ARRAYS

It is collection of homogeneous [same type] variables.

Array is nothing but collection of contiguous memory locations, where we can store and manage more than one value of same type under one name.

It is a derived data type.

It is an implicit / internal pointer.

It is a implicit const pointer

It is one of data structure.

Advantages:

Generally to store several values of same type, we have to declare several variables. Here we have to remember all these variable names also. When the program is too big, it is very difficult to remember all the variable names. In this situation, the only solution is array.

Array reduce program length.

Array minimize the errors.

In functions to carry several values of same type at a time, we are using arrays.

It allows to arrange our data in a order.

Disadvantage:

Array size is Constant Positive Integer value. Due to this we are not able to change the array size at run time. Sometimes it causes memory wastage / shortage.

In C language we are using

1. **One dimensional arrays**
2. **Multi dimensional arrays**

One dimensional arrays:

- **An array with one row and several columns.**
- **An array with single subscripting operator [ ] is called one dimensional array.**
- **It is an implicit single pointer.**

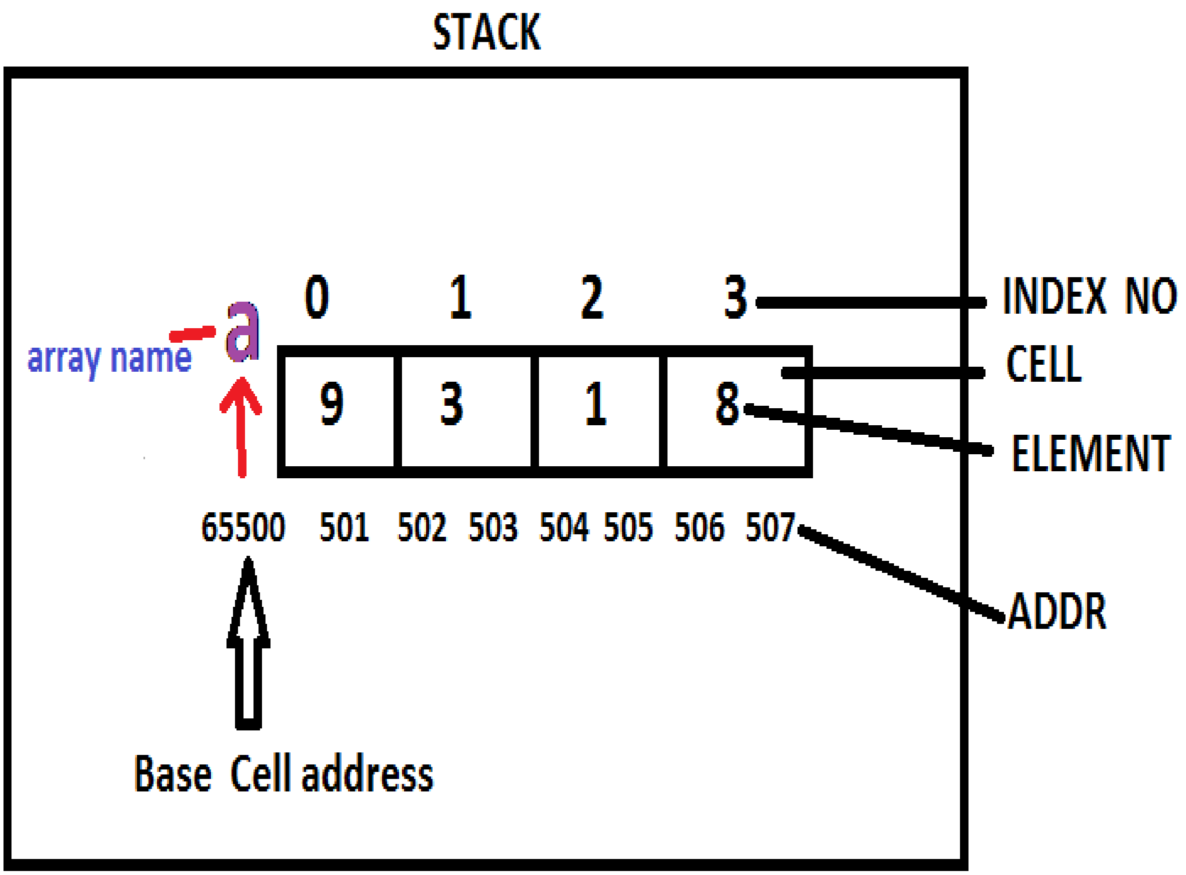
Syntax:

```
datatype  variable[size] = {elements};
```

Eg:

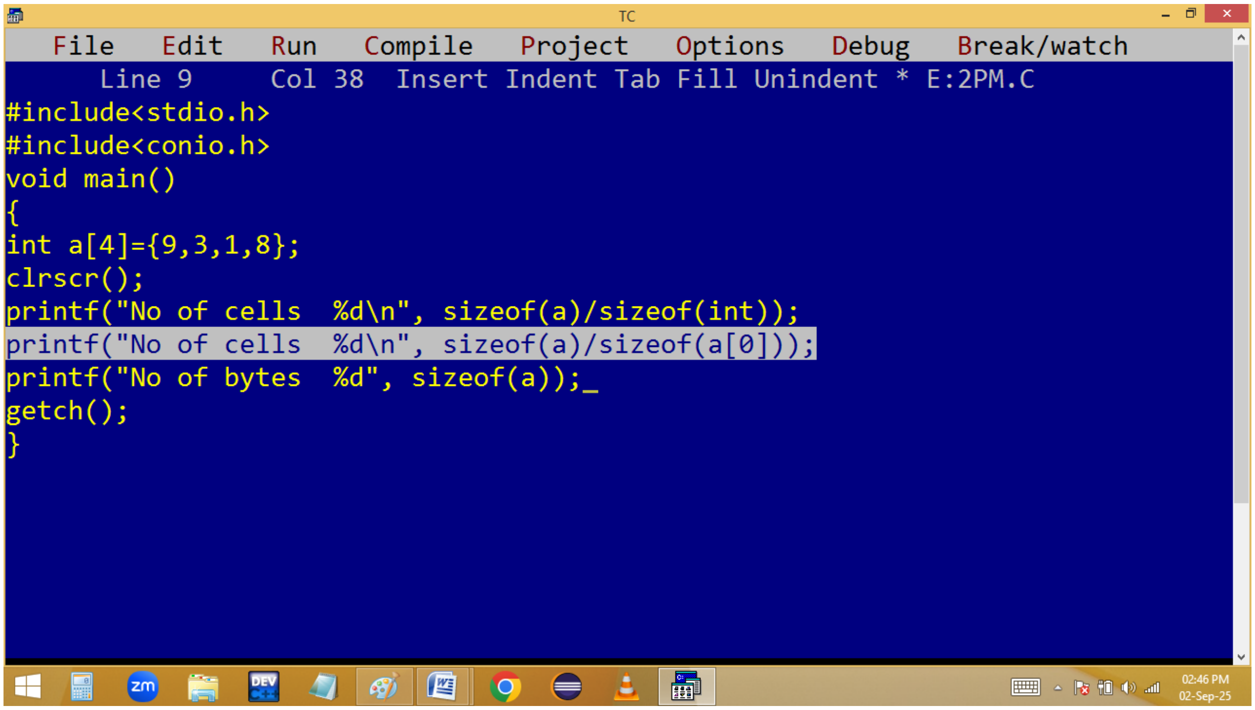
```
int  a[4] = { 9, 3, 1, 8 };
```

Memory allocation for array:

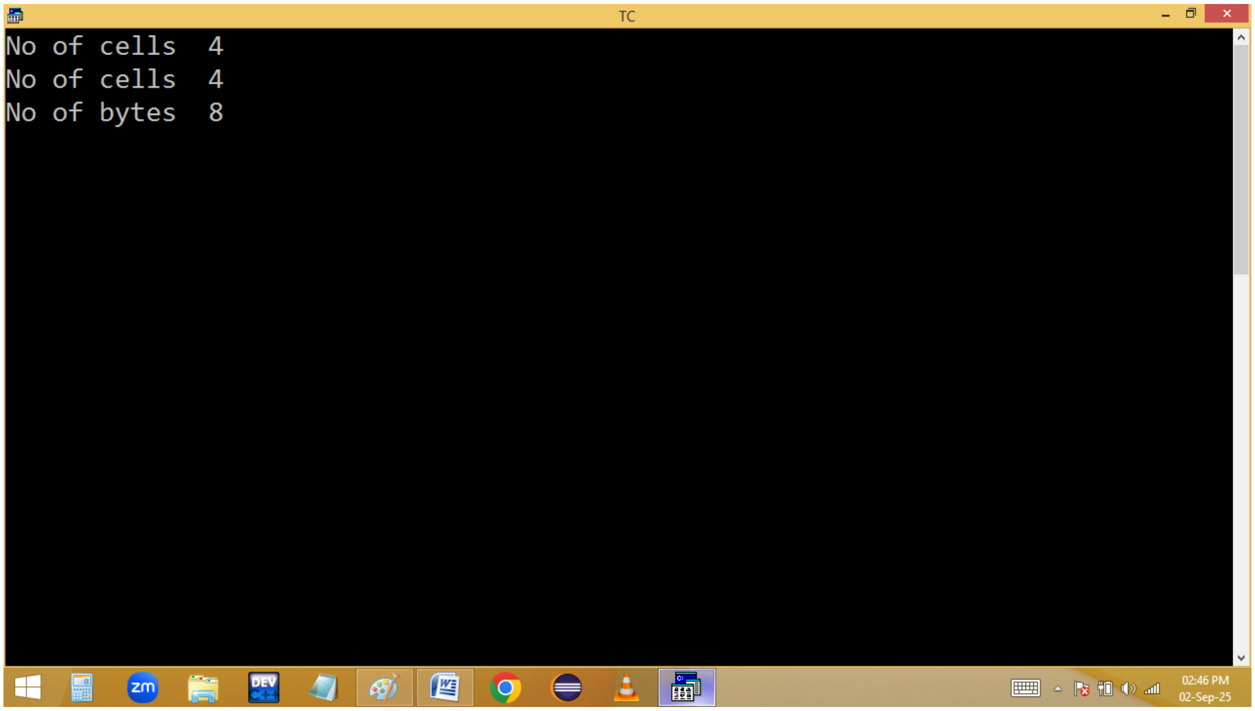


Array is implicit pointer because of array variable stores base cell [0 cell 1st byte] address. Hence array variable value and 0 cell address both are same.

