

## **VARIABLES**

**Variable is a container is used to store the values.**

**Variable is a named memory location where we can store and manipulate [ modify ] the values.**

**In C we should have to declare the variables at the first line of any function. In C++ we can declare anywhere.**

**Always the variables are stored in primary memory i.e. RAM Only. Due to this when the program execution completed, automatically the variables deleted.**

**Every variable having 2 stages.**

**1. Variable declaration / declared**

**Eg: int a;**

**2. Variable initialization / defined**

**Eg: a=100;**

**When a variable is defined then only memory allocated.**

**Variables are case sensitive i.e. lower and upper are different.**

**int a=10;**

**int A=20;**

**Syntax:**

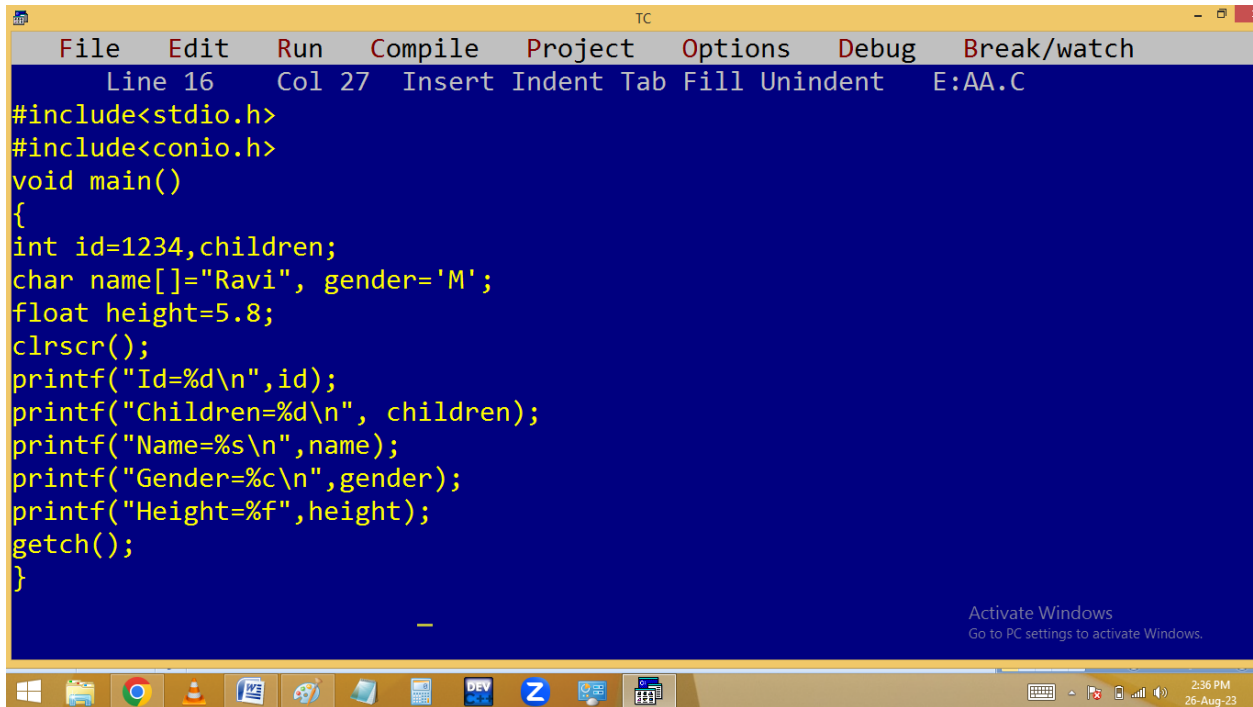
**datatype variable[=value], variable[=value],.....;**

**Eg:**

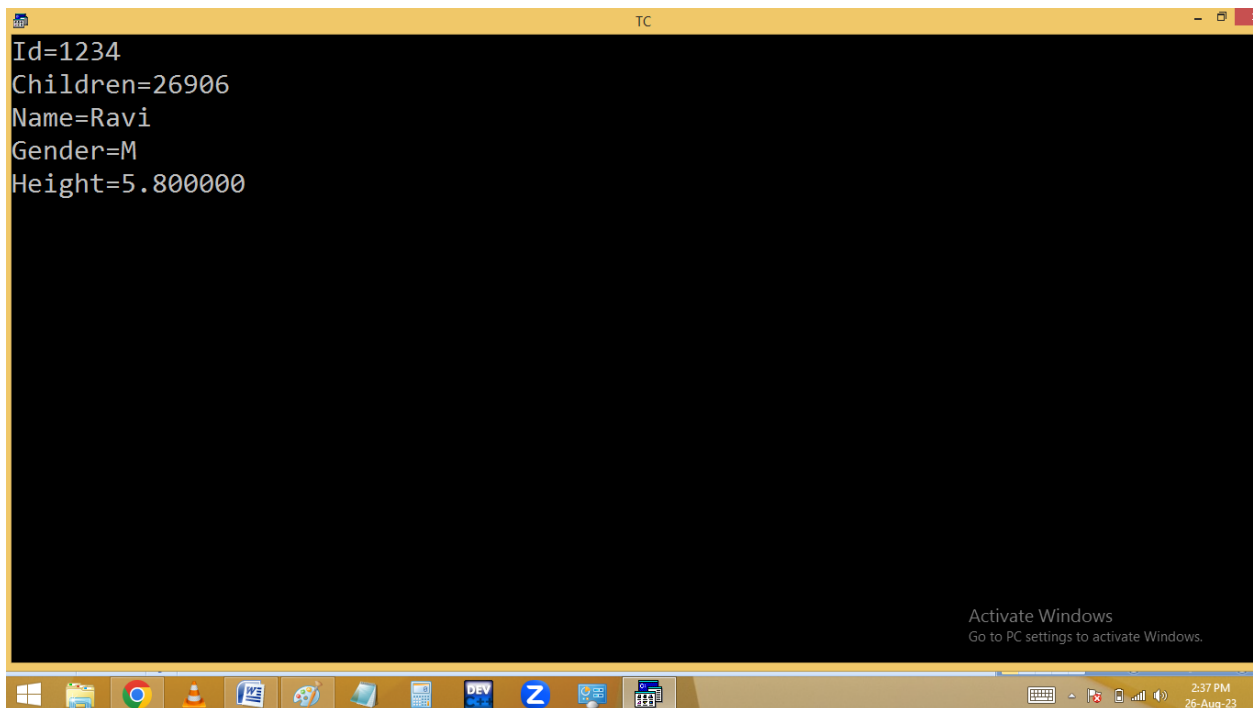
**int id=1234, children=2;**

**char name[]="Ravi", gender='M';**

**float height=5.8;**



```
File Edit Run Compile Project Options Debug Break/watch
Line 16 Col 27 Insert Indent Tab Fill Unindent E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int id=1234,children;
char name[]="Ravi", gender='M';
float height=5.8;
clrscr();
printf("Id=%d\n",id);
printf("Children=%d\n", children);
printf("Name=%s\n",name);
printf("Gender=%c\n",gender);
printf("Height=%f",height);
getch();
}
```



```
Id=1234
Children=26906
Name=Ravi
Gender=M
Height=5.800000
```

**Memory allocation for variables:**

4 bits = 1 nibble

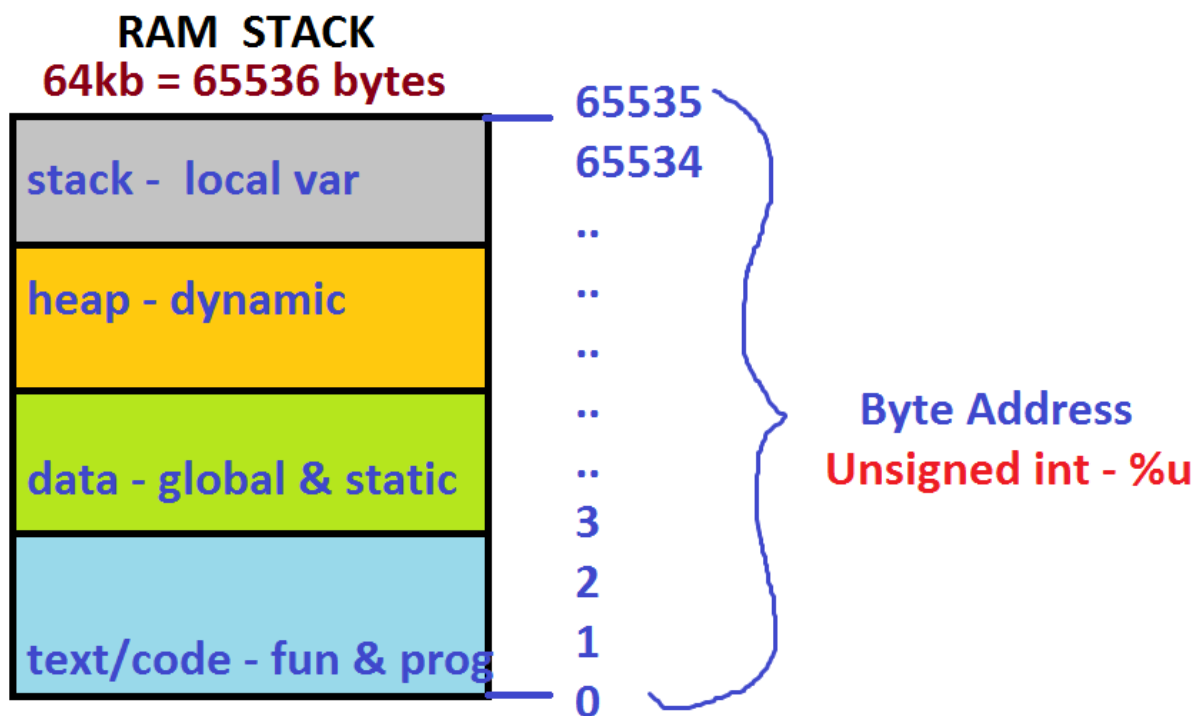
2 nibbles / 8 bits = 1 byte

1024 bytes = 1kb

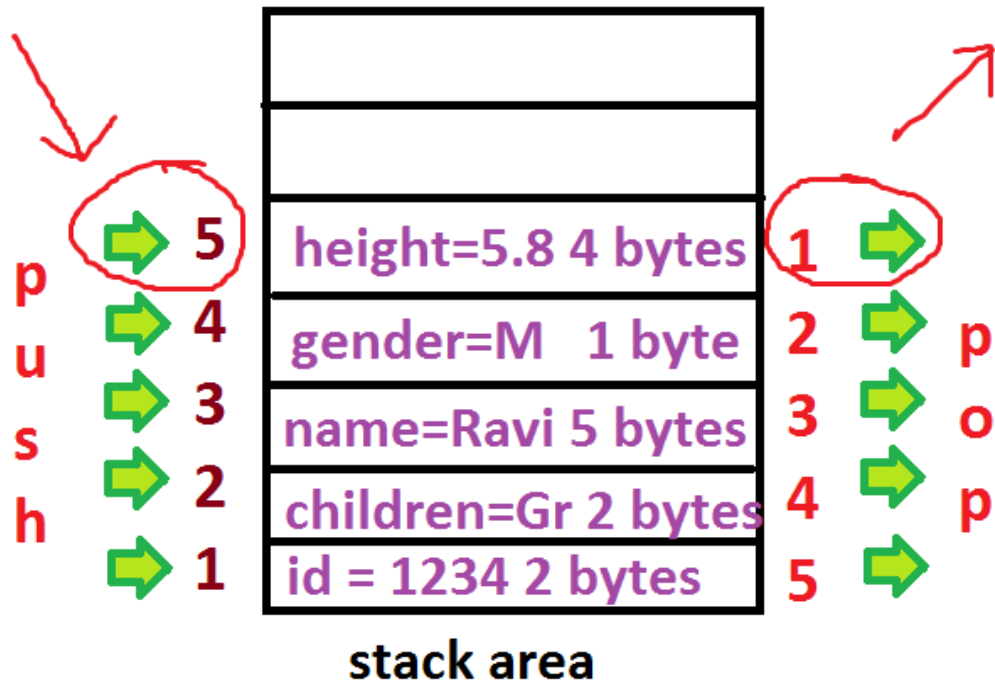
1024kb=1mb

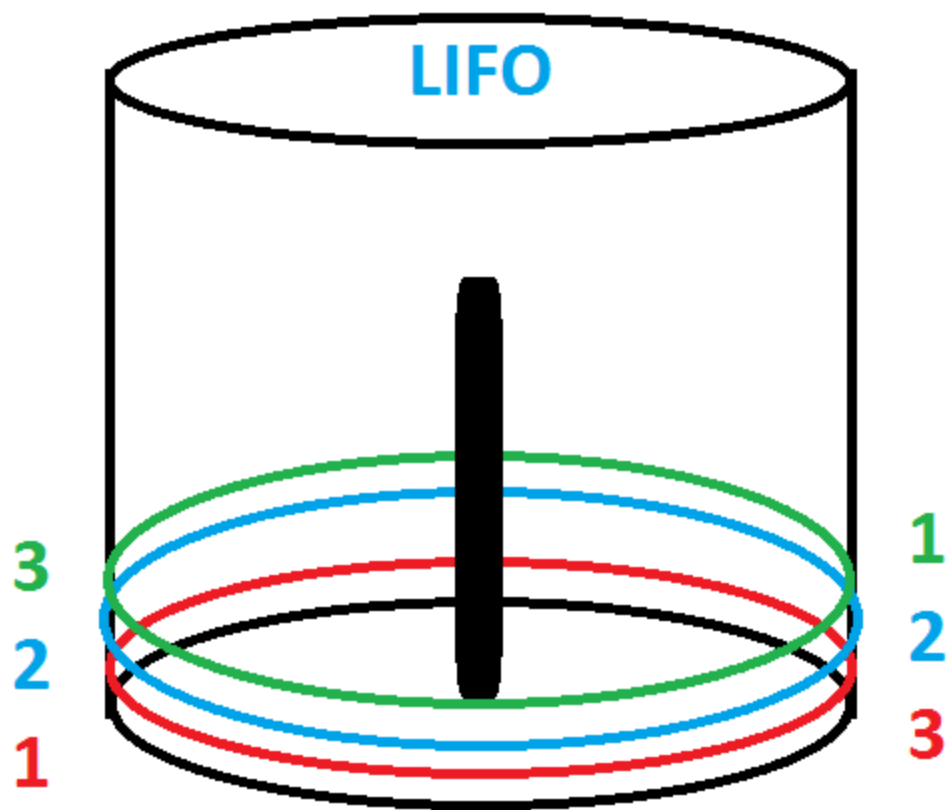
1023mb=1gb

1024gb=1tb

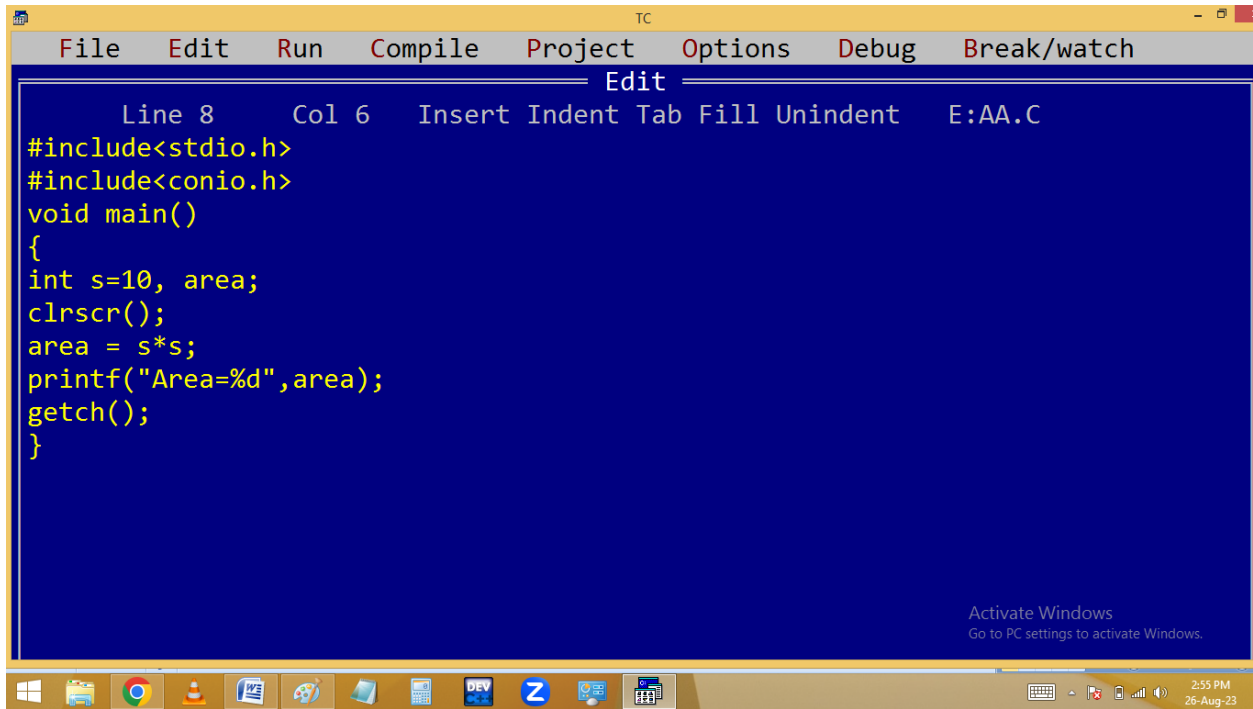


lifo-last in first out  
filo-first in last ot



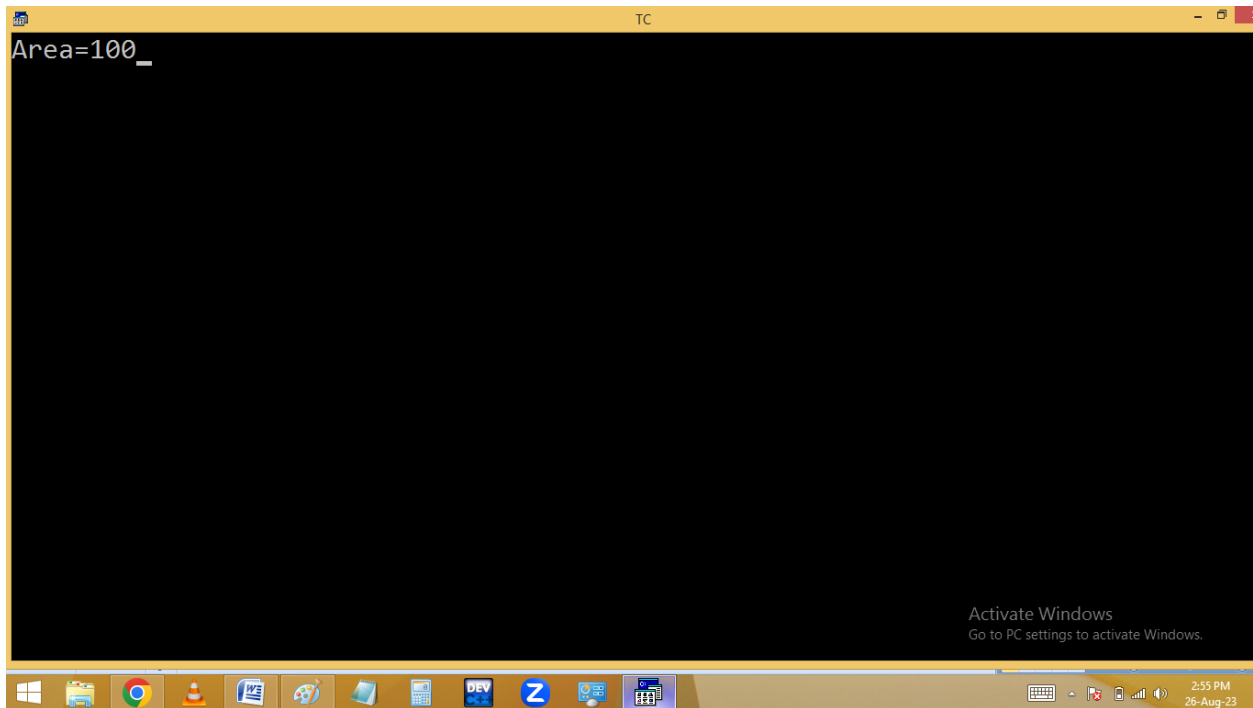


Finding square area:



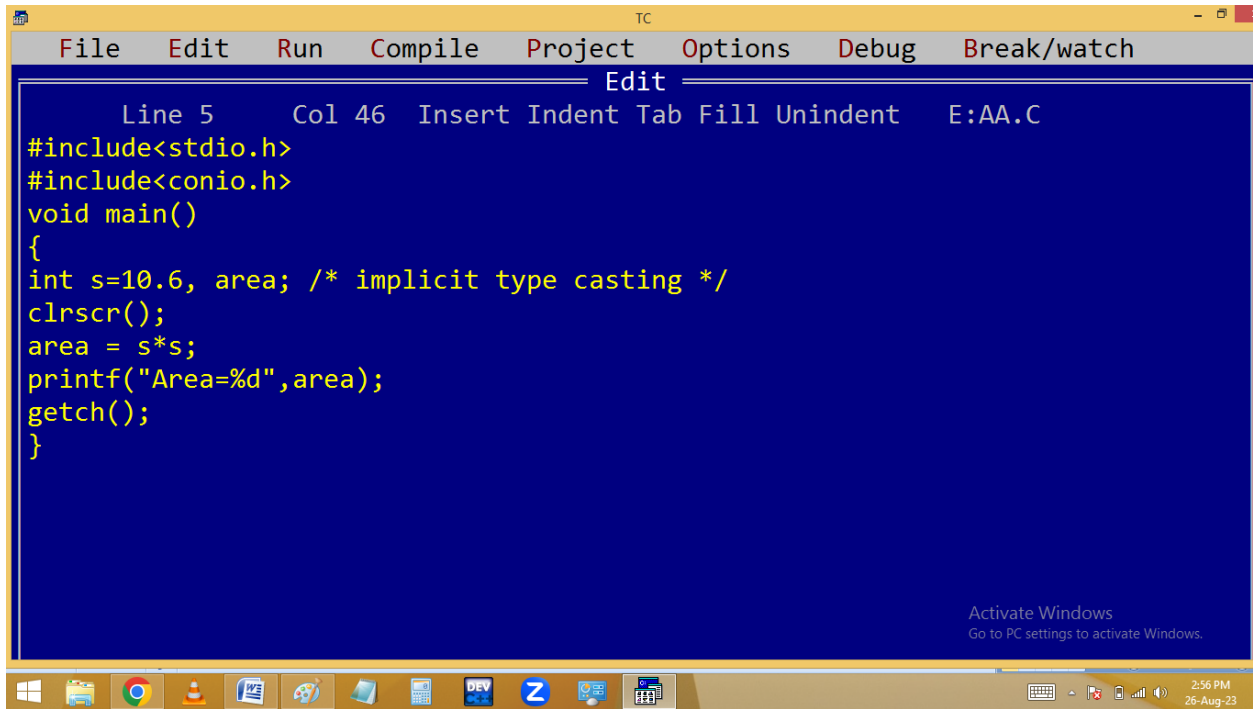
The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a toolbar. The main window is titled 'Edit' and shows a C program in a blue editor. The code calculates the area of a square with side length 10. The status bar at the bottom indicates 'Line 8 Col 6' and the file path 'E:AA.C'. An 'Activate Windows' watermark is visible in the bottom right corner.

```
Line 8 Col 6 Insert Indent Tab Fill Unindent E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int s=10, area;
clrscr();
area = s*s;
printf("Area=%d",area);
getch();
}
```



The screenshot shows the Turbo C++ (TC) IDE with the same menu bar and toolbar. The main window now displays the output of the program, which is 'Area=100\_'. The status bar at the bottom shows the time '2:55 PM' and the date '26-Aug-23'. An 'Activate Windows' watermark is visible in the bottom right corner.

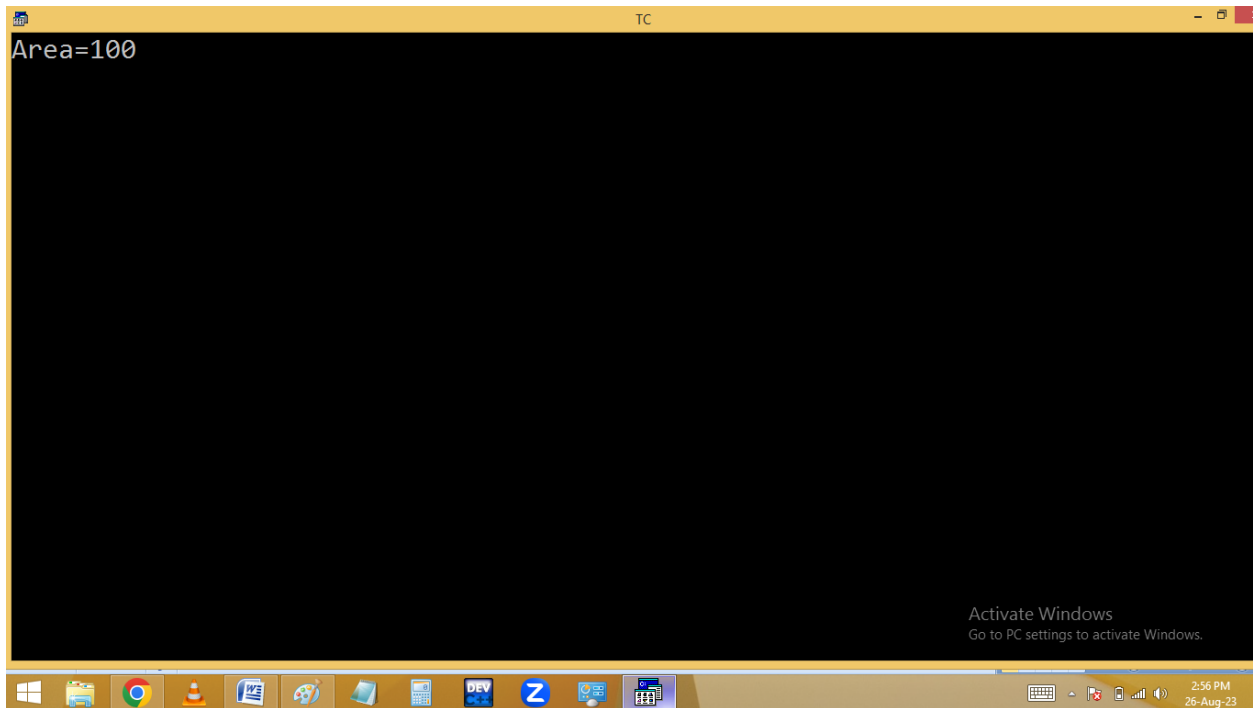
```
Area=100_
```



The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a toolbar. The main window is titled 'Edit' and shows a C program in a blue editor. The code is as follows:

```
Line 5      Col 46  Insert Indent Tab Fill Unindent  E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int s=10.6, area; /* implicit type casting */
clrscr();
area = s*s;
printf("Area=%d",area);
getch();
}
```

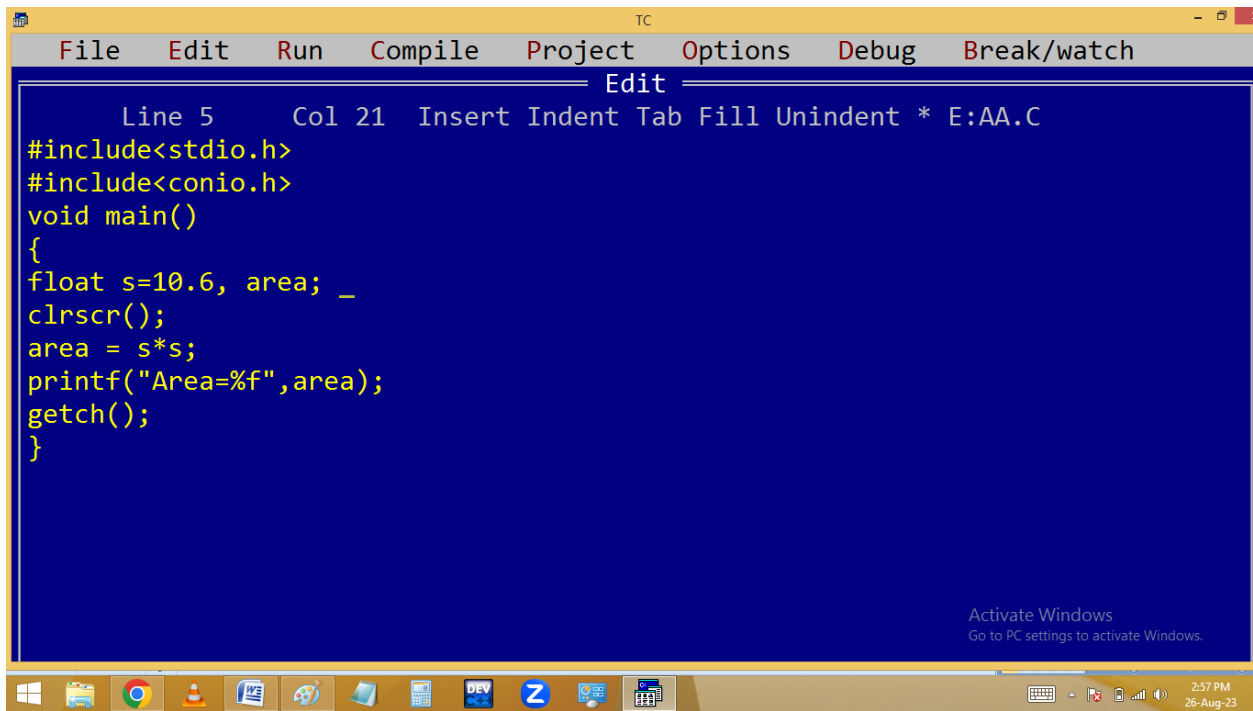
The Windows taskbar at the bottom shows various icons including the Start button, File Explorer, Google Chrome, VLC media player, and others. The system clock in the bottom right corner indicates 2:56 PM on 26-Aug-23. An 'Activate Windows' watermark is visible in the bottom right corner of the IDE window.



The screenshot shows the Turbo C++ (TC) IDE with the same menu bar and toolbar. The main window now displays the output of the program, which is 'Area=100'. The background of the IDE window is black.

The Windows taskbar at the bottom is identical to the first screenshot, showing the same icons and system clock (2:56 PM on 26-Aug-23). The 'Activate Windows' watermark is also present in the bottom right corner.

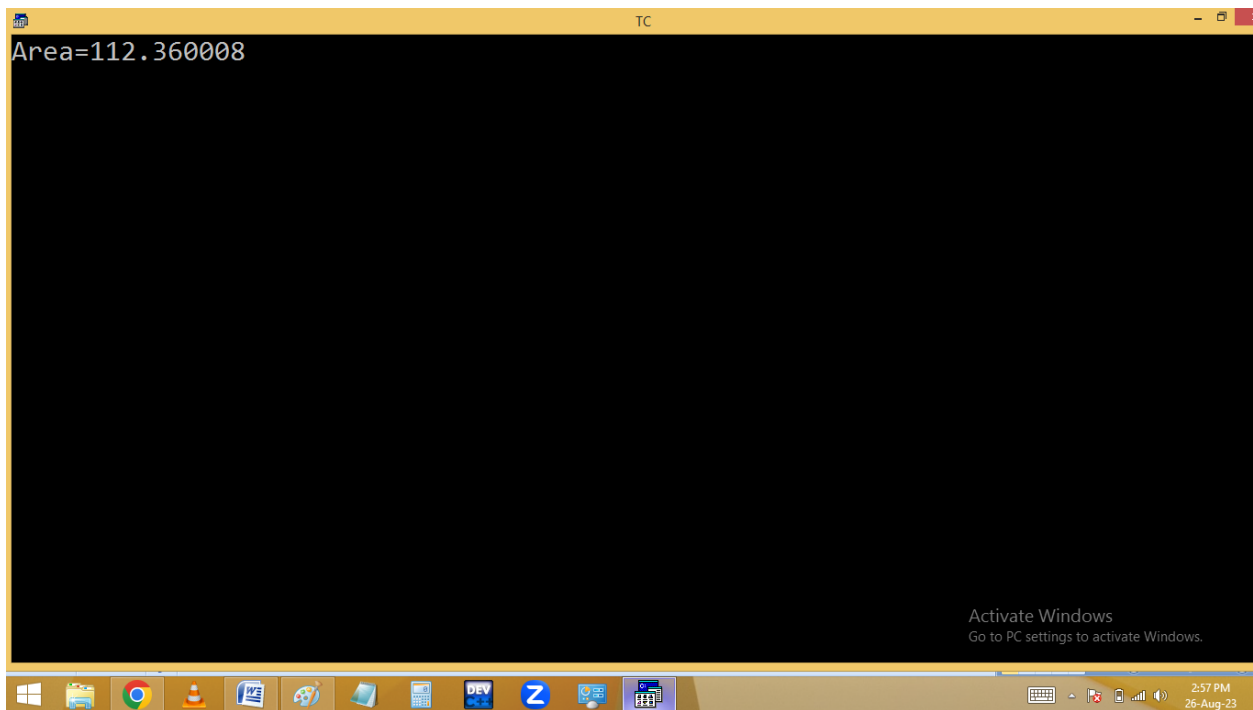




The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a toolbar. The main window is titled "Edit" and contains the following C code:

```
Line 5      Col 21  Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
float s=10.6, area; _
clrscr();
area = s*s;
printf("Area=%f",area);
getch();
}
```

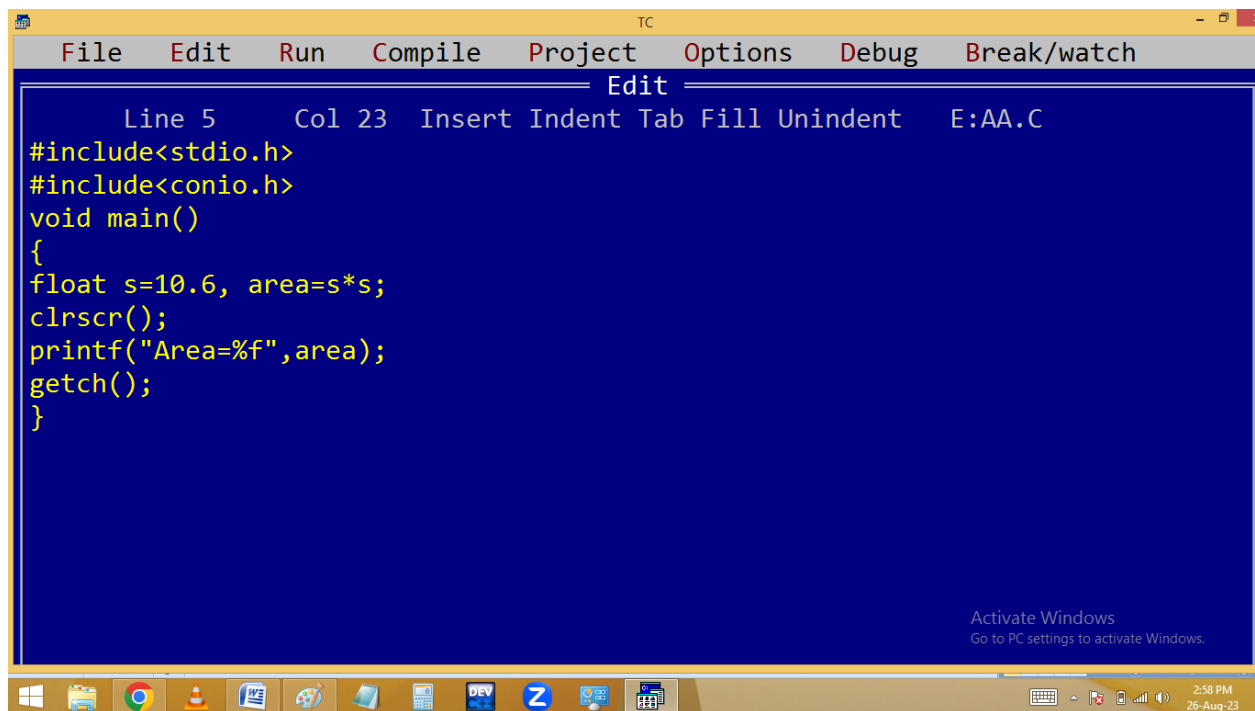
The status bar at the bottom right indicates "Activate Windows" and "Go to PC settings to activate Windows." The Windows taskbar at the bottom shows the Start button and several application icons.



The screenshot shows the Turbo C++ (TC) IDE with the same menu bar and toolbar. The main window now displays the output of the program:

```
Area=112.360008
```

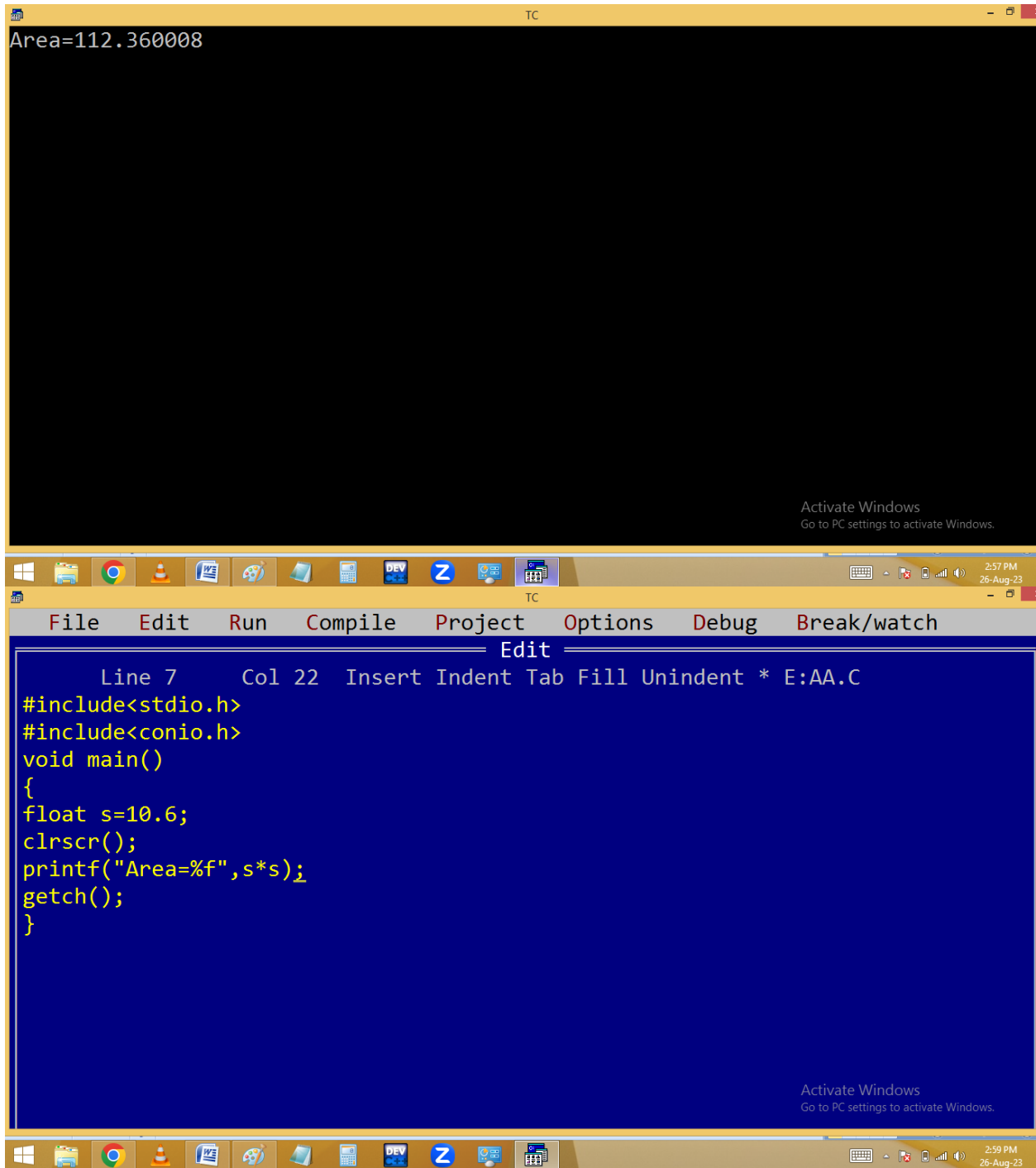
The status bar at the bottom right indicates "Activate Windows" and "Go to PC settings to activate Windows." The Windows taskbar at the bottom shows the Start button and several application icons.

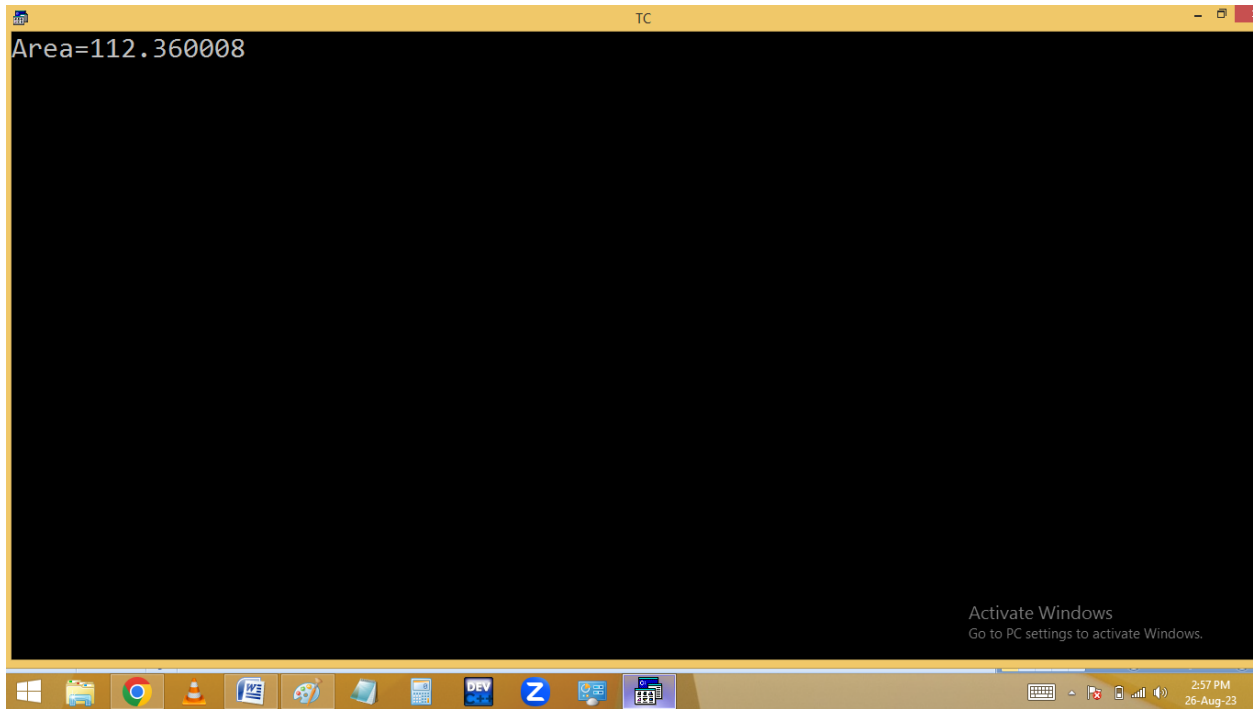


The image shows a screenshot of a Turbo C++ (TC) IDE window. The title bar at the top reads "TC". Below it is a menu bar with the following options: File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The main editing area has a dark blue background with yellow text. At the top of this area, a status bar shows "Line 5", "Col 23", and a list of editing actions: Insert, Indent, Tab, Fill, Unindent. The file name "E:AA.C" is also displayed. The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
float s=10.6, area=s*s;
clrscr();
printf("Area=%f",area);
getch();
}
```

In the bottom right corner of the IDE window, there is a message that says "Activate Windows" and "Go to PC settings to activate Windows." Below the IDE window is the Windows taskbar, which contains several icons including the Start button, File Explorer, Google Chrome, VLC media player, Word, Paint, a folder, a calculator, a device manager icon, a blue 'Z' icon, a network icon, and a taskbar icon. The system tray on the right side of the taskbar shows the date and time as "2:58 PM" and "26-Aug-23".





**Finding area of a triangle:**

```
TC
File Edit Run Compile Project Options Debug Break/watch
Edit
Line 8 Col 22 Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
float b=10.6, h=2.66, area;
clrscr();
area = 0.5*b*h;
printf("Area=%f",area);
getch();
}

Area=14.098001

TC
Activate Windows
Go to PC settings to activate Windows.
```

**Finding cube value:**

**a cube is  $a*a*a$**

The image shows a screenshot of the Turbo C++ (TC) IDE. The top window is the 'Edit' window, which contains a C program. The program calculates the cube of the number 10. The code is as follows:

```
Line 7      Col 31  Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=10, cube=a*a*a;
clrscr();
printf("%d cube is %d",a, cube);
getch();
}
```

The bottom window is the output window, which displays the result of the program's execution:

```
10 cube is 1000
```

The IDE's status bar at the bottom indicates the time as 3:02 PM on 26-Aug-23. The taskbar shows various application icons, including Windows Explorer, Google Chrome, and the Turbo C++ IDE itself.

The image shows a screenshot of the Turbo C++ (TC) IDE. The top window is the 'Edit' window, displaying a C program. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 5', 'Col 10', and 'Insert' mode. The code in the editor is as follows:

```
Line 5    Col 10    Insert Indent Tab Fill Unindent    E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=100, cube=a*a*a;
clrscr();
printf("%d cube is %d",a, cube);
getch();
}
```

The bottom window is the output window, which shows the result of the program's execution: '100 cube is 16960\_'. The status bar at the bottom of the output window also indicates 'Line 5', 'Col 10', and 'Insert' mode. The taskbar at the bottom of the screen shows various application icons, including Windows Explorer, Google Chrome, and the Turbo C++ IDE. The system clock in the bottom right corner shows '3:03 PM' and '26-Aug-23'.

100 cube is 16960\_

The image shows a screenshot of the Turbo C++ (TC) IDE. The top window is the 'Edit' window, displaying a C program. The code is as follows:

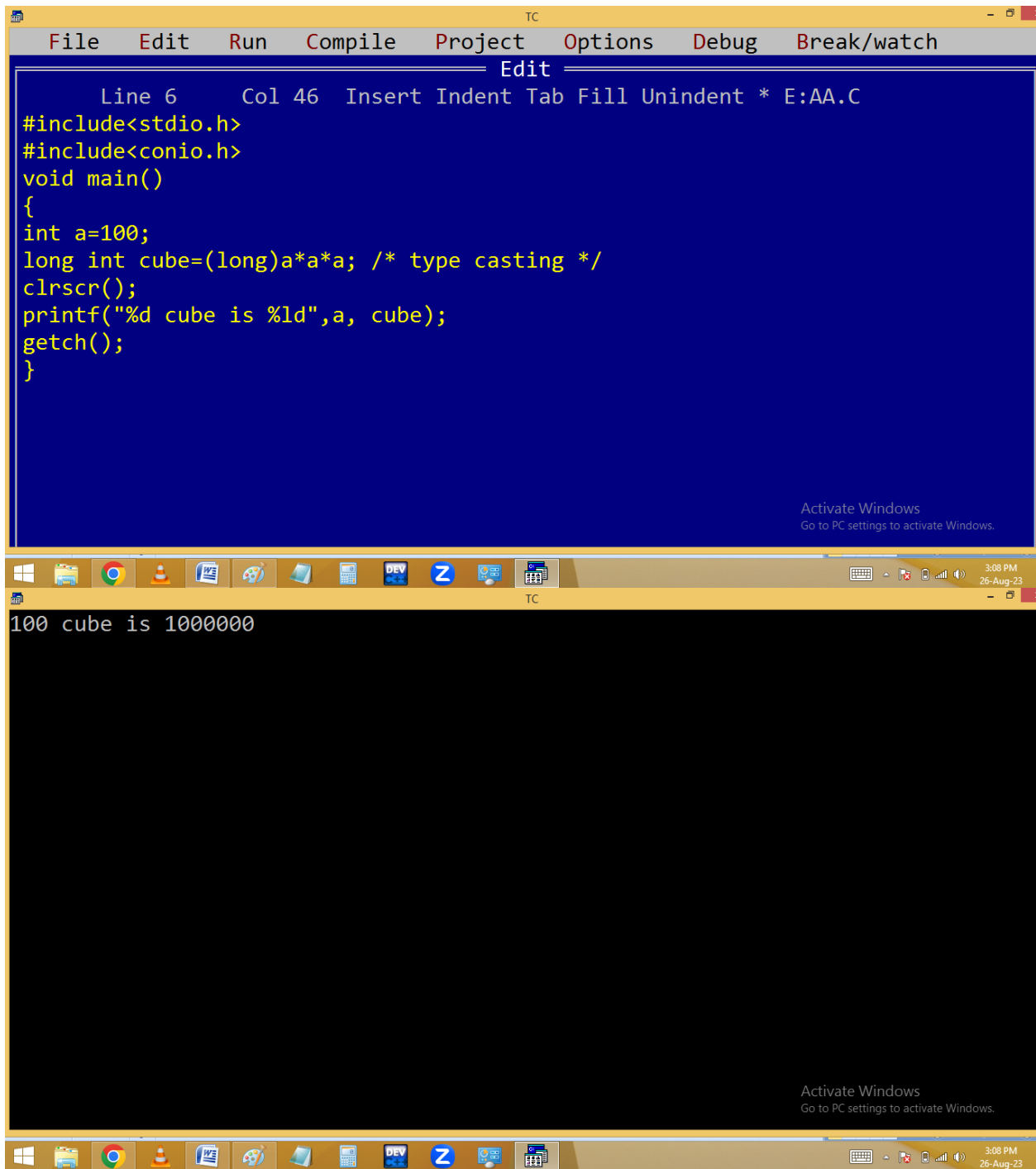
```
Line 8      Col 22  Insert Indent Tab Fill Unindent  E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=100;
long int cube=a*a*a;
clrscr();
printf("%d cube is %ld",a, cube);
getch();
}
```

The bottom window is the output window, which shows the result of the program's execution:

```
100 cube is 16960_
```

The Windows taskbar at the bottom of the screen shows the time as 3:04 PM on 26-Aug-23. The system tray includes icons for network, volume, and power. The Windows logo is visible in the bottom-left corner of the taskbar.





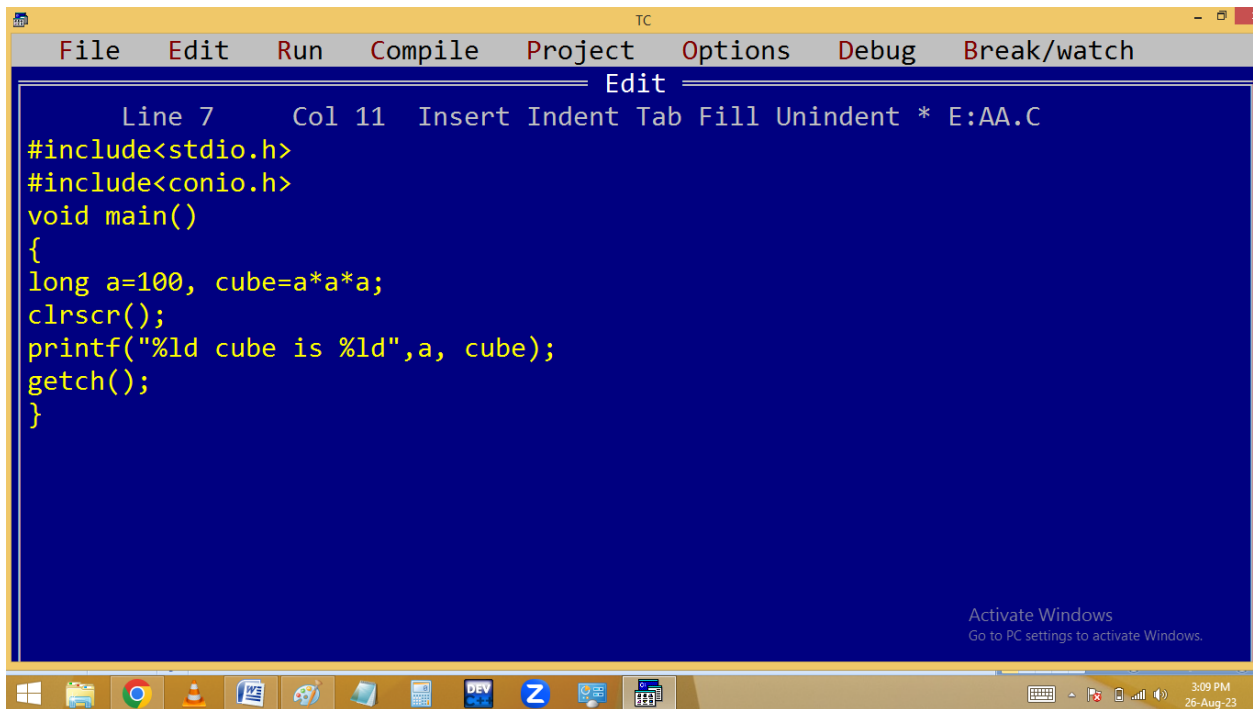
The image shows a screenshot of the Turbo C++ (TC) IDE. The top window, titled 'Edit', contains the following C code:

```
Line 6      Col 46  Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=100;
long int cube=(long)a*a*a; /* type casting */
clrscr();
printf("%d cube is %ld",a, cube);
getch();
}
```

The bottom window, titled 'TC', displays the output of the program:

```
100 cube is 1000000
```

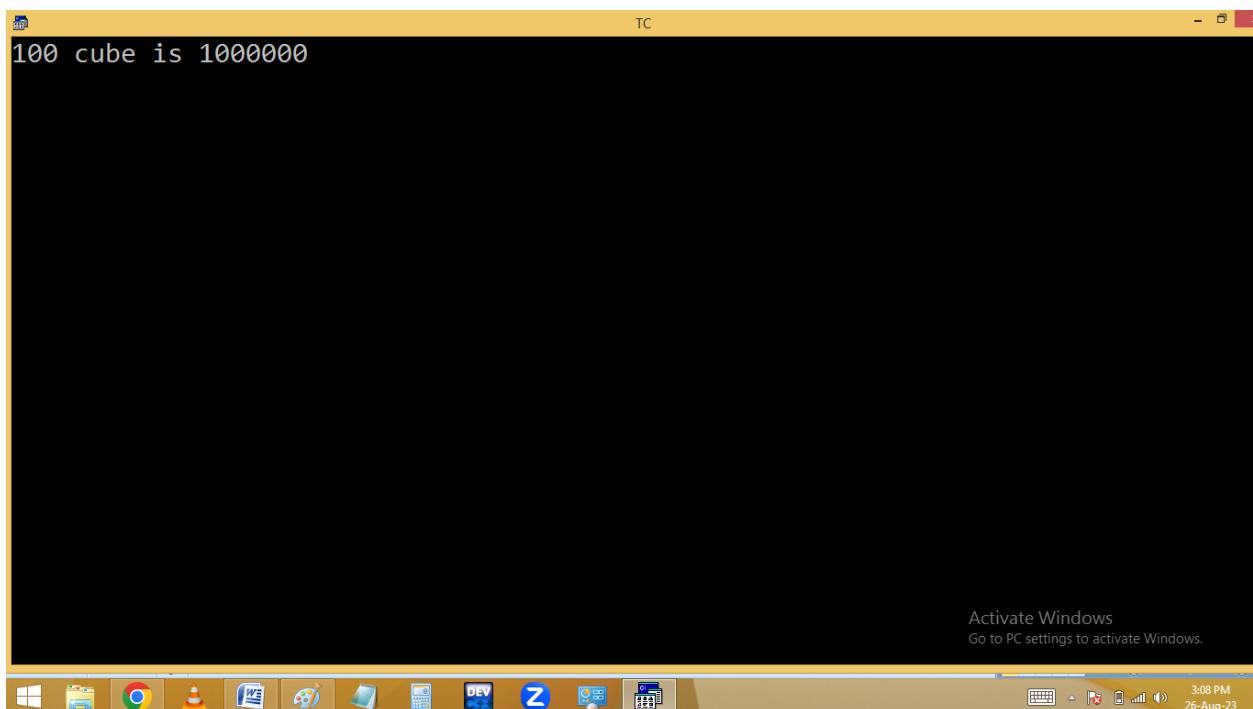
Both windows include a status bar at the bottom with the text 'Activate Windows Go to PC settings to activate Windows.' and a system tray on the right showing the time as 3:08 PM on 26-Aug-23.



The screenshot shows the Turbo C++ IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a toolbar. The main window is titled 'Edit' and contains the following C code:

```
Line 7      Col 11  Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
    long a=100, cube=a*a*a;
    clrscr();
    printf("%ld cube is %ld",a, cube);
    getch();
}
```

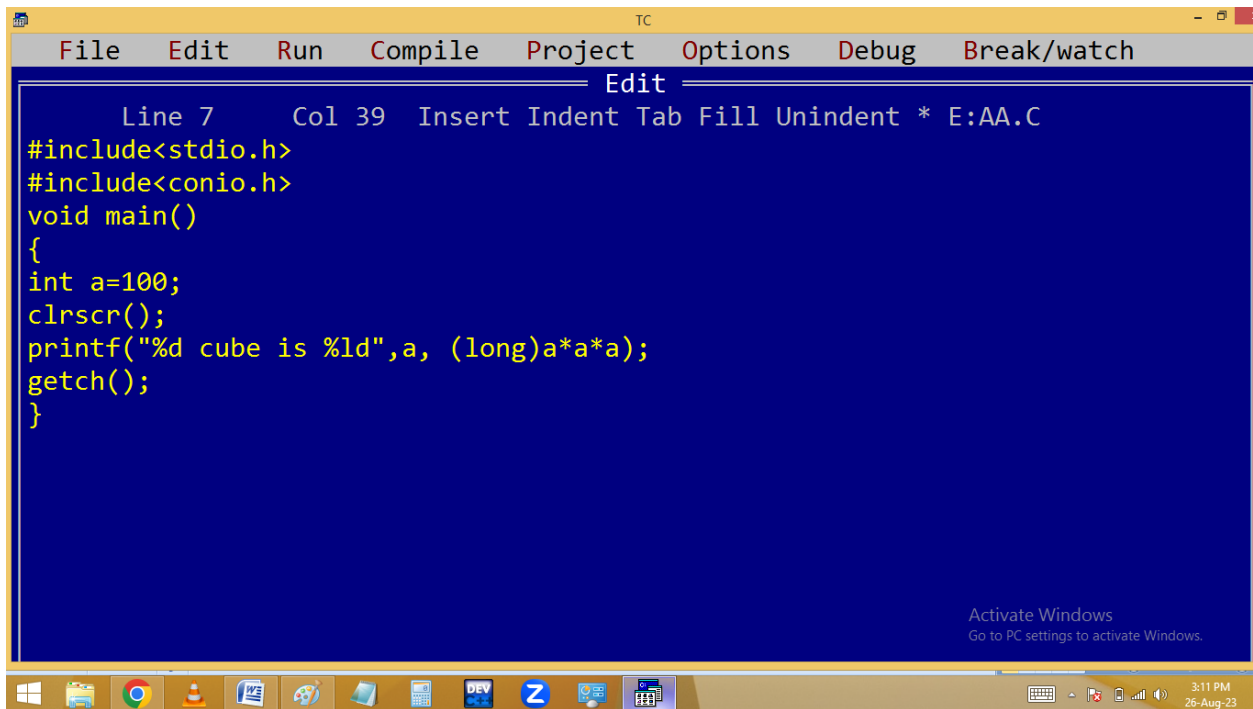
The status bar at the bottom right indicates 'Activate Windows' and 'Go to PC settings to activate Windows.' The taskbar at the bottom shows various icons including Windows, File Explorer, Chrome, and others.



The screenshot shows the Turbo C++ IDE with the same menu bar and toolbar. The main window now displays the output of the program:

```
100 cube is 1000000
```

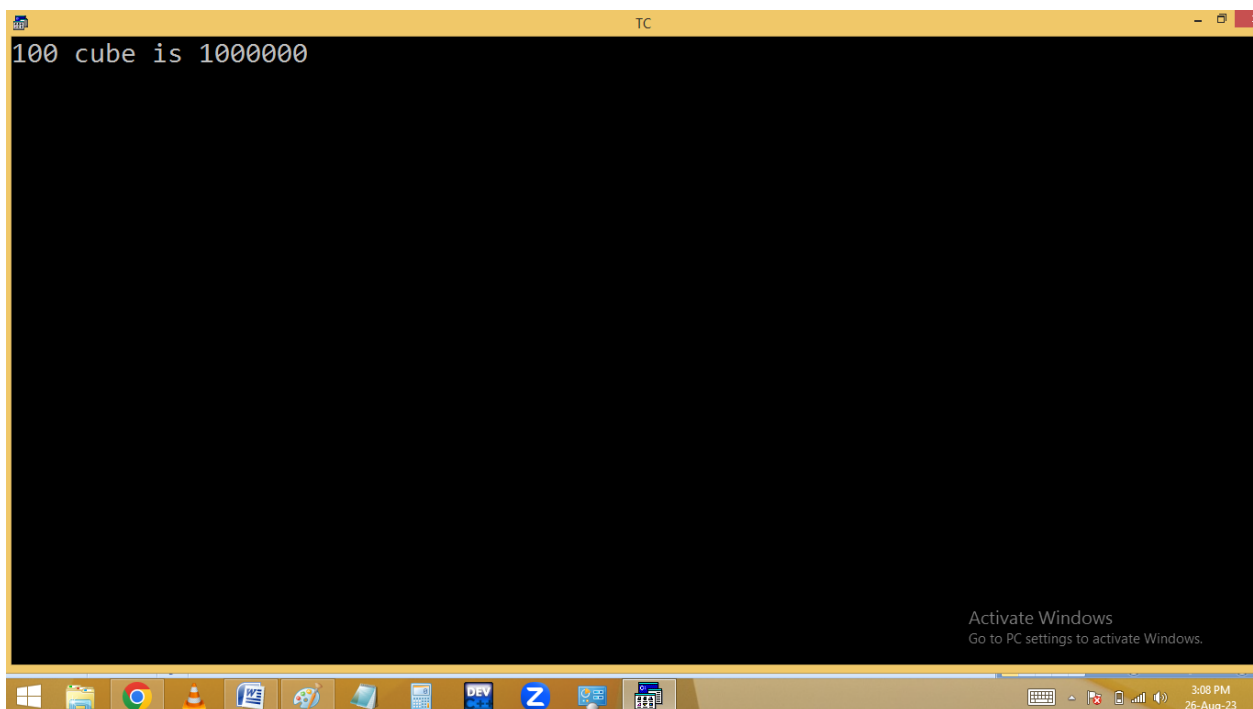
The status bar at the bottom right indicates 'Activate Windows' and 'Go to PC settings to activate Windows.' The taskbar at the bottom shows various icons including Windows, File Explorer, Chrome, and others.



The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a toolbar. The main window is titled 'Edit' and contains the following C code:

```
Line 7      Col 39  Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=100;
clrscr();
printf("%d cube is %ld",a, (long)a*a*a);
getch();
}
```

The status bar at the bottom right indicates 'Activate Windows' and 'Go to PC settings to activate Windows.' The taskbar at the bottom shows various application icons and the system clock displaying 3:11 PM on 26-Aug-23.



The screenshot shows the Turbo C++ (TC) IDE with the same menu bar and toolbar. The main window now displays the output of the program:

```
100 cube is 1000000
```

The status bar at the bottom right indicates 'Activate Windows' and 'Go to PC settings to activate Windows.' The taskbar at the bottom shows various application icons and the system clock displaying 3:08 PM on 26-Aug-23.

**Finding power value using pow():**

$$2^5=32$$

$$b \cdot 2^5 \cdot p = 32$$

The screenshot displays the Turbo C++ (TC) IDE. The top menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The 'Edit' menu is open, showing options like Line 10, Col 34, Insert, Indent, Tab, Fill, Unindent, and \* E:AA.C. The main editor window contains the following C code:

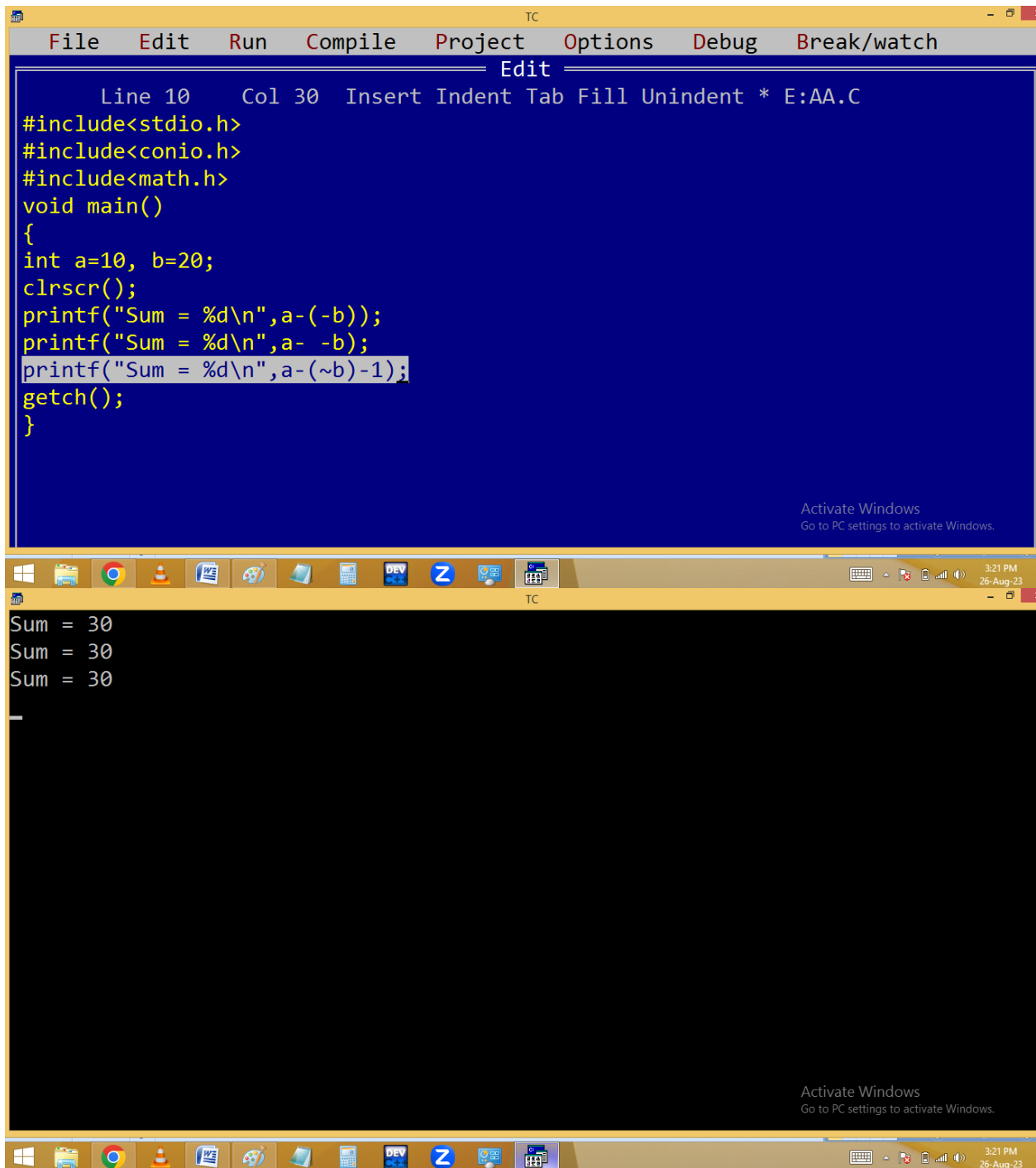
```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
int b=2,p=5;
clrscr();
printf("%d ^ %d = %f\n",b, p, pow(b,p));
printf("%d ^ %d = %.0f\n",b, p, pow(b,p));
printf("%d ^ %d = %d",b, p, (int)pow(b,p));
getch();
}
```

The output window at the bottom shows the results of the program's execution:

```
2 ^ 5 = 32.000000
2 ^ 5 = 32
2 ^ 5 = 32
```

The Windows taskbar at the bottom shows the time as 3:18 PM on 26-Aug-23. An 'Activate Windows' watermark is visible in the bottom right corner of the IDE windows.

**Add two numbers without using + operator:**



The image shows a screenshot of the Turbo C++ (TC) IDE. The top window is the 'Edit' window, displaying a C program. The code is as follows:

```
Line 10   Col 30   Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
int a=10, b=20;
clrscr();
printf("Sum = %d\n",a-(-b));
printf("Sum = %d\n",a- -b);
printf("Sum = %d\n",a-(~b)-1);
getch();
}
```

The bottom window is the output window, which shows the result of the program's execution:

```
Sum = 30
Sum = 30
Sum = 30
```

The Windows taskbar at the bottom indicates the system time is 3:21 PM on 26-Aug-23. The 'Activate Windows' watermark is visible in the bottom right corner of both windows.

a=10

b=20

a-(~b)-1

10-(~20)-1

10-(-21)-1

10+21-1

31-1=30

**Swap [ interchange ] of two numbers:**

**Method 1: without using operators**

The image shows a screenshot of the Turbo C++ (TC) IDE. The top window is the 'Edit' window, displaying a C program for swapping two numbers. The code is as follows:

```
Line 3      Col 1      Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=10, b=20;
clrscr();
printf("Before swap a=%d, b=%d\n",a,b);
printf("After  swap a=%d, b=%d",b,a);
getch();
}
```

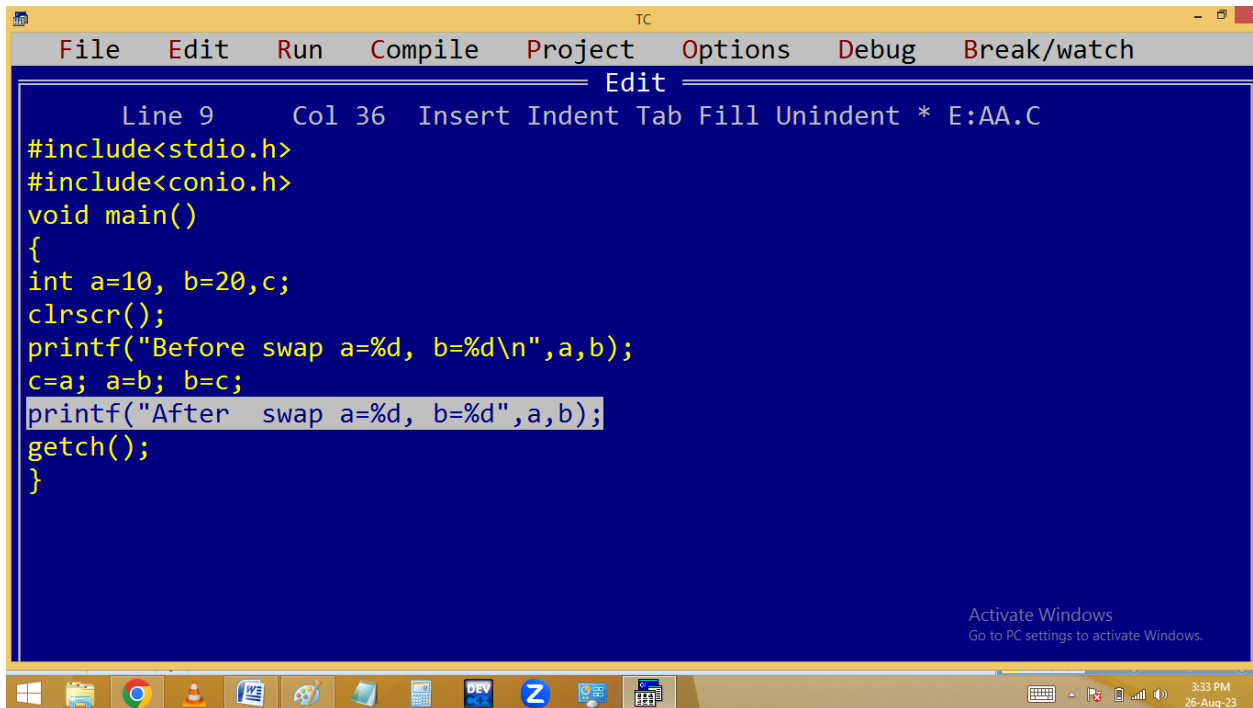
The bottom window is the 'TC' window, which shows the output of the program:

```
Before swap a=10, b=20
After  swap a=20, b=10
```

The Windows taskbar at the bottom shows the time as 3:32 PM on 26-Aug-23. An 'Activate Windows' watermark is visible in the bottom right corner of both the IDE windows.



## Using 3<sup>rd</sup> variable:



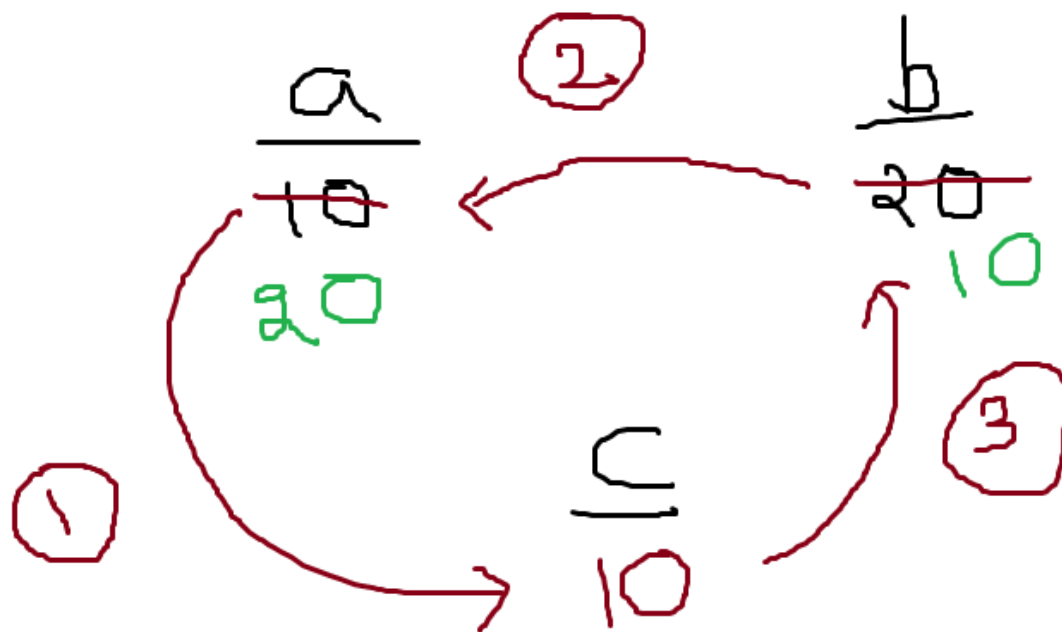
The screenshot shows the Turbo C++ (TC) IDE interface. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 9', 'Col 36', and 'Insert Indent Tab Fill Unindent \* E:AA.C'. The main editing area has a dark blue background with yellow text. The code is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a=10, b=20,c;
clrscr();
printf("Before swap a=%d, b=%d\n",a,b);
c=a; a=b; b=c;
printf("After swap a=%d, b=%d",a,b);
getch();
}
```

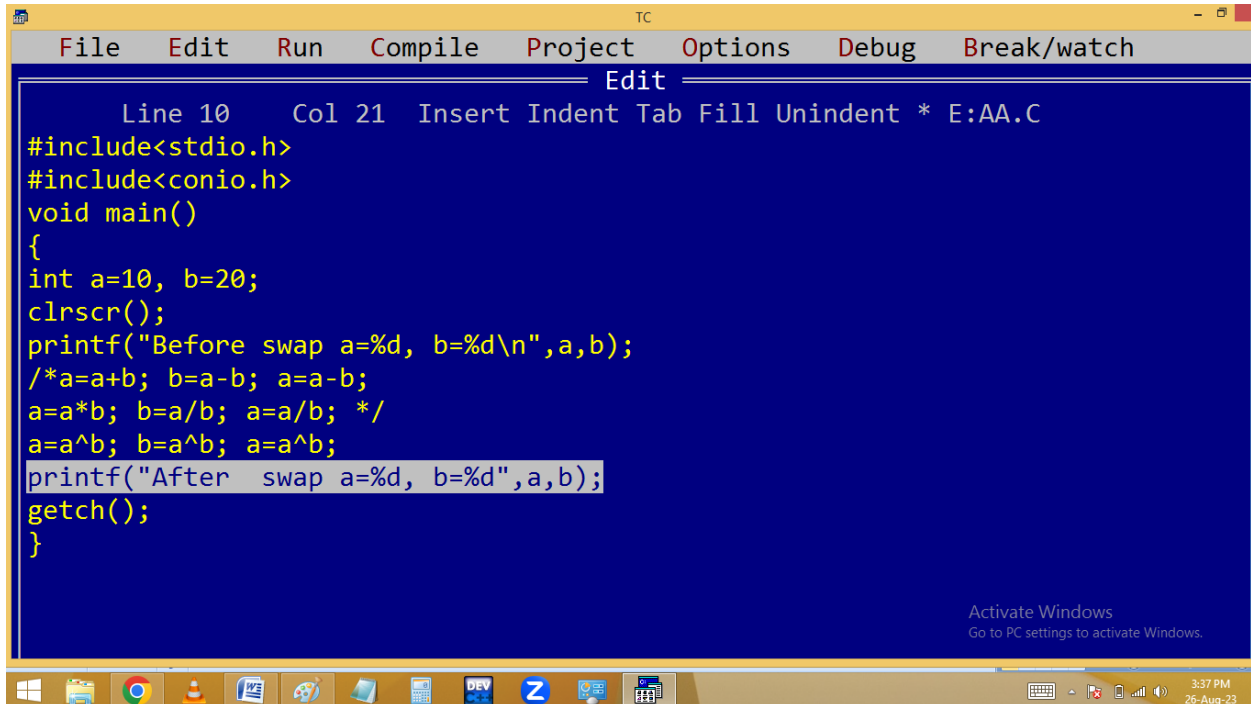
The line `printf("After swap a=%d, b=%d",a,b);` is highlighted with a light blue background. In the bottom right corner of the IDE, there is a message: 'Activate Windows Go to PC settings to activate Windows.' The Windows taskbar is visible at the bottom, showing various application icons and the system clock indicating 3:33 PM on 26-Aug-23.

```
Before swap a=10, b=20
After  swap a=20, b=10_
```

Activate Windows  
Go to PC settings to activate Windows.



## Without using 3<sup>rd</sup> variable:



```
TC
File Edit Run Compile Project Options Debug Break/watch
Edit
Line 10 Col 21 Insert Indent Tab Fill Unindent * E:AA.C
#include<stdio.h>
#include<conio.h>
void main()
{
int a=10, b=20;
clrscr();
printf("Before swap a=%d, b=%d\n",a,b);
/*a=a+b; b=a-b; a=a-b;
a=a*b; b=a/b; a=a/b; */
a=a^b; b=a^b; a=a^b;
printf("After swap a=%d, b=%d",a,b);
getch();
}
```

Activate Windows  
Go to PC settings to activate Windows.

3:37 PM  
26-Aug-23

~~a=10~~     ~~30~~     20  
~~b=20~~     10

$a = a + b \implies 10 + 20 = 30$   
 $b = a - b \implies 30 - 20 = 10$   
 $a = a - b \implies 30 - 10 = 20$

~~a=10~~     ~~200~~     20  
~~b=20~~     10

$a = a * b \implies 10 * 20 = 200$   
 $b = a / b \implies 200 / 20 = 10$   
 $a = a / b \implies 200 / 10 = 20$

