

$$\begin{array}{r}
 2 \overline{) 10} \\
 \underline{2 } \\
 2 \overline{) 2-0} \\
 \underline{2 } \\
 2 \overline{) 2-1} \\
 \underline{2 } \\
 1-0
 \end{array}$$

$$\begin{array}{r}
 2 \overline{) 20} \\
 \underline{2 } \\
 2 \overline{) 10-0} \\
 \underline{2 } \\
 2 \overline{) 5-0} \\
 \underline{2 } \\
 2 \overline{) 2-1} \\
 \underline{2 } \\
 1-0
 \end{array}$$

~~a=10~~ 30
b=20

a=30
~~b=20~~ 10

~~a=30~~ 20 ✓
b=10 ✓

a=a^b ==>
a= 01010
b= 10100
11110=30
16+8+4+2=30

b=a^b
a=30=11110
b=20=10100
01010=10

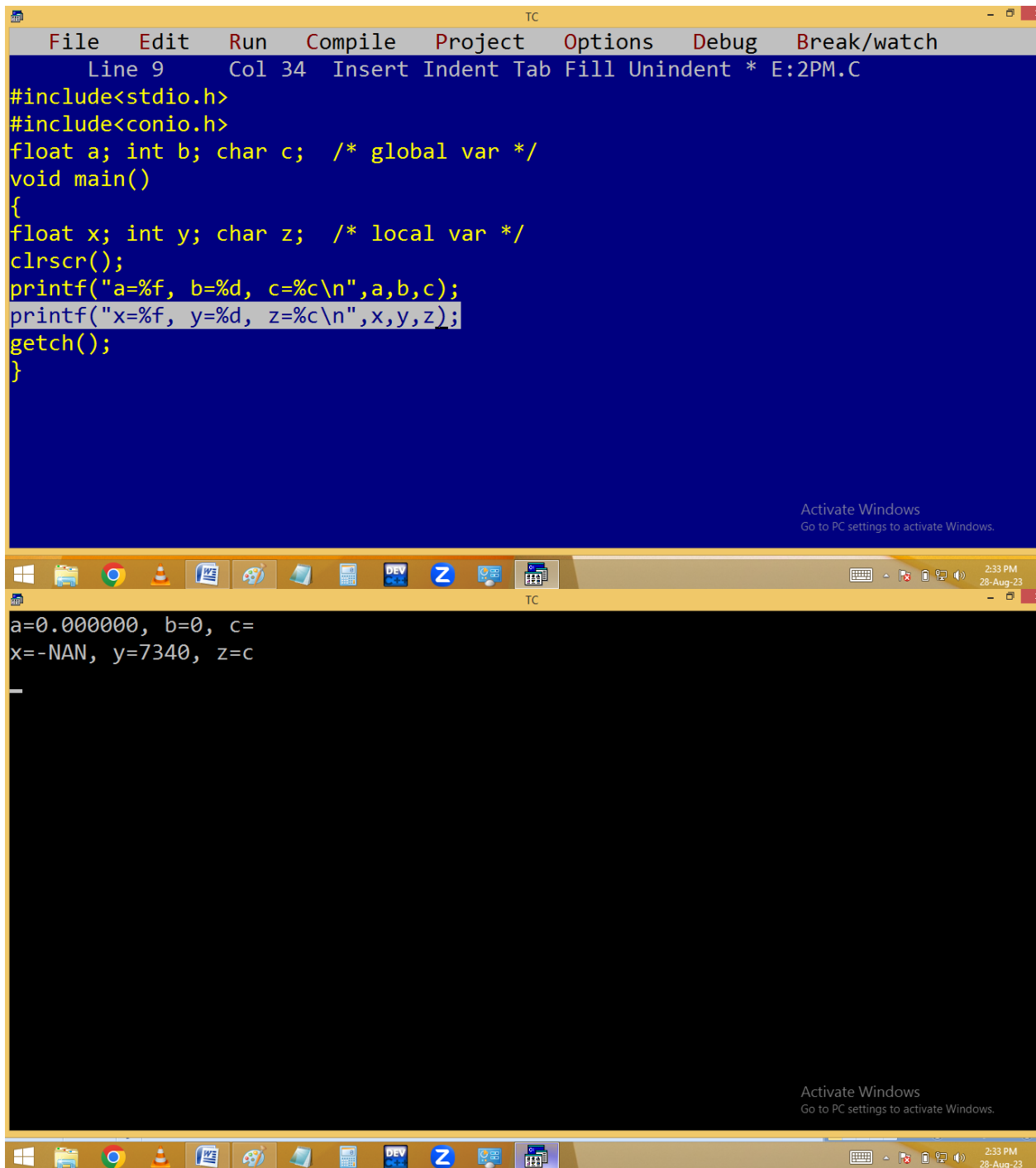
a=a^b
a=30=11110
b=10=01010
10100=20

Basically we are using 2 types of variables.

1. Local variables
2. Global variables

	Local variables	Global variables
Declaration	Within function	Top of the prog
Storage area	Stack area	Data area
Initial values	Garbage	Int-0, float-0.000000, char-blank
Scope – where we can access	Within function	Total program
Life time-when they deleted	after fun execution	After main() closed

Finding initial values of local & global variables:



The screenshot displays the Turbo C++ (TC) IDE. The top window shows a C program with global and local variables. The bottom window shows the output of the program, demonstrating the initial values of these variables.

```
File Edit Run Compile Project Options Debug Break/watch
Line 9 Col 34 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
float a; int b; char c; /* global var */
void main()
{
float x; int y; char z; /* local var */
clrscr();
printf("a=%f, b=%d, c=%c\n",a,b,c);
printf("x=%f, y=%d, z=%c\n",x,y,z);
getch();
}
```

Output:

```
a=0.000000, b=0, c=
x=-NAN, y=7340, z=c
```

The output shows that the global variable `a` is initialized to 0.000000, `b` to 0, and `c` to an empty character. The local variable `x` is initialized to -NAN (Not a Number), `y` to 7340, and `z` to the character 'c'.

Finding storage location of local & global var's:

```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 8 Col 35 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
int a; /* global var */
void main()
{
int b; /* local var */
clrscr();
printf("a addr=%u, b addr=%u",&a,&b);
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

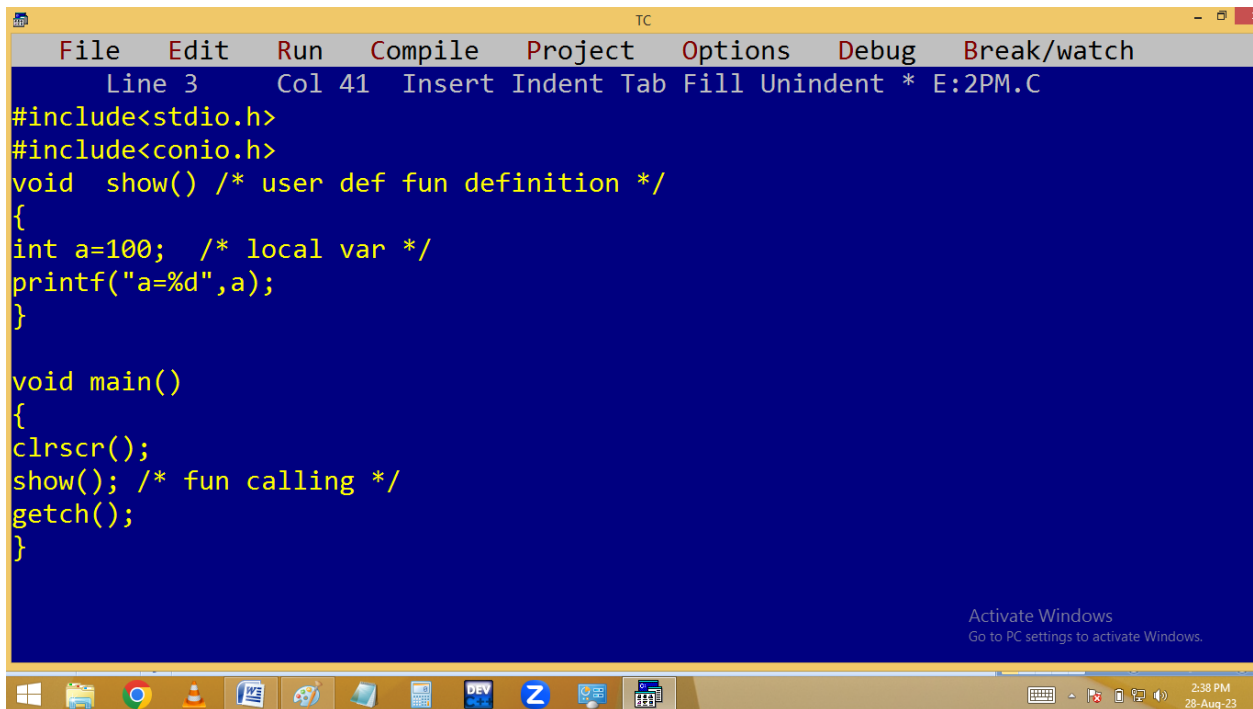
2:36 PM
28-Aug-23