Finding array size:

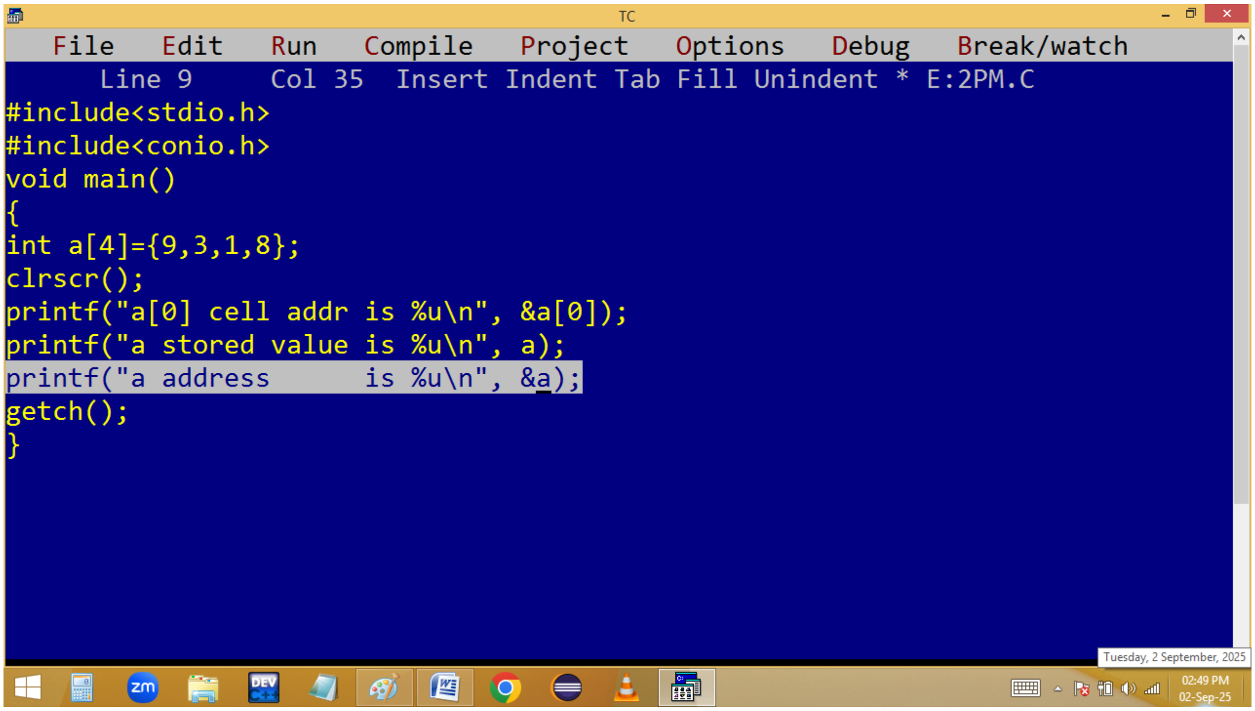


```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[4]={9,3,1,8};
clrscr();
printf("No of cells  %d\n", sizeof(a)/sizeof(int));
printf("No of cells  %d\n", sizeof(a)/sizeof(a[0]));
printf("No of bytes  %d", sizeof(a));
getch();
}
```



```
No of cells  4
No of cells  4
No of bytes  8
```

Finding array address:



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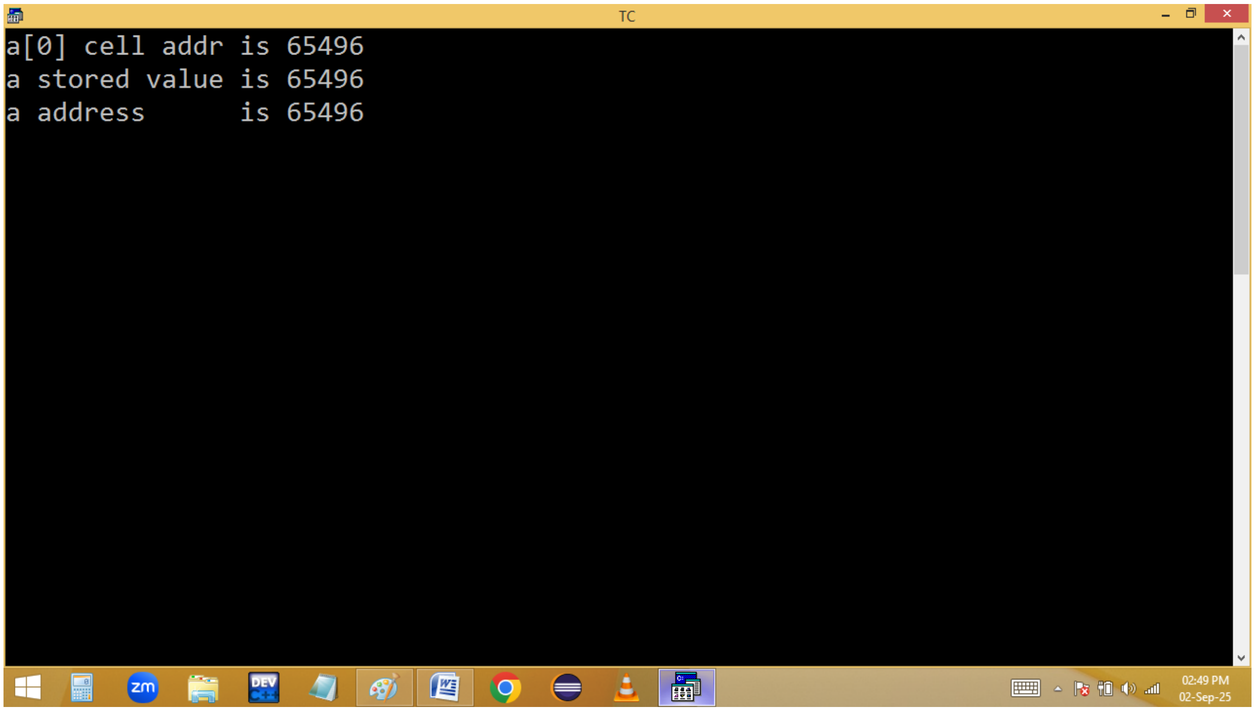
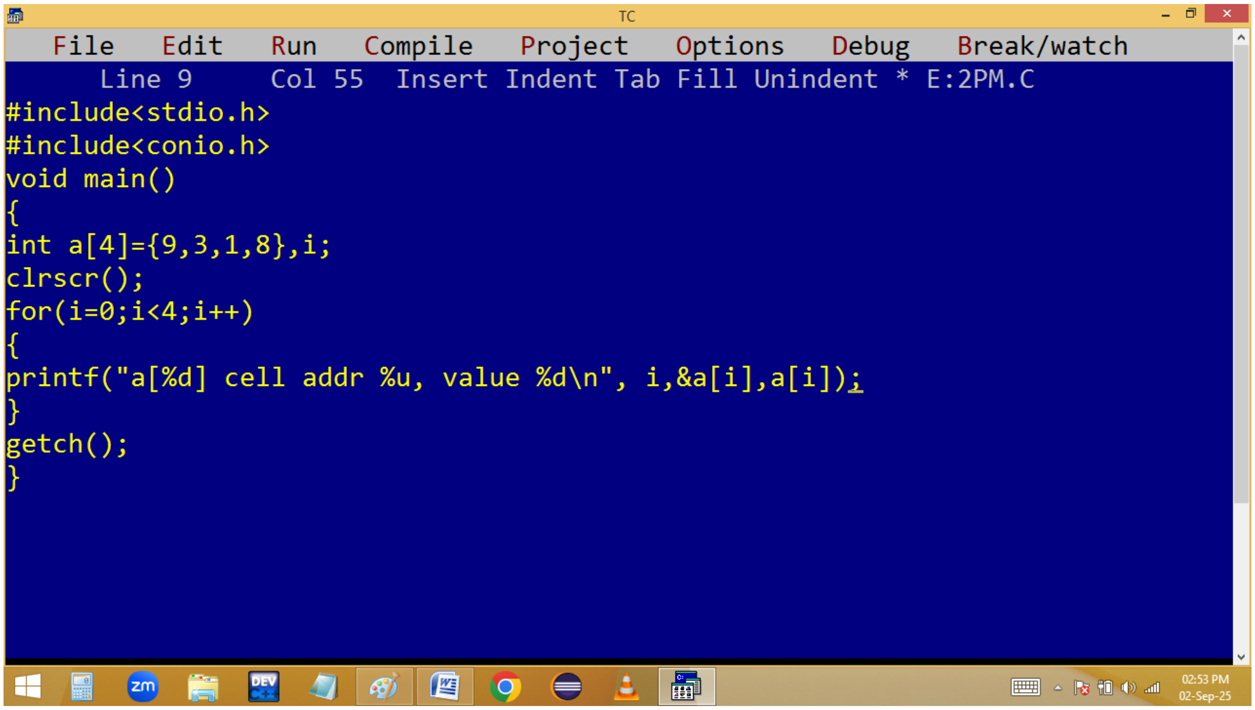
```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[4]={9,3,1,8};
clrscr();
printf("a[0] cell addr is %u\n", &a[0]);
printf("a stored value is %u\n", a);
printf("a address       is %u\n", &a);
getch();
}
```



```
a[0] cell addr is 65496
a stored value is 65496
a address       is 65496
```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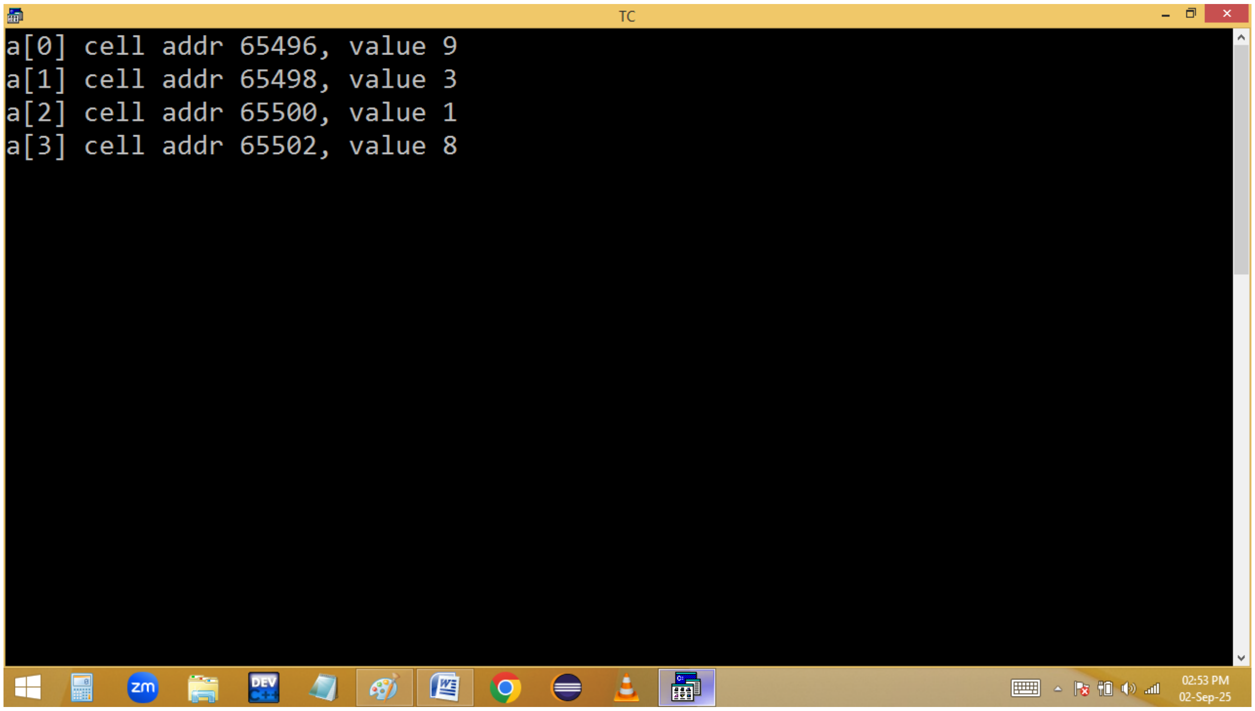
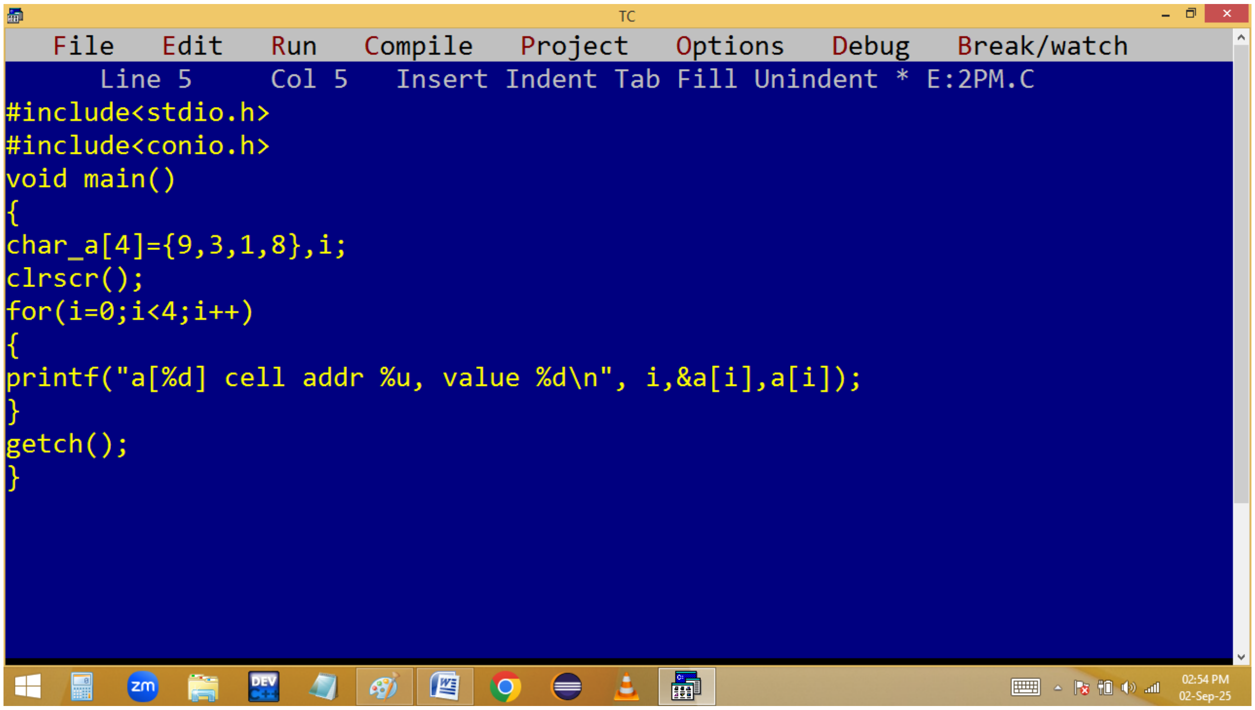
```c
#include<stdio.h>
#include<conio.h>
void main()
{
int a[4]={9,3,1,8},i;
clrscr();
for(i=0;i<4;i++)
{
printf("a[%d] cell addr %u, value %d\n", i,&a[i],a[i]);
}
getch();
}
```



```
a[0] cell addr 65496, value 9
a[1] cell addr 65498, value 3
a[2] cell addr 65500, value 1
a[3] cell addr 65502, value 8
```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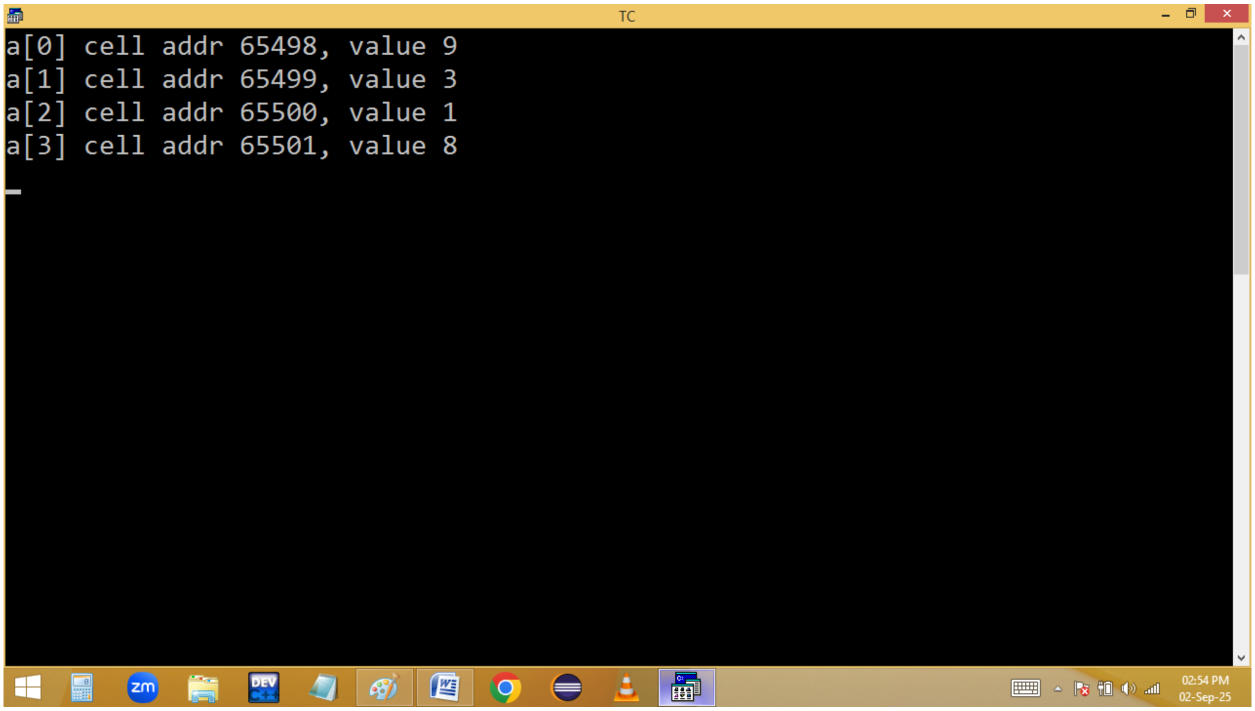
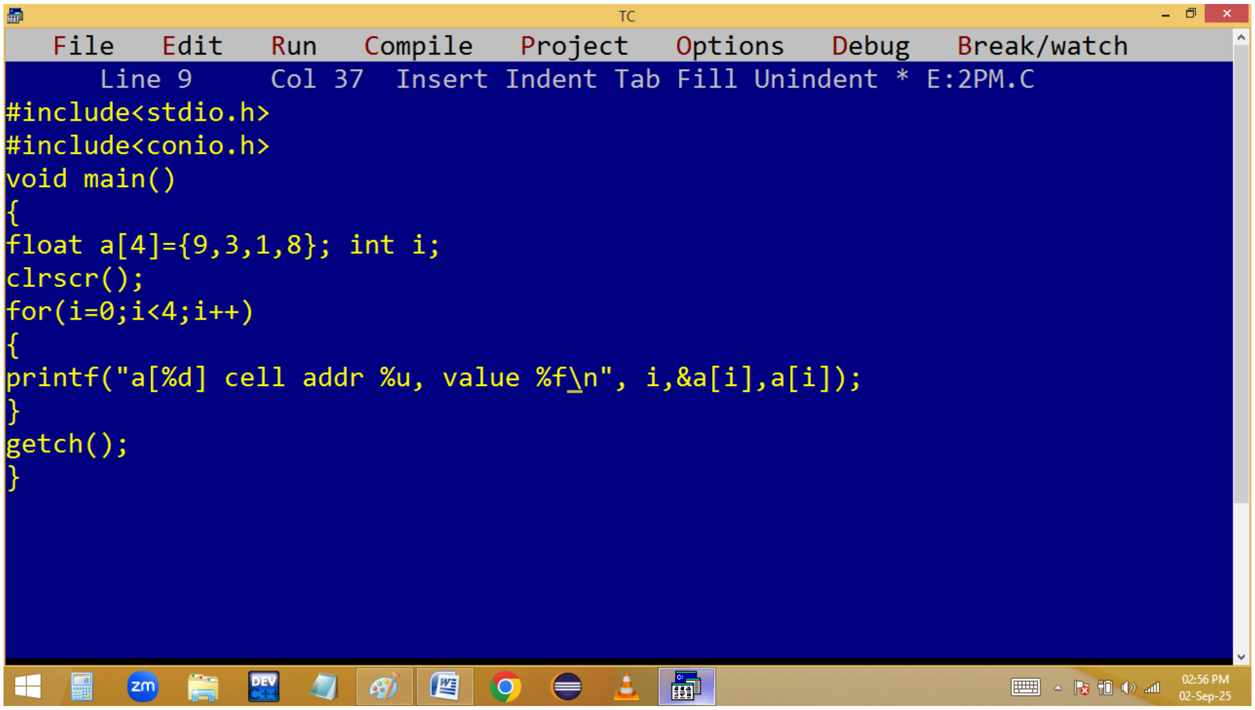
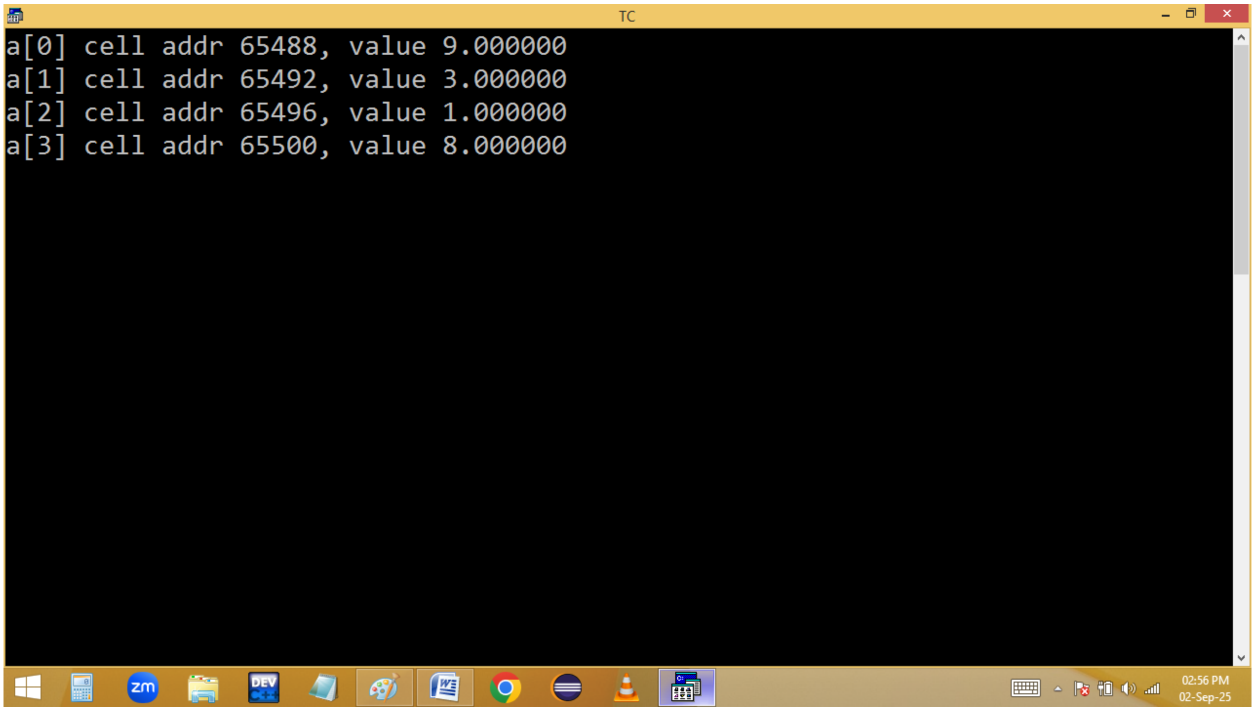
```
#include<stdio.h>
#include<conio.h>
void main()
{
char a[4]={9,3,1,8},i;
clrscr();
for(i=0;i<4;i++)
{
printf("a[%d] cell addr %u, value %d\n", i,&a[i],a[i]);
}
getch();
}
```



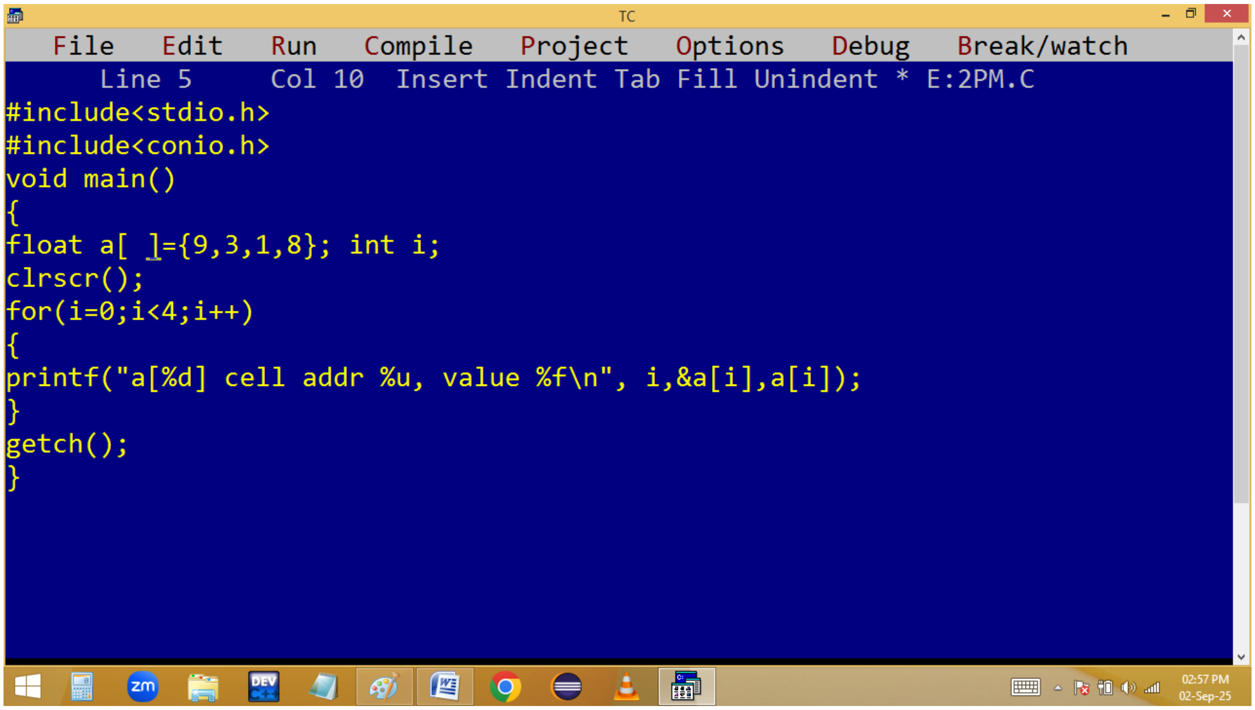
```
a[0] cell addr 65498, value 9
a[1] cell addr 65499, value 3
a[2] cell addr 65500, value 1
a[3] cell addr 65501, value 8
```



```
#include<stdio.h>
#include<conio.h>
void main()
{
float a[4]={9,3,1,8}; int i;
clrscr();
for(i=0;i<4;i++)
{
printf("a[%d] cell addr %u, value %f\n", i,&a[i],a[i]);
}
getch();
}
```



```
a[0] cell addr 65488, value 9.000000
a[1] cell addr 65492, value 3.000000
a[2] cell addr 65496, value 1.000000
a[3] cell addr 65500, value 8.000000
```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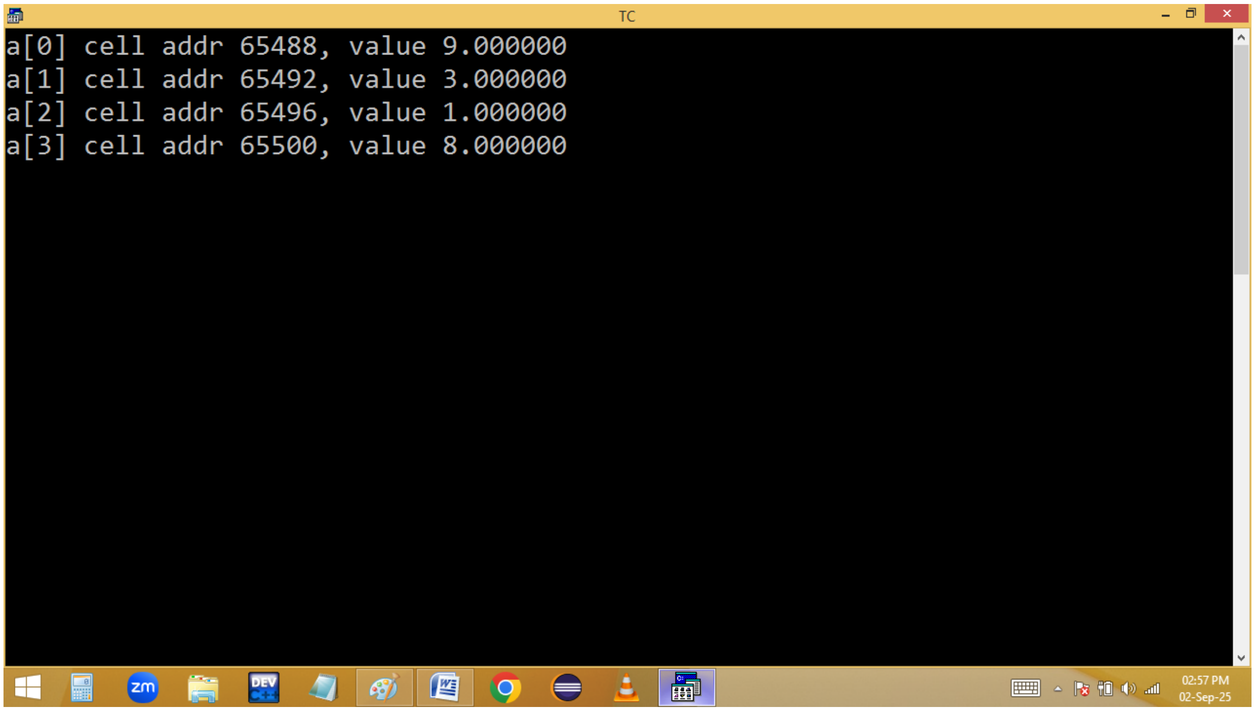
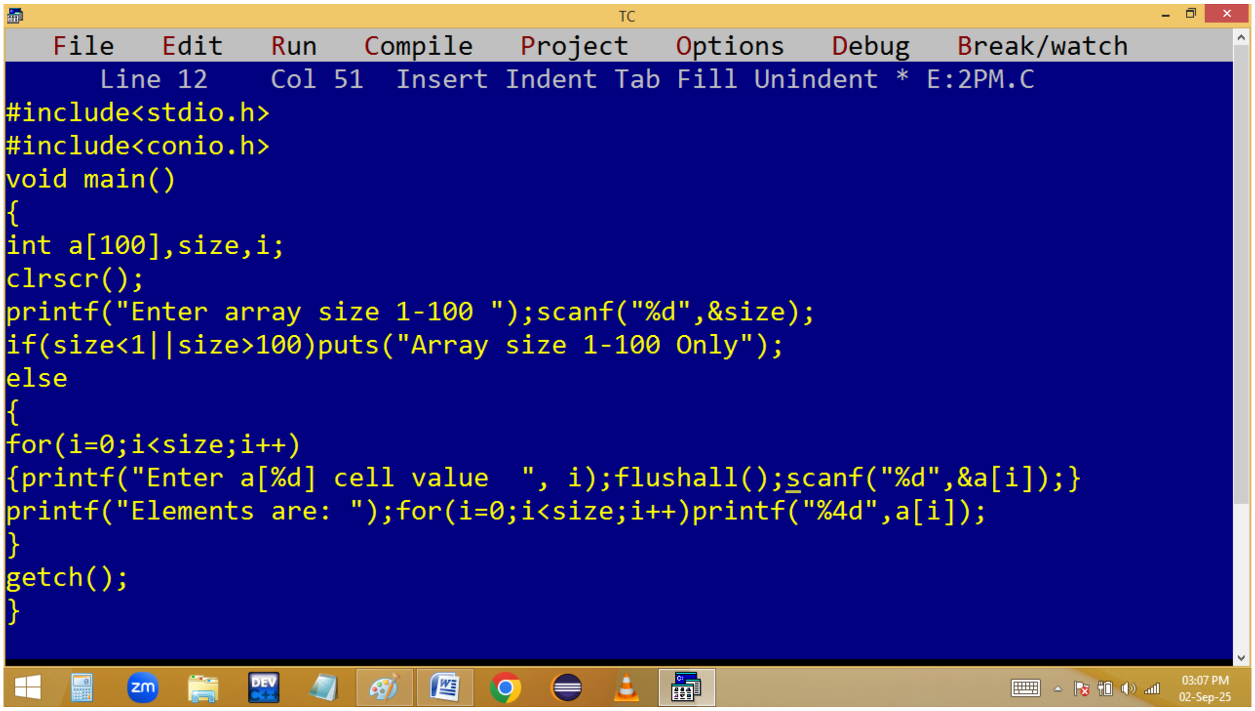
```
#include<stdio.h>
#include<conio.h>
void main()
{
float a[ ]={9,3,1,8}; int i;
clrscr();
for(i=0;i<4;i++)
{
printf("a[%d] cell addr %u, value %f\n", i,&a[i],a[i]);
}
getch();
}
```



```
a[0] cell addr 65488, value 9.000000
a[1] cell addr 65492, value 3.000000
a[2] cell addr 65496, value 1.000000
a[3] cell addr 65500, value 8.000000
```

Reading and printing array elements at runtime: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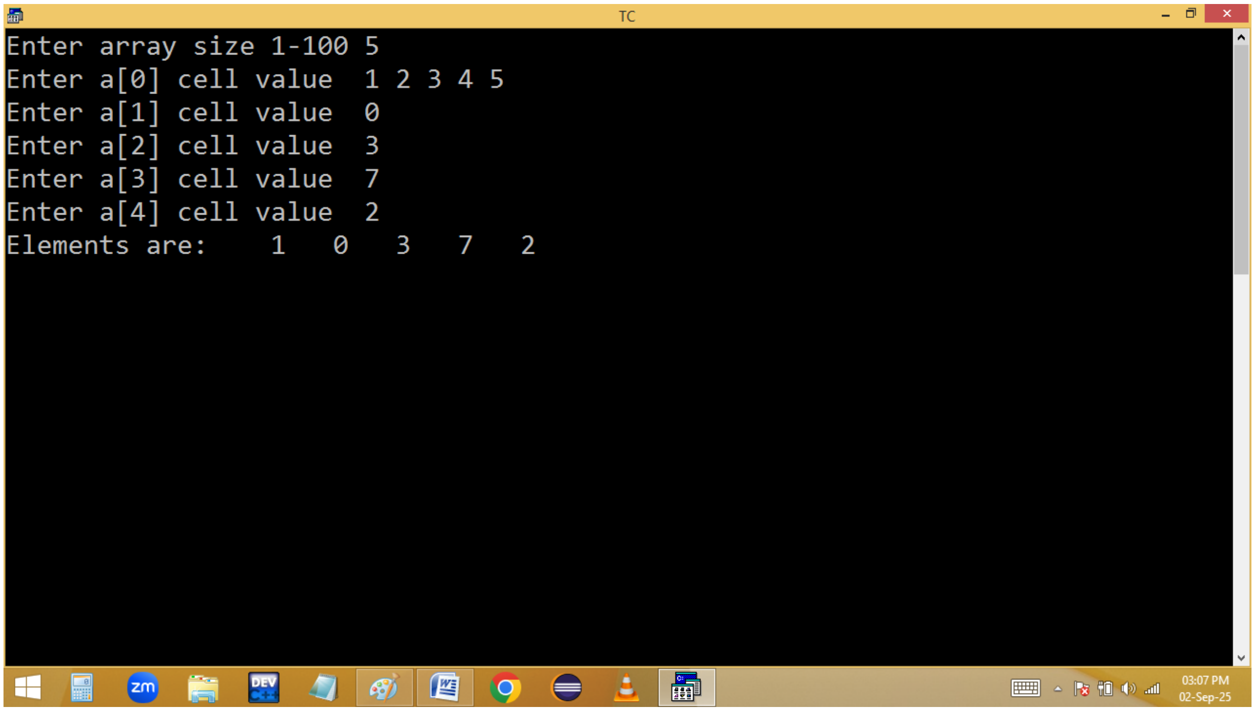
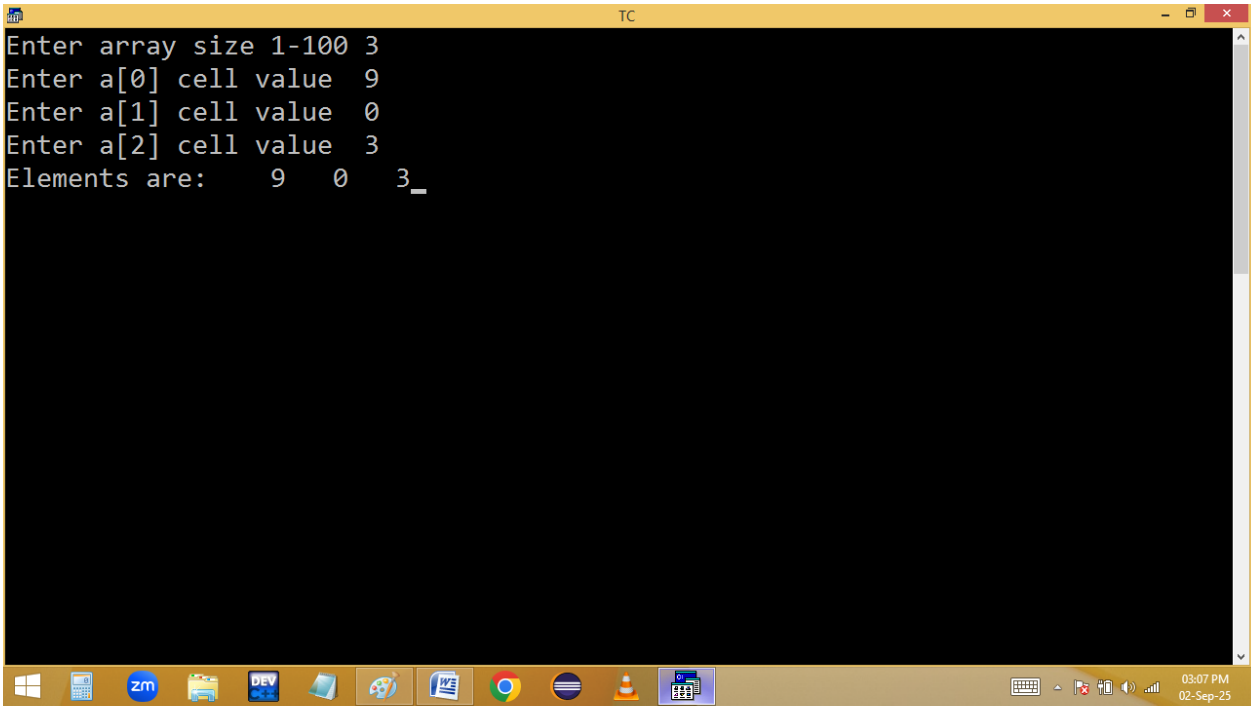
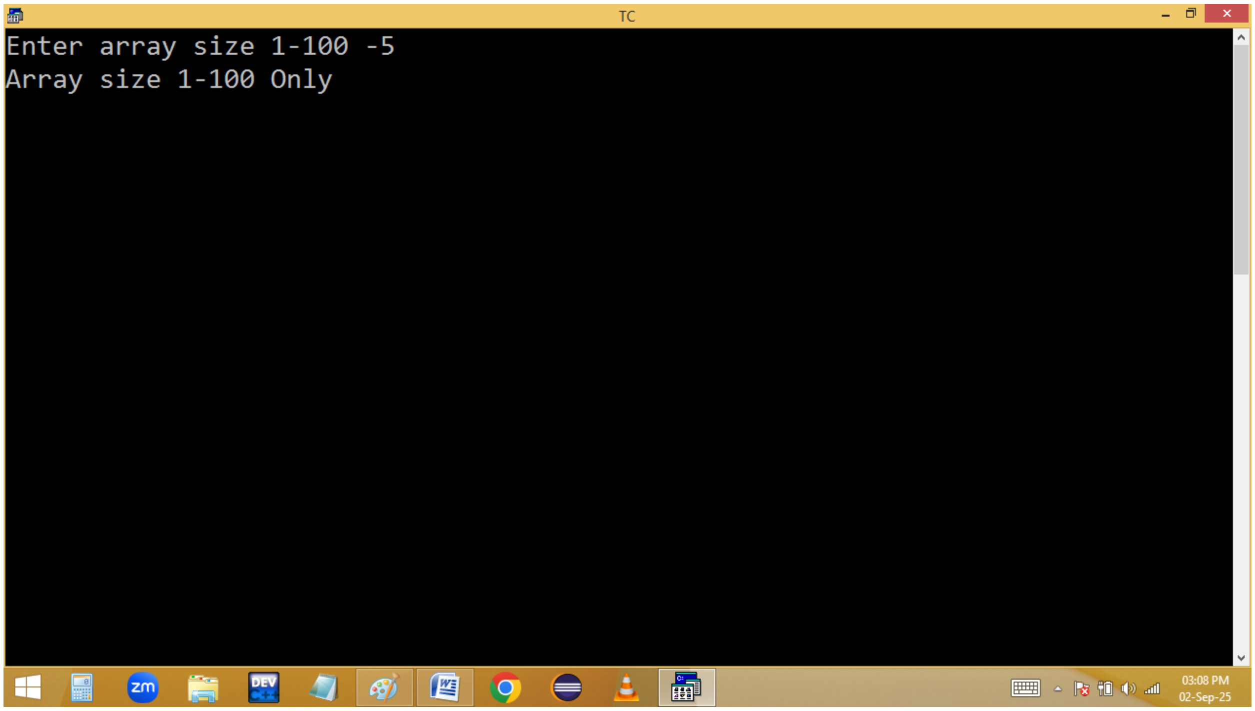
```
#include<stdio.h>
#include<conio.h>
void main()
{
int a[100],size,i;
clrscr();
printf("Enter array size 1-100 ");scanf("%d",&size);
if(size<1||size>100)puts("Array size 1-100 Only");
else
{
for(i=0;i<size;i++)
{printf("Enter a[%d] cell value  ", i);flushall();scanf("%d",&a[i]);}
printf("Elements are: ");for(i=0;i<size;i++)printf("%4d",a[i]);
}
getch();
}
```



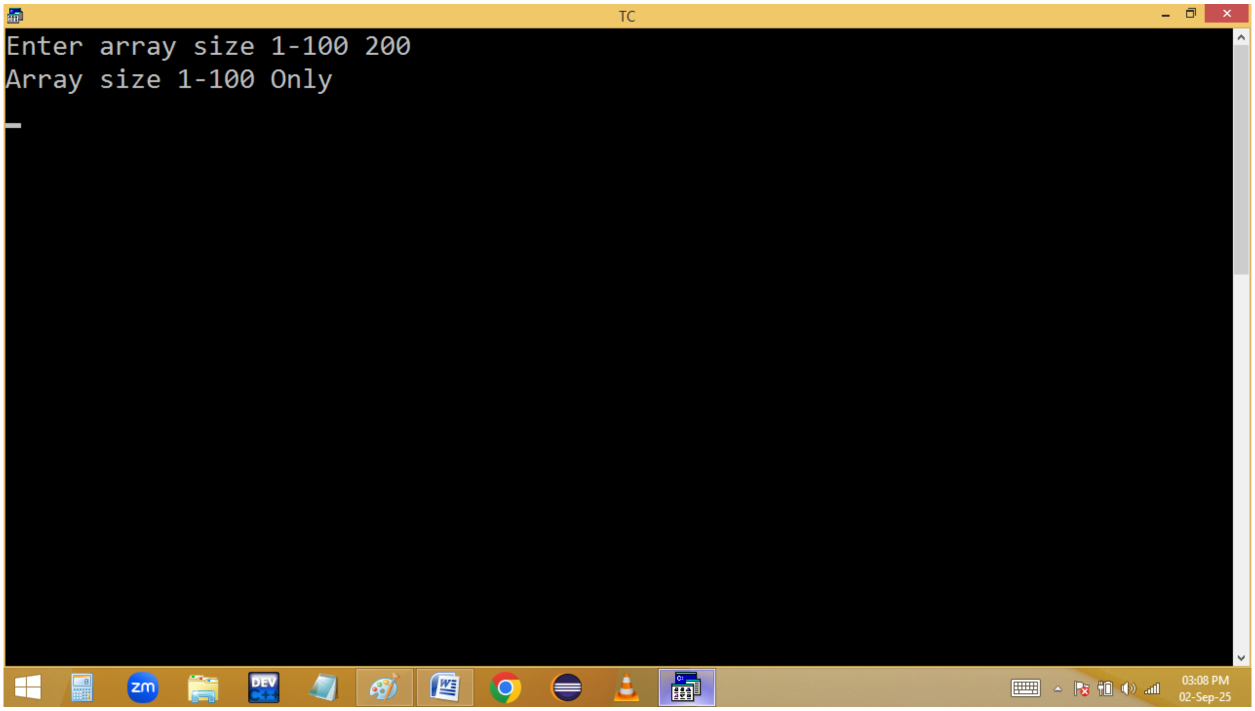
```
Enter array size 1-100 5
Enter a[0] cell value  1 2 3 4 5
Enter a[1] cell value  0
Enter a[2] cell value  3
Enter a[3] cell value  7
Enter a[4] cell value  2
Elements are:    1   0   3   7   2
```



```
Enter array size 1-100 3
Enter a[0] cell value  9
Enter a[1] cell value  0
Enter a[2] cell value  3
Elements are:     9    0    3_
```

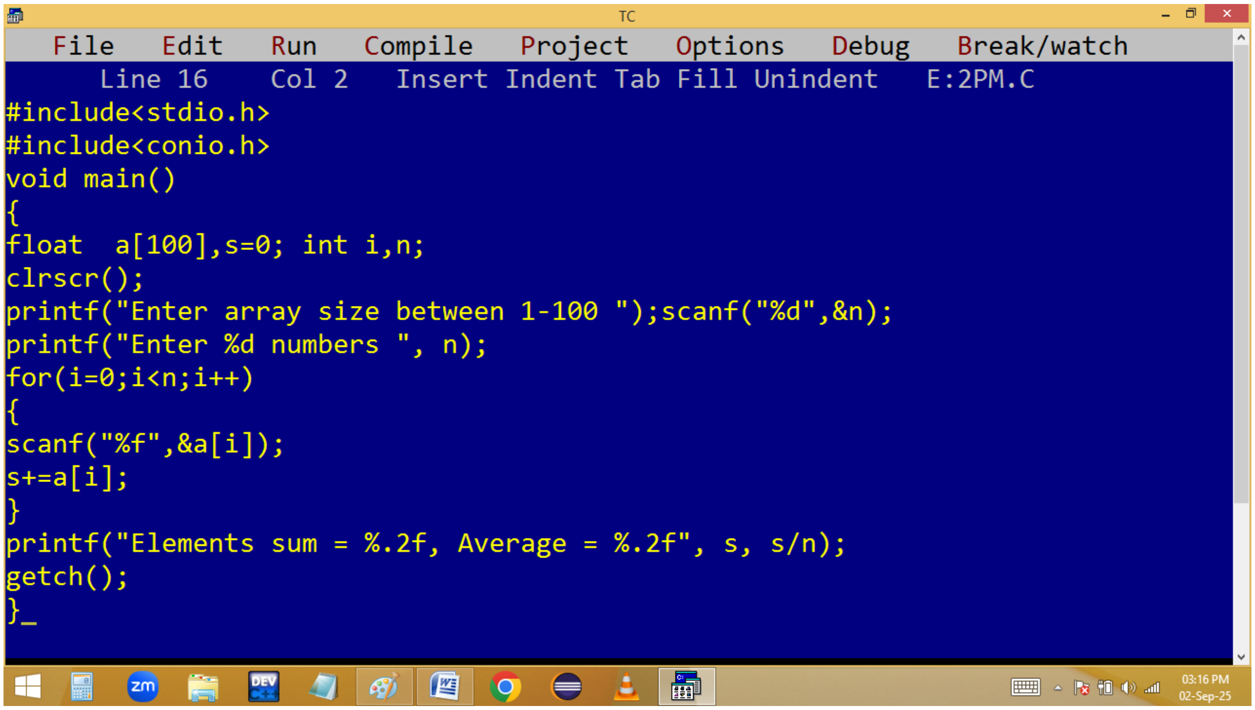


```
Enter array size 1-100 -5
Array size 1-100 Only
```



```
Enter array size 1-100 200
Array size 1-100 Only
```

Read n elements into array and find the elements sum and average?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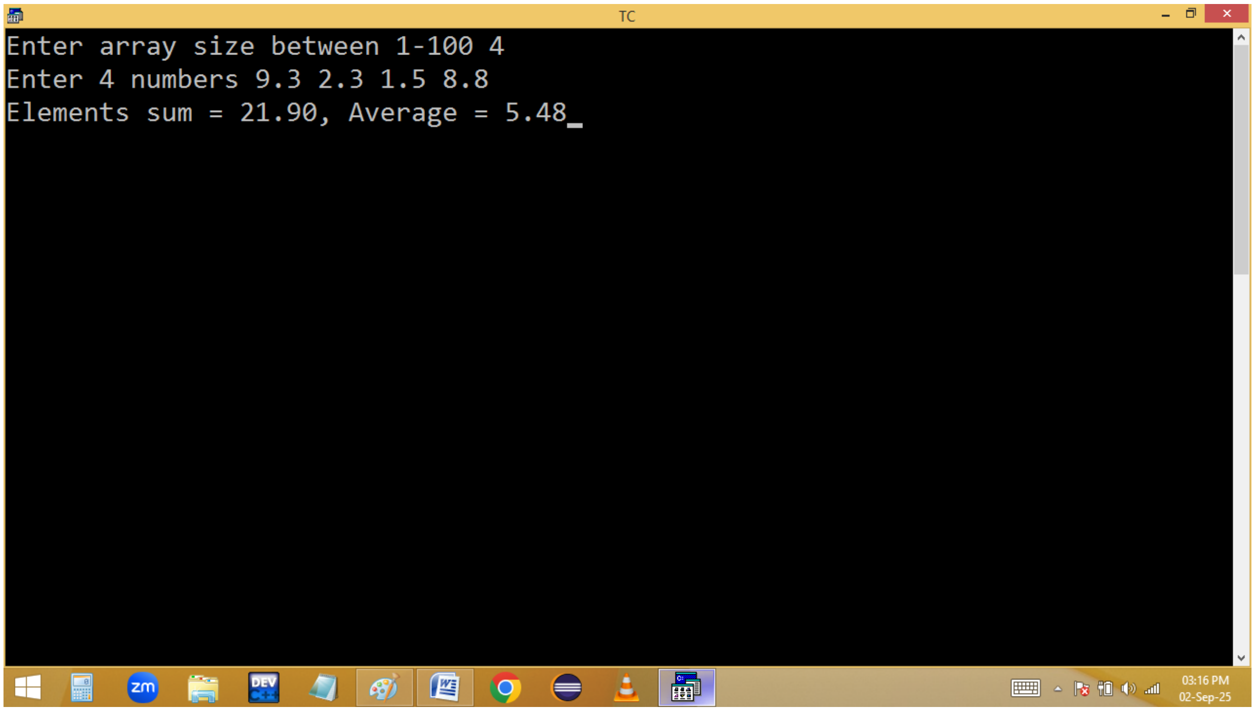
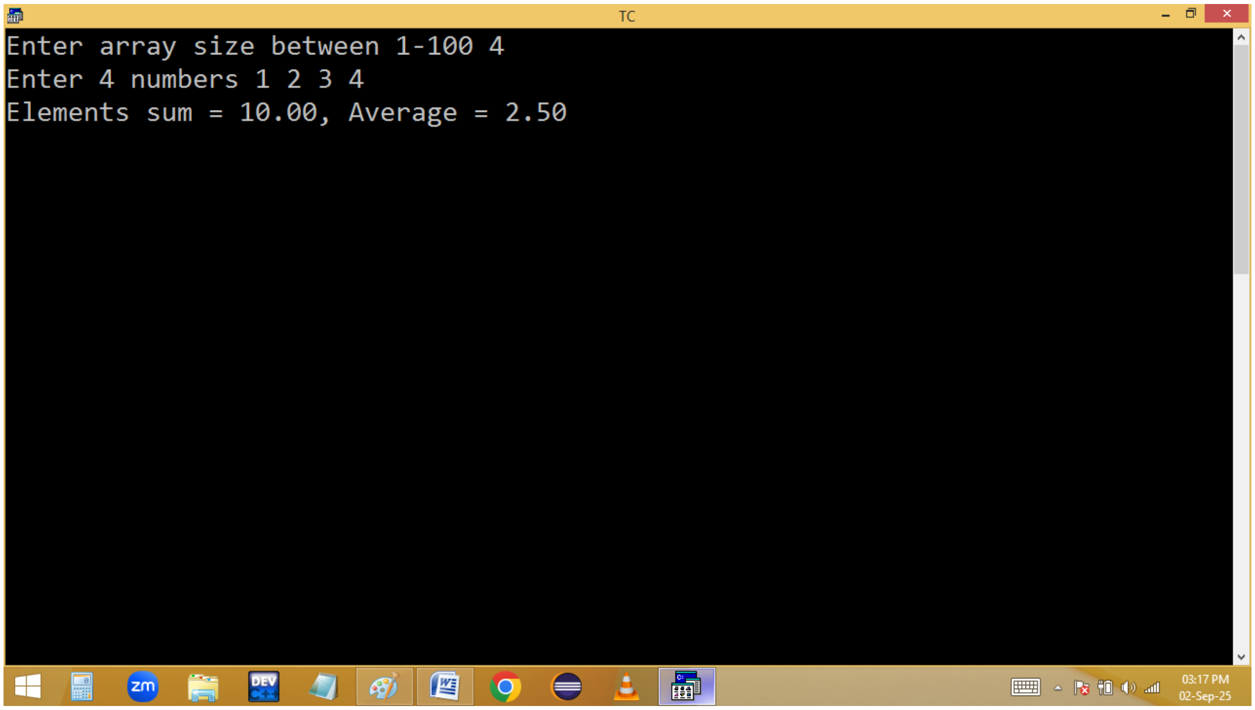
```c
#include<stdio.h>
#include<conio.h>
void main()
{
float  a[100],s=0; int i,n;
clrscr();
printf("Enter array size between 1-100 ");scanf("%d",&n);
printf("Enter %d numbers ", n);
for(i=0;i<n;i++)
{
scanf("%f",&a[i]);
s+=a[i];
}
printf("Elements sum = %.2f, Average = %.2f", s, s/n);
getch();
}
```



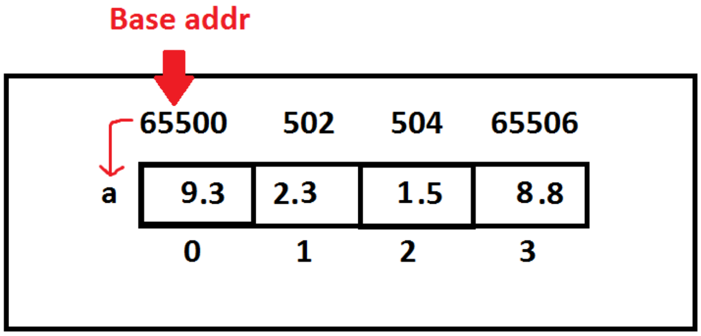
```
Enter array size between 1-100 4
Enter 4 numbers 9.3 2.3 1.5 8.8
Elements sum = 21.90, Average = 5.48
```



```
Enter array size between 1-100 4
Enter 4 numbers 1 2 3 4
Elements sum = 10.00, Average = 2.50
```

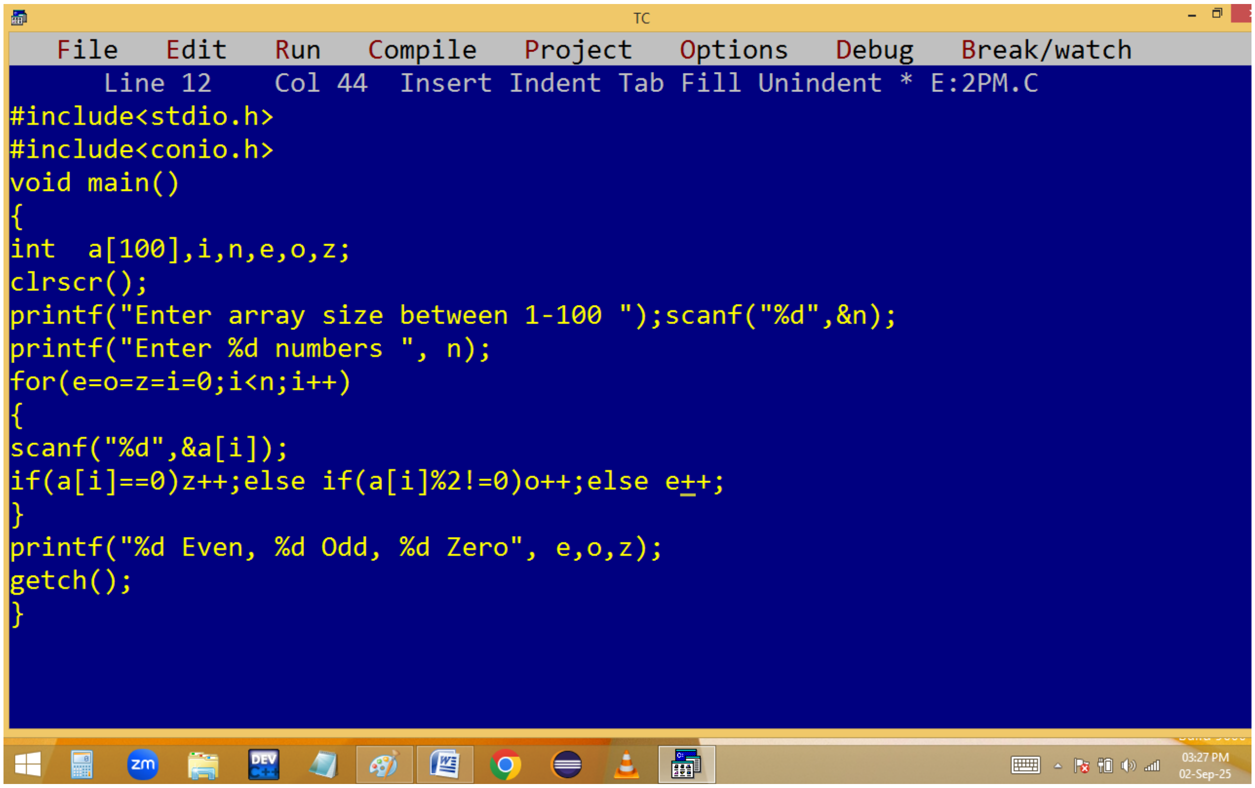
```
for( i=0;i<4;i++)
{
scanf("%f",&a[i]);
s+=a[i];
}

p("Sum=%.2f, Avg=%.2f",s,s/4);
```

i	s
0	0+
1	9.3
2	2.3
3	1.5
	8.8
	21.90



65500	502	504	65506
9.3	2.3	1.5	8.8
0	1	2	3

Finding no of even/odd/zero elements in array:



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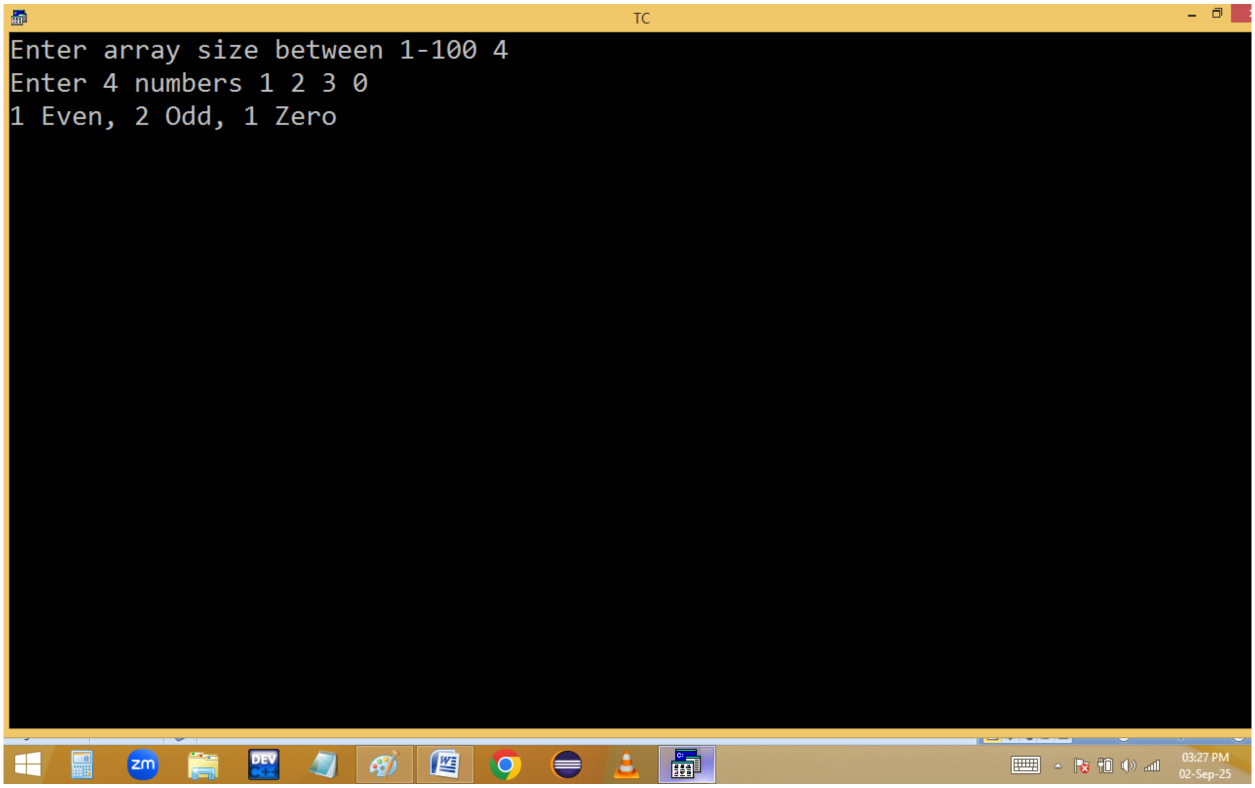
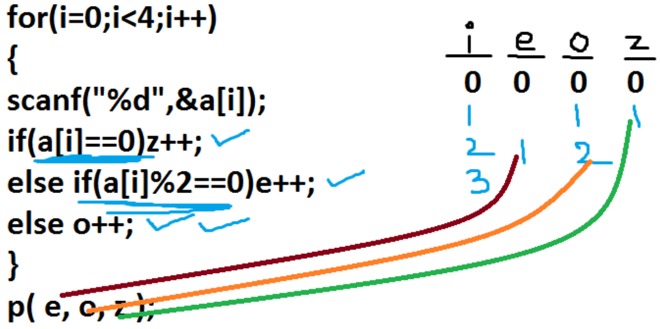
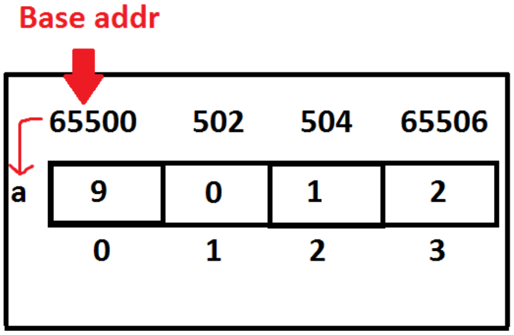
```
#include<stdio.h>
#include<conio.h>
void main()
{
int  a[100],i,n,e,o,z;
clrscr();
printf("Enter array size between 1-100 ");scanf("%d",&n);
printf("Enter %d numbers ", n);
for(e=o=z=i=0;i<n;i++)
{
scanf("%d",&a[i]);
if(a[i]==0)z++;else if(a[i]%2!=0)o++;else e++;
}
printf("%d Even, %d Odd, %d Zero", e,o,z);
getch();
}
```



```
Enter array size between 1-100 4
Enter 4 numbers 1 2 3 0
1 Even, 2 Odd, 1 Zero
```



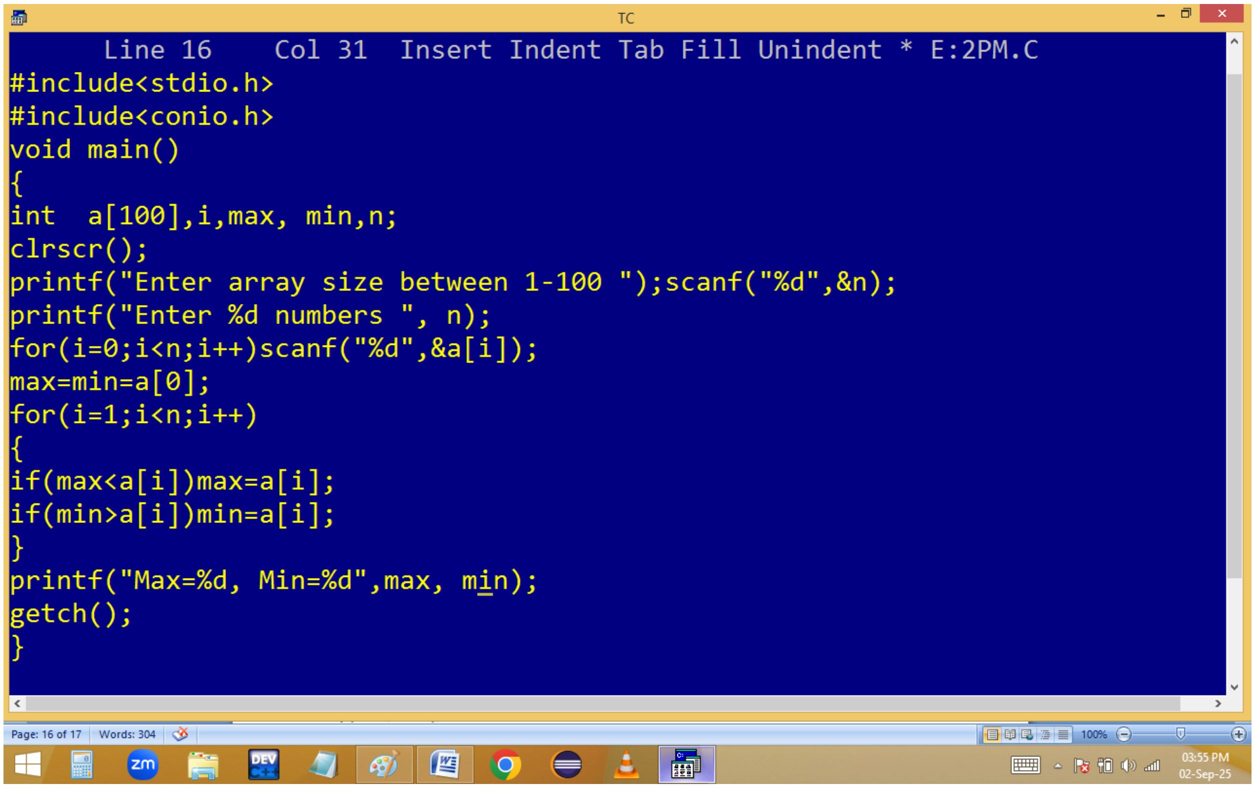
```
for(i=0;i<4;i++)
{
scanf("%d",&a[i]);
if(a[i]==0)z++;
else if(a[i]%2==0)e++;
else o++;
}
p( e, o, z);
```



Base addr

	65500	502	504	65506
a	9	0	1	2
	0	1	2	3

Finding max, min elements of array:



```
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#include<stdio.h>
#include<conio.h>
void main()
{
int  a[100],i,max, min,n;
clrscr();
printf("Enter array size between 1-100 ");scanf("%d",&n);
printf("Enter %d numbers ", n);
for(i=0;i<n;i++)scanf("%d",&a[i]);
max=min=a[0];
for(i=1;i<n;i++)
{
if(max<a[i])max=a[i];
if(min>a[i])min=a[i];
}
printf("Max=%d, Min=%d",max, min);
getch();
}
```
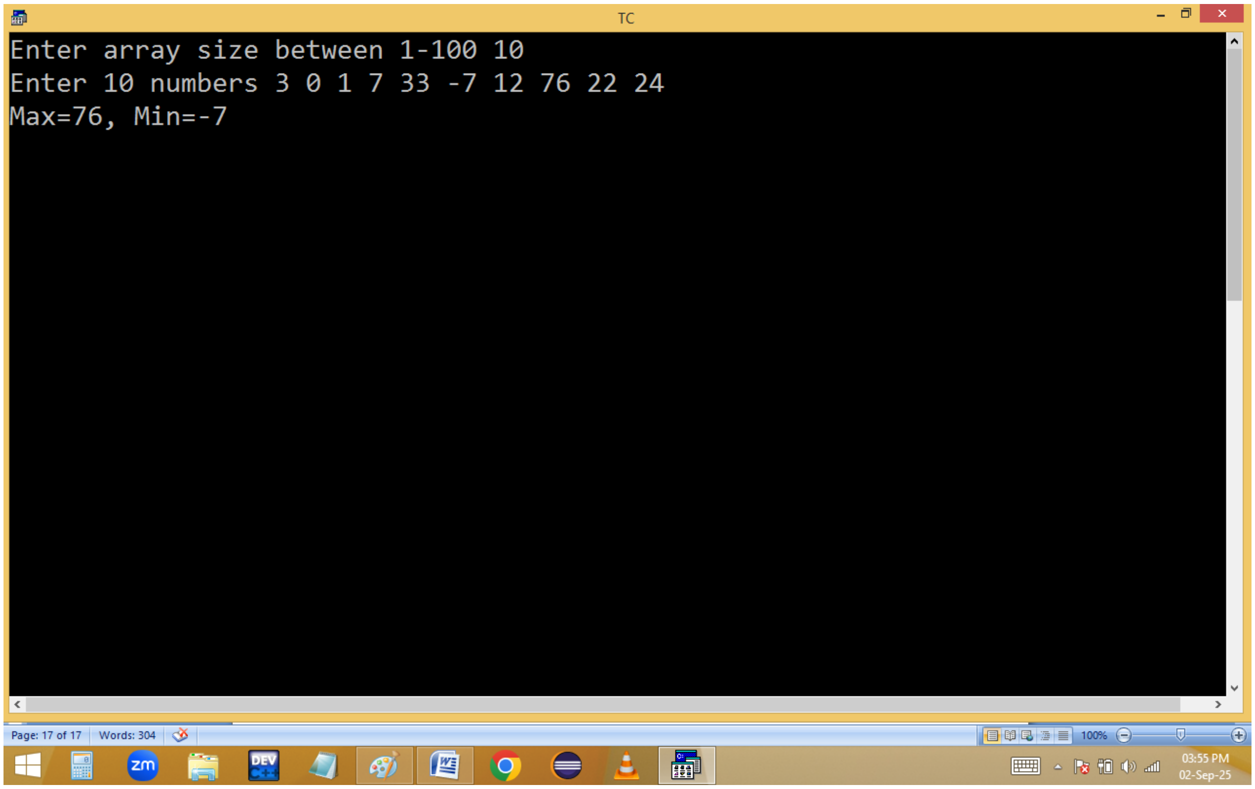
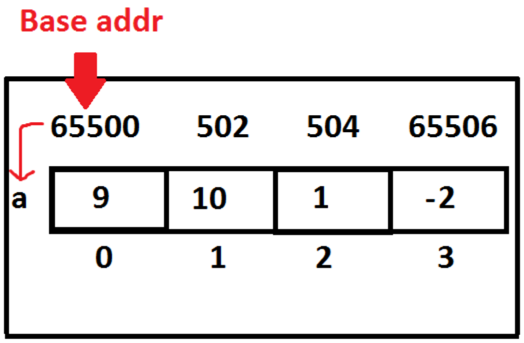



```
Enter array size between 1-100 10
Enter 10 numbers 3 0 1 7 33 -7 12 76 22 24
Max=76, Min=-7
```

i	max	Min
1	9	9

```
for(i=1;i<4;i++)
{   9 < 10
if(max<a[i])max=a[i];
if(min>a[i])min=a[i];
}
p( max,  min );
```



Home work:

1. Arrange array elements in reverse order permanently.
2. Decimal to binary conversion

   Eg: **20 ==> 10100**