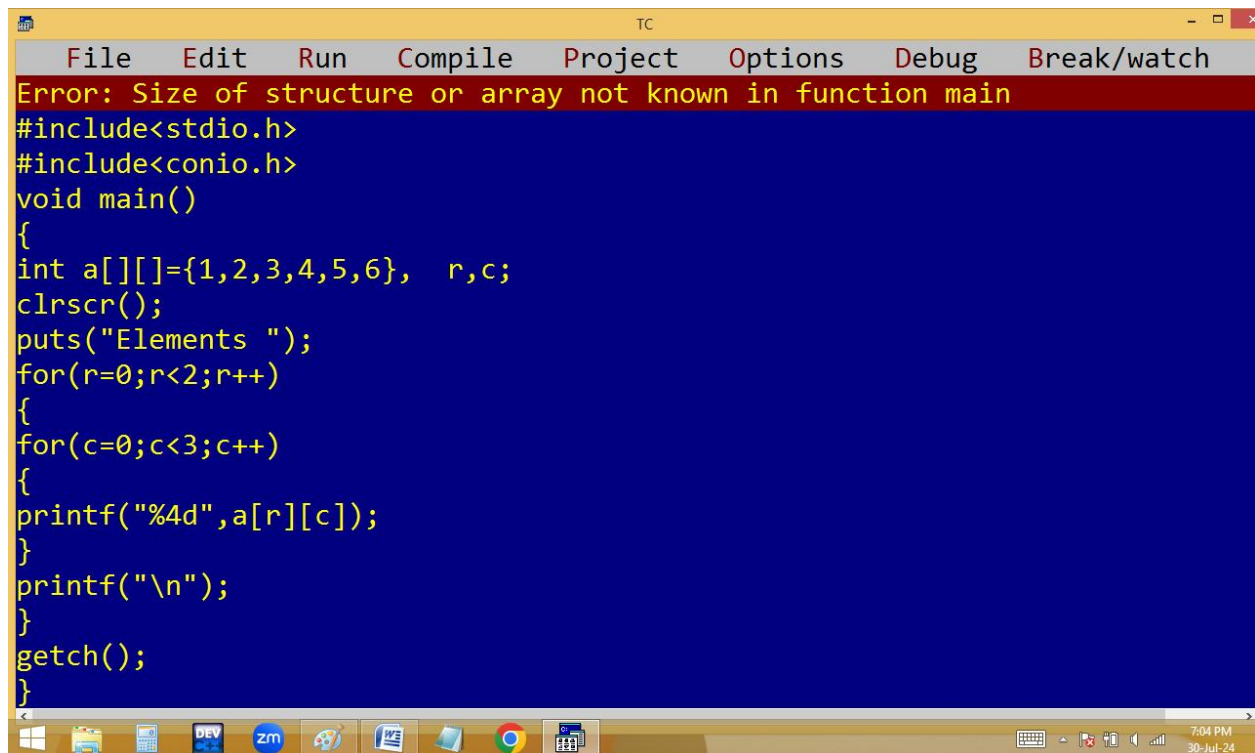
The Windows taskbar at the bottom shows the time as 7:02 PM on 30-Jul-24.



```
File Edit Run Compile Project Options Debug Break/watch
Line 6 Col 23 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={10,'a',1.9}, 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();
}
```



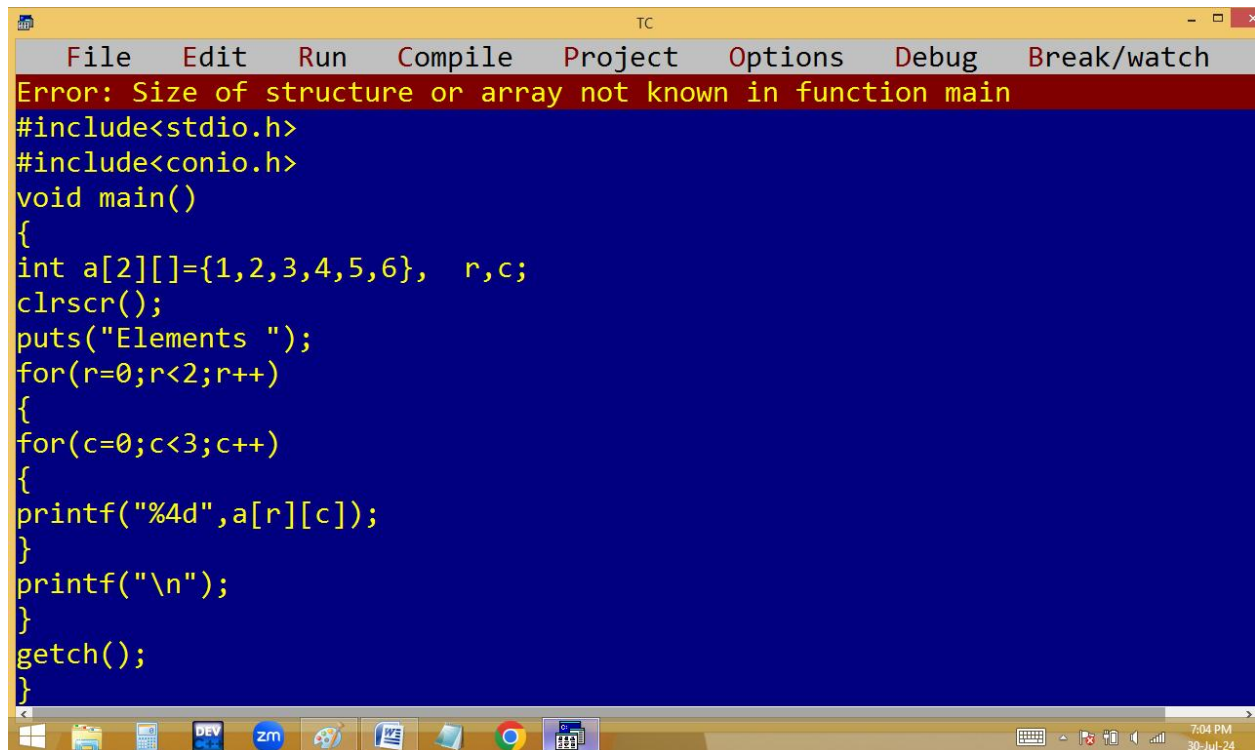
```
Elements
10  97  1
0   0   0
```



The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a dark blue editor area. A red error message banner at the top reads "Error: Size of structure or array not known in function main". The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][]={1,2,3,4,5,6}, 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();
}
```

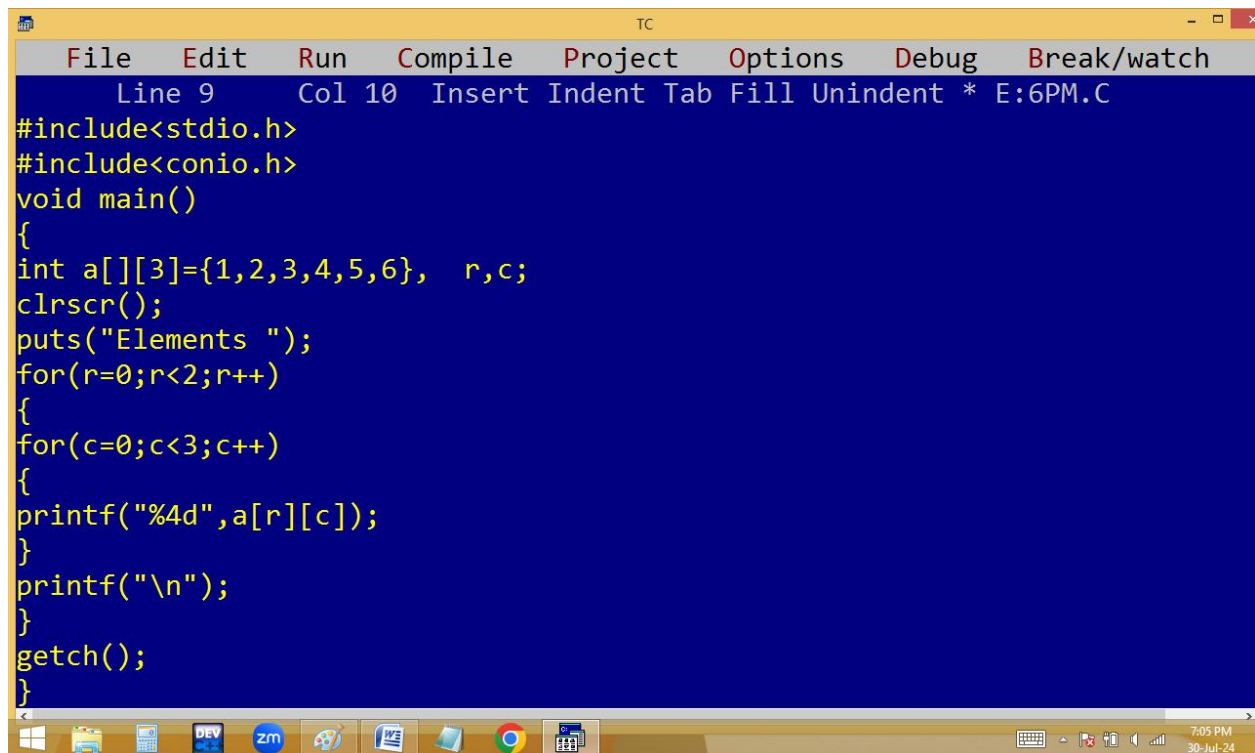
The Windows taskbar at the bottom shows icons for File Explorer, Calculator, DEV C++, ZOOM, and other applications, with a system clock indicating 7:04 PM on 30-Jul-24.



This screenshot is identical to the one above, showing the same TC IDE window with the same error message and code. The code in the editor is:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][]={1,2,3,4,5,6}, 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();
}
```

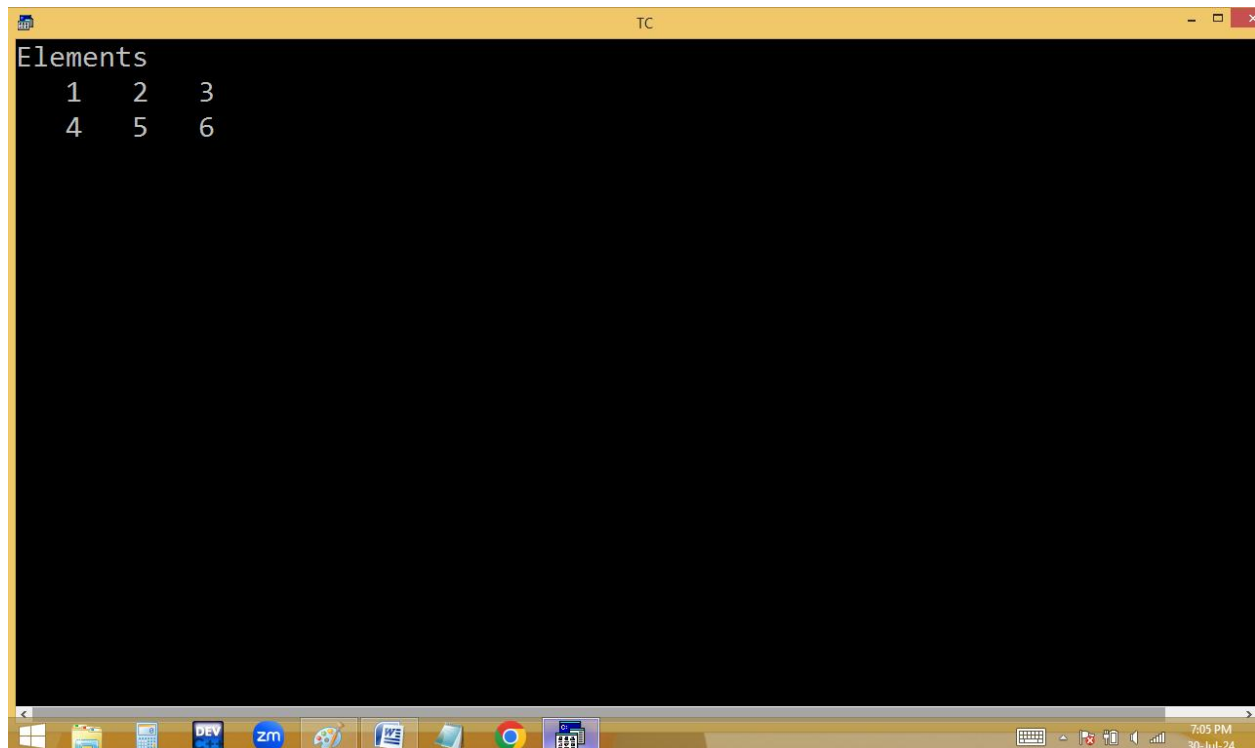
The taskbar and system clock are also identical to the first screenshot.



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar and a menu bar containing File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 9 Col 10 Insert Indent Tab Fill Unindent * E:6PM.C'. The main editing area has a blue background and contains the following C code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][3]={1,2,3,4,5,6}, 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();
}
```

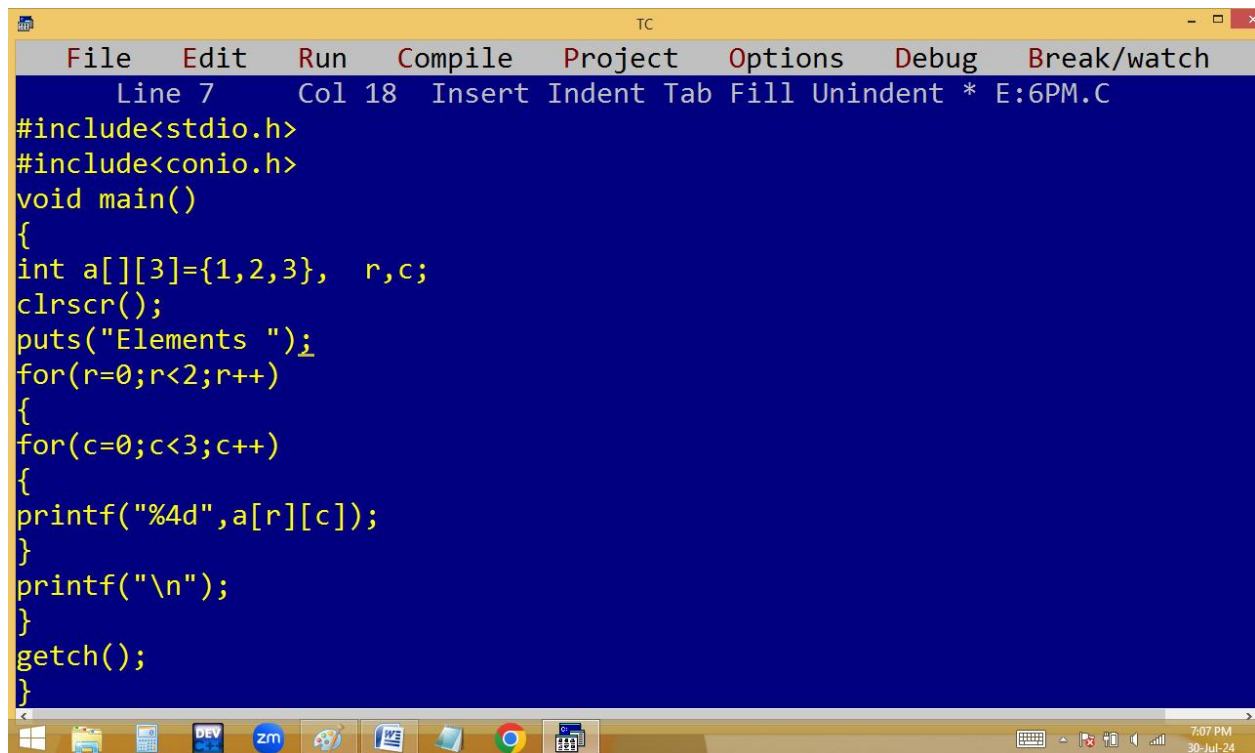
The Windows taskbar at the bottom shows icons for File Explorer, Calculator, DEV C++, Zoom, and other applications. The system clock in the bottom right corner displays '7:05 PM 30-Jul-24'.



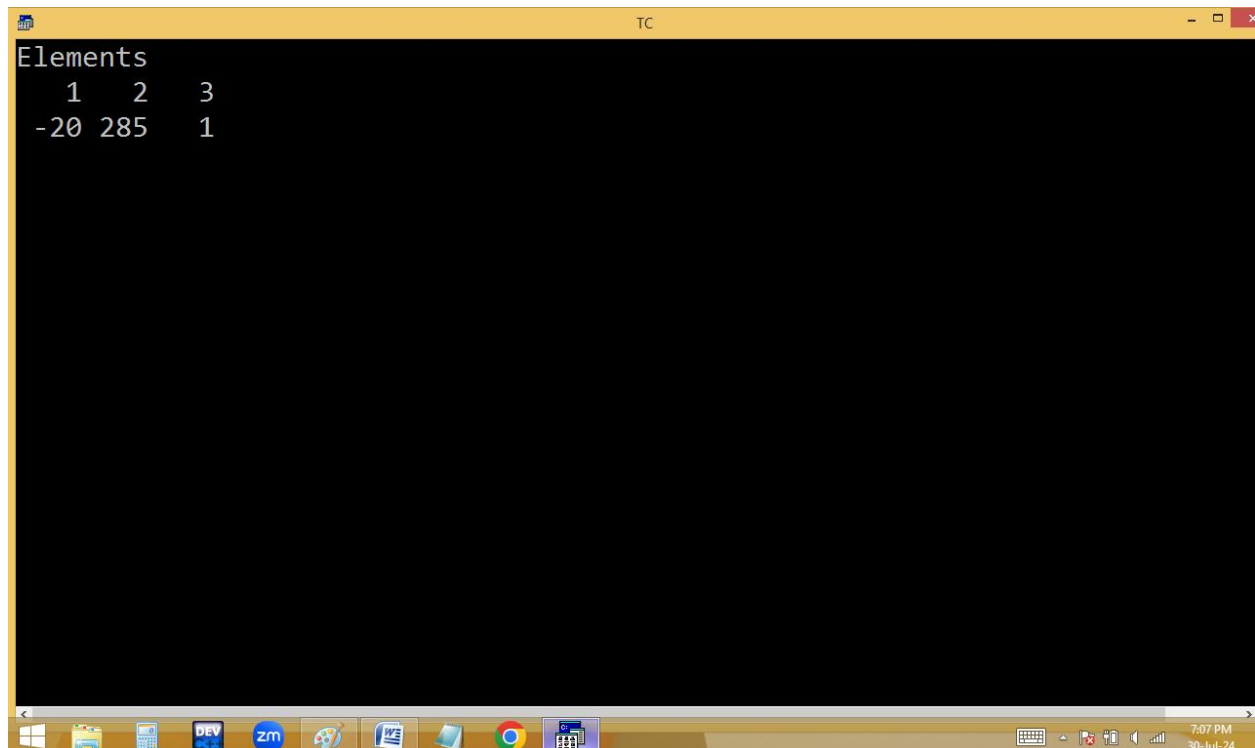
The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar. The main editing area has a black background and displays the output of the program:

```
Elements
 1  2  3
 4  5  6
```

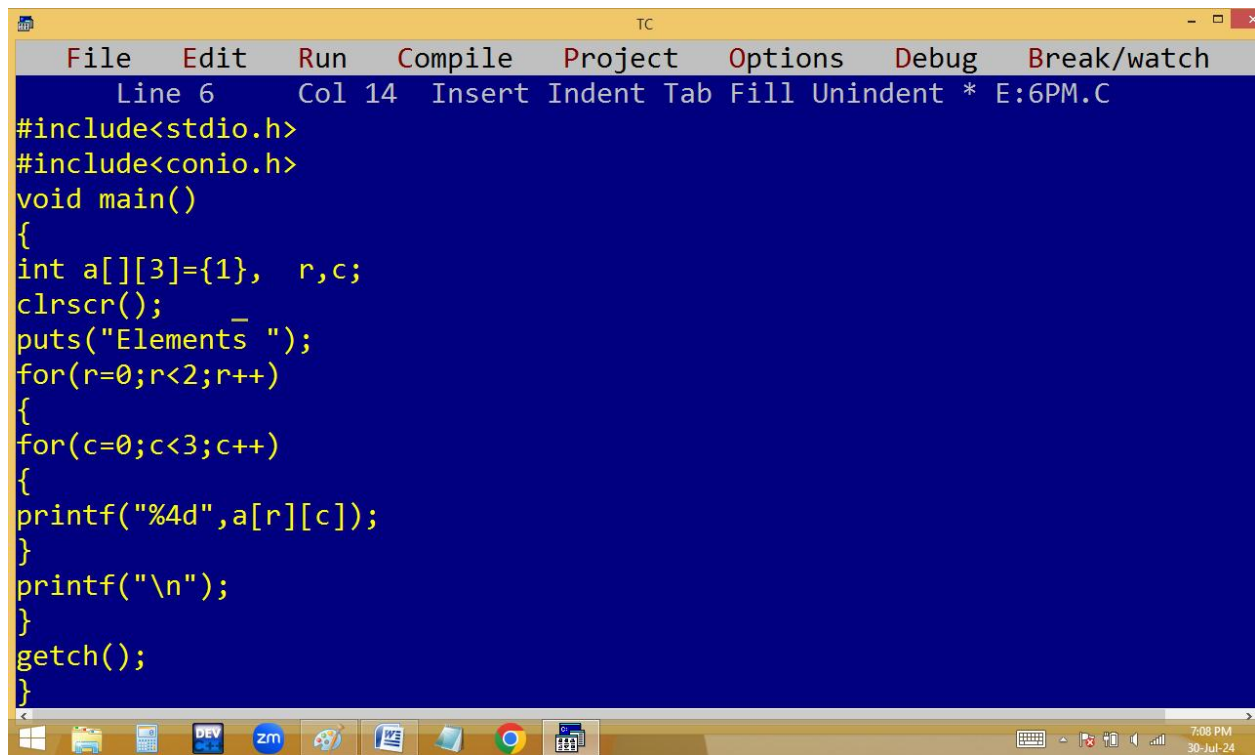
The Windows taskbar at the bottom is identical to the first screenshot, showing the same set of application icons and system clock.



```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 7 Col 18 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][3]={1,2,3}, 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();
}
```



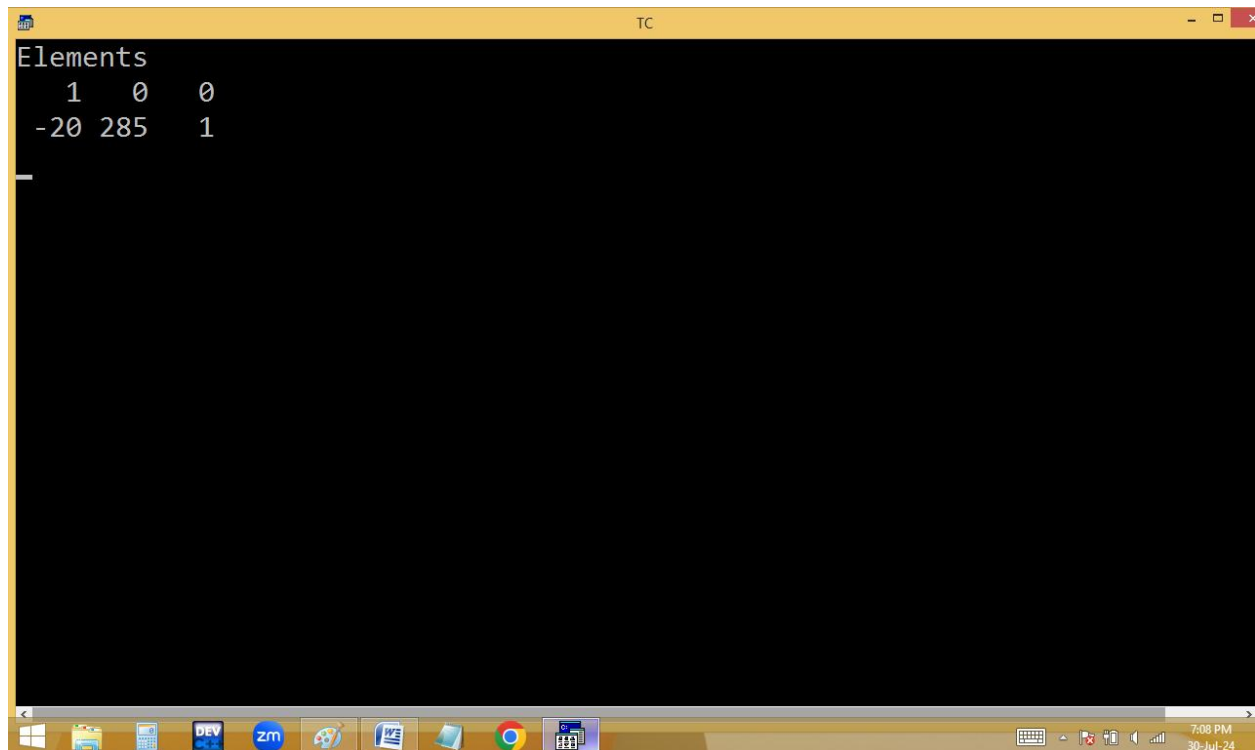
```
TC
Elements
1 2 3
-20 285 1
```



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar and a menu bar containing File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 6 Col 14 Insert Indent Tab Fill Unindent * E:6PM.C'. The code is written in a blue editor window and is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[][3]={1}, 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();
}
```

The Windows taskbar at the bottom shows icons for Windows, File Explorer, Calculator, DEV C++, ZOOM, Paint, Notepad, Google Chrome, and a task view icon. The system clock in the bottom right corner shows 7:08 PM on 30-Jul-24.



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar and a menu bar. The status bar at the top indicates 'Line 6 Col 14 Insert Indent Tab Fill Unindent * E:6PM.C'. The output is displayed in a black window with the following text:

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

The Windows taskbar at the bottom shows icons for Windows, File Explorer, Calculator, DEV C++, ZOOM, Paint, Notepad, Google Chrome, and a task view icon. The system clock in the bottom right corner shows 7:08 PM on 30-Jul-24.


```
TC
Line 18 Col 22 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3]={9}, r,c;
clrscr();
a[0][0]=1; a[1][2]=6;
puts("Elements ");
for(r=0;r<2;r++)
{
for(c=0;c<3;c++)
{
printf("%4d",a[r][c]);
}
printf("\n");
}
getch();
}
```

```
TC
Elements
1  0  0
0  0  6
```

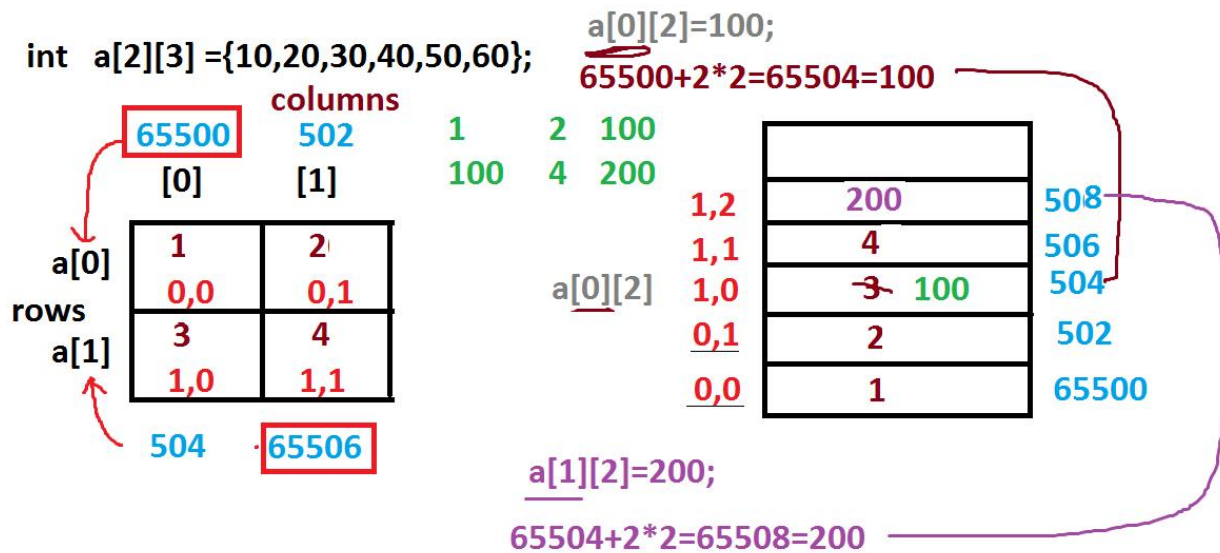
Page: 25 of 25 Words: 175 120% 7:09 PM 30-Jul-24

```
TC
Line 13 Col 11 Insert Indent Tab Fill Unindent * E:6PM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a[2][3], r,c;
clrscr();
a[0][0]=1; a[1][2]=6;
puts("Elements ");
for(r=0;r<2;r++)
{
for(c=0;c<3;c++)
{
printf("%6d",a[r][c]);
}
printf("\n");
}
getch();
}
```

```
TC
1 7083 1824
-20 5201 6
```

```
TC
Line 18 Col 25 Insert Indent Tab Fill Unindent * E:6PM.C
#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("%6d",a[r][c]);
}
printf("\n");
}
getch();
}
```

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



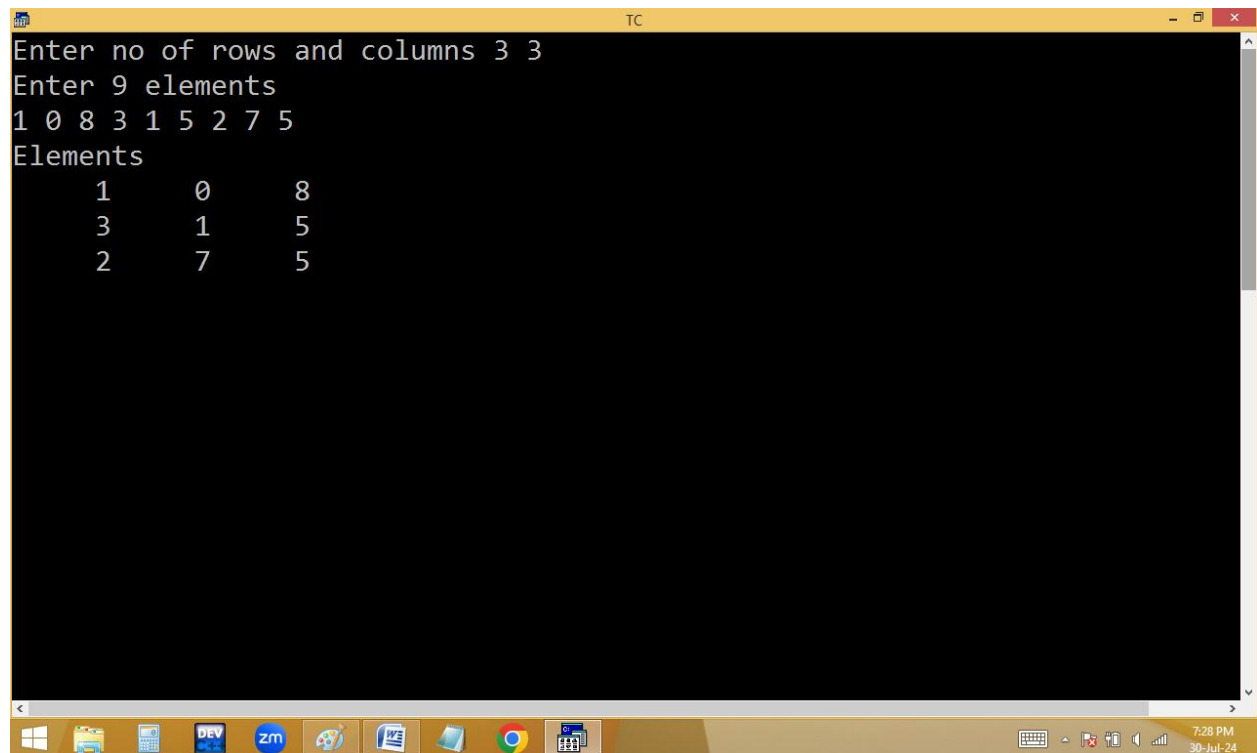
Reading and printing elements of n*n matrix:

```

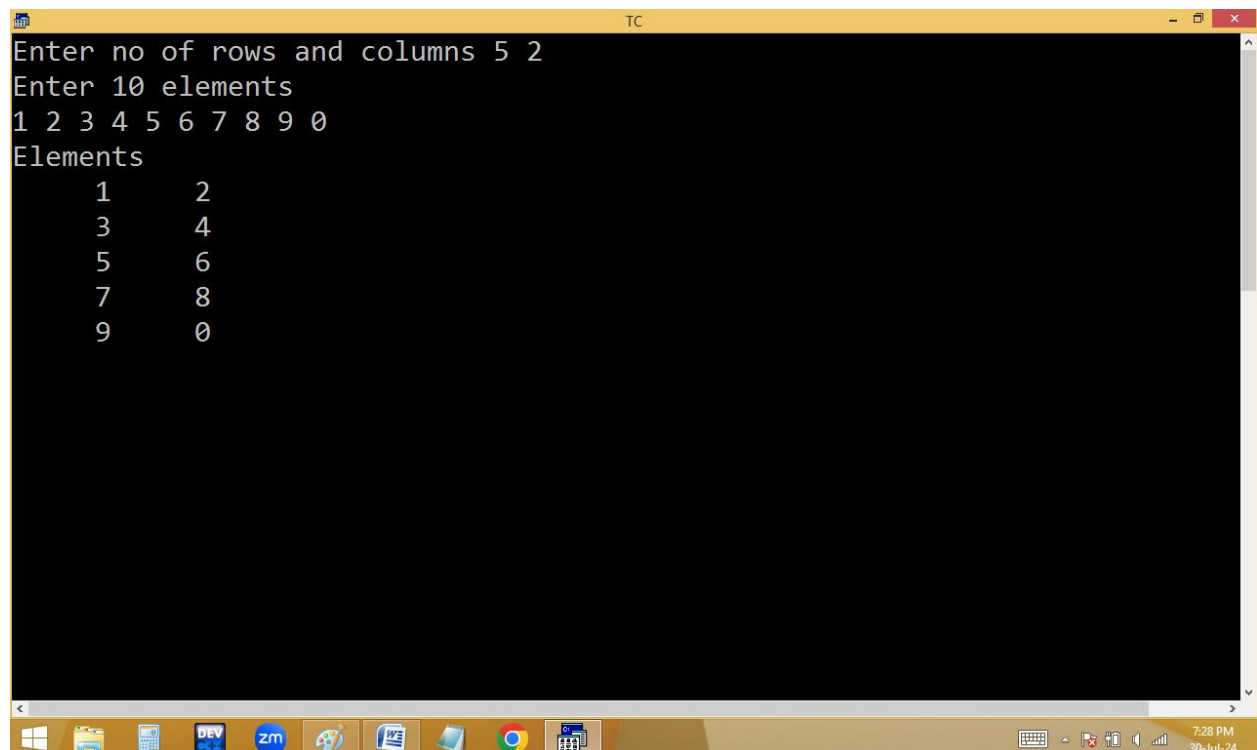
#include<stdio.h>
#include<conio.h>
void main()
{
int a[10][10],nr,nc, r,c; clrscr();
printf("Enter no of rows and columns ");scanf("%d %d",&nr, &nc);
printf("Enter %d elements\n", nr*nc);
for(r=0;r<nr;r++) for(c=0;c<nc;c++)scanf("%d",&a[r][c]);
puts("Elements ");
for(r=0;r<nr;r++)
{
for(c=0;c<nc;c++)
{
printf("%6d",a[r][c]);
}
printf("\n");
}
getch();
}

```

```
TC
Enter no of rows and columns 3 3
Enter 9 elements
1 0 8 3 1 5 2 7 5
Elements
    1    0    8
    3    1    5
    2    7    5
```

A screenshot of a Windows 10 desktop. The taskbar at the bottom shows icons for Windows, File Explorer, Calculator, DEV, zm, Paint, Word, Edge, and a calendar. The system tray on the right shows the time as 7:28 PM on 30-Jul-24. A terminal window titled 'TC' is open, displaying the following text: 'Enter no of rows and columns 3 3', 'Enter 9 elements', '1 0 8 3 1 5 2 7 5', 'Elements', and a 3x3 matrix of numbers: 1 0 8, 3 1 5, 2 7 5.

```
TC
Enter no of rows and columns 5 2
Enter 10 elements
1 2 3 4 5 6 7 8 9 0
Elements
    1    2
    3    4
    5    6
    7    8
    9    0
```

A screenshot of a Windows 10 desktop, identical to the one above. The terminal window titled 'TC' displays: 'Enter no of rows and columns 5 2', 'Enter 10 elements', '1 2 3 4 5 6 7 8 9 0', 'Elements', and a 5x2 matrix of numbers: 1 2, 3 4, 5 6, 7 8, 9 0.