```
TC
a=0.000000, b=0, c=
x=-NAN, y=7340, z=c
_
```

Activate Windows
Go to PC settings to activate Windows.

2:33 PM
28-Aug-23

Scope of local variables:



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 3', 'Col 41', and the file name 'E:2PM.C'. The main editing area has a dark blue background with yellow text. The code defines a function 'show()' with a local integer variable 'a' set to 100, and a 'main()' function that calls 'show()'. The Windows taskbar at the bottom shows various application icons and the system clock indicating 2:38 PM on 28-Aug-23.

```
File Edit Run Compile Project Options Debug Break/watch
Line 3 Col 41 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
void show() /* user def fun definition */
{
int a=100; /* local var */
printf("a=%d",a);
}

void main()
{
clrscr();
show(); /* fun calling */
getch();
}
```

Activate Windows
Go to PC settings to activate Windows.

2:38 PM
28-Aug-23

The screenshot shows the Turbo C++ (TC) IDE interface. The top window displays the code: `a=100`. The bottom window shows the compilation error: `Error: Undefined symbol 'a' in function main`. The code in the editor is as follows:

```
#include<conio.h>
void show() /* user def fun definition */
{
    int a=100; /* local var */
    printf("a=%d\n",a);
}

void main()
{
    clrscr();
    show(); /* fun calling */
    printf("a=%d",a);
    getch();
}
```

The error message indicates that the global variable `a` is not recognized in the `main` function, likely due to a missing `extern` declaration or incorrect linking order.

Global variable scope:

The screenshot displays the Turbo C++ (TC) IDE interface. The top menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 3 Col 20 Insert Indent Tab Fill Unindent * E:2PM.C'. The main editor window has a blue background and contains the following C code:

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void show() /* user def fun definition */
{
printf("a=%d\n",a);
}

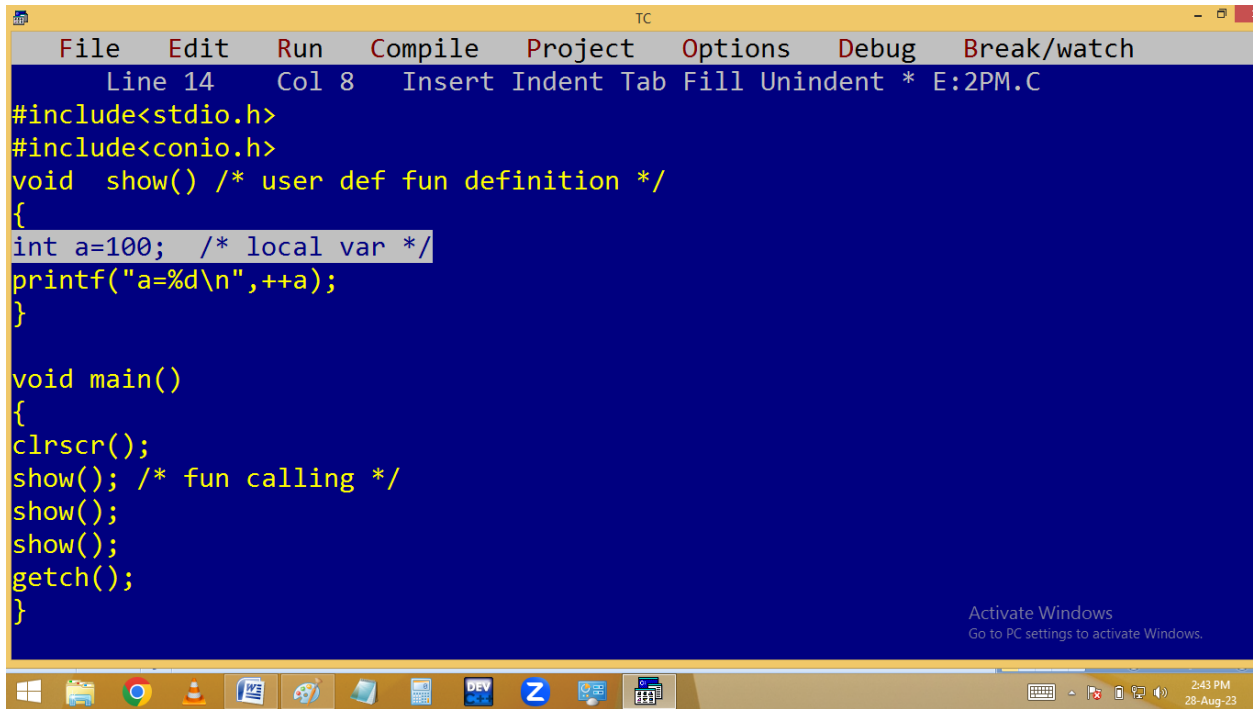
void main()
{
clrscr();
show(); /* fun calling */
printf("a=%d",a);
getch();
}
```

Below the editor, the output window shows the program's execution results:

```
a=100
a=100
```

The Windows taskbar at the bottom shows the time as 2:41 PM on 28-Aug-23. An 'Activate Windows' watermark is visible in the bottom right corner of the output window.

Finding life time of local variable:



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. Under the "Edit" menu, a status bar shows "Line 14 Col 8" and "Insert Indent Tab Fill Unindent * E:2PM.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 show() /* user def fun definition */
{
    int a=100; /* local var */
    printf("a=%d\n",++a);
}

void main()
{
    clrscr();
    show(); /* fun calling */
    show();
    show();
    getch();
}
```

In the bottom right corner of the IDE window, there is a message: "Activate Windows Go to PC settings to activate Windows." The Windows taskbar is visible at the bottom of the screen, showing various application icons and the system clock indicating 2:43 PM on 28-Aug-23.


```
TC
a=101
a=101
a=101
```

Activate Windows
Go to PC settings to activate Windows.

RAM STACK

```
int a=100 ✓  
++a -101 ✓  
a deleted  
int a=100 ✓  
++a -101 ✓  
a deleted  
int a=100 ✓  
++a -101 ✓  
a deleted
```

```
#include<conio.h>
void show() /* user def fun definition */
{
    int a=100; /* local var */
    printf("a=%d\n",++a);
} /* a deleted */

void main()
{
    clrscr();
    show(); /* fun calling */
    show();
    show();
    getch();
}
```

Finding global variable life time:

The screenshot displays the Turbo C++ (TC) IDE interface. The top menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 3 Col 20 Insert Indent Tab Fill Unindent * E:2PM.C'. The main editor window contains the following C code:

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void show() /* user def fun definition */
{
printf("a=%d\n",++a);
}

void main()
{
clrscr();
show(); /* fun calling */
show();
show();
getch();
}
```

The output window at the bottom shows the execution results:

```
a=101
a=102
a=103
```

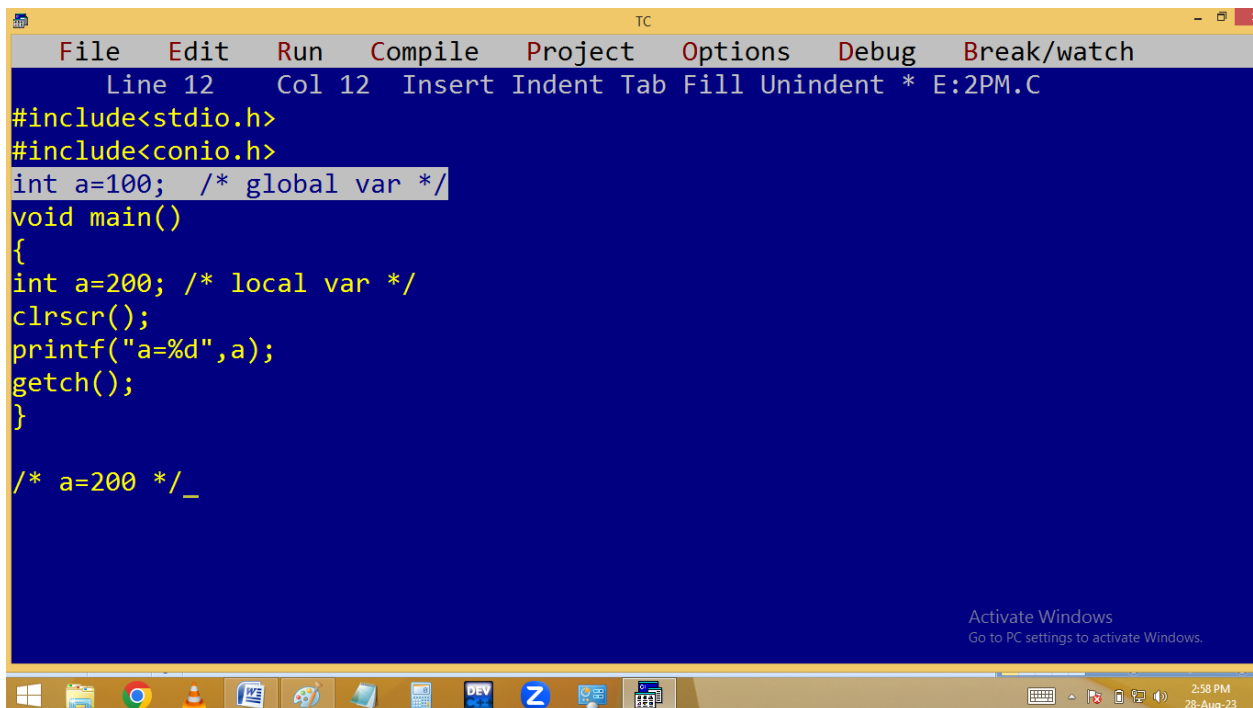
The Windows taskbar at the bottom shows the time as 2:47 PM and 2:48 PM on 28-Aug-23. An 'Activate Windows' watermark is visible in the bottom right corner of the output window.

RAM STACK

```
int a = 100
++a  = 101 ✓
++a  = 102 ✓
++a  = 103 ✓
```

```
#include<conio.h>
int a=100; /* global var */
void show() /* user def fun defi
{
printf("a=%d\n",++a);
}

void main()
{
clrscr();
show(); /* fun calling */
show();
show();
getch();
} /* a deleted */
```



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 12 Col 12 Insert Indent Tab Fill Unindent * E:2PM.C'. The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void main()
{
int a=200; /* local var */
clrscr();
printf("a=%d",a);
getch();
}

/* a=200 */_
```

The Windows taskbar at the bottom shows various application icons and the system clock indicating 2:58 PM on 28-Aug-23.

Note: When local and global var with same name, always priority goes to local var.

The image shows a screenshot of the Turbo C++ IDE. The top window, titled 'GLO.CPP', contains the following C++ code:

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void main()
{
int a=200; /* local var */
clrscr();
printf("global a=%d\n",::a); /* scope op */
printf("local  a=%d",a);
getch();
}
```

The status bar at the bottom of the editor shows '13:1'. Below the editor is a console window showing the output of the program:

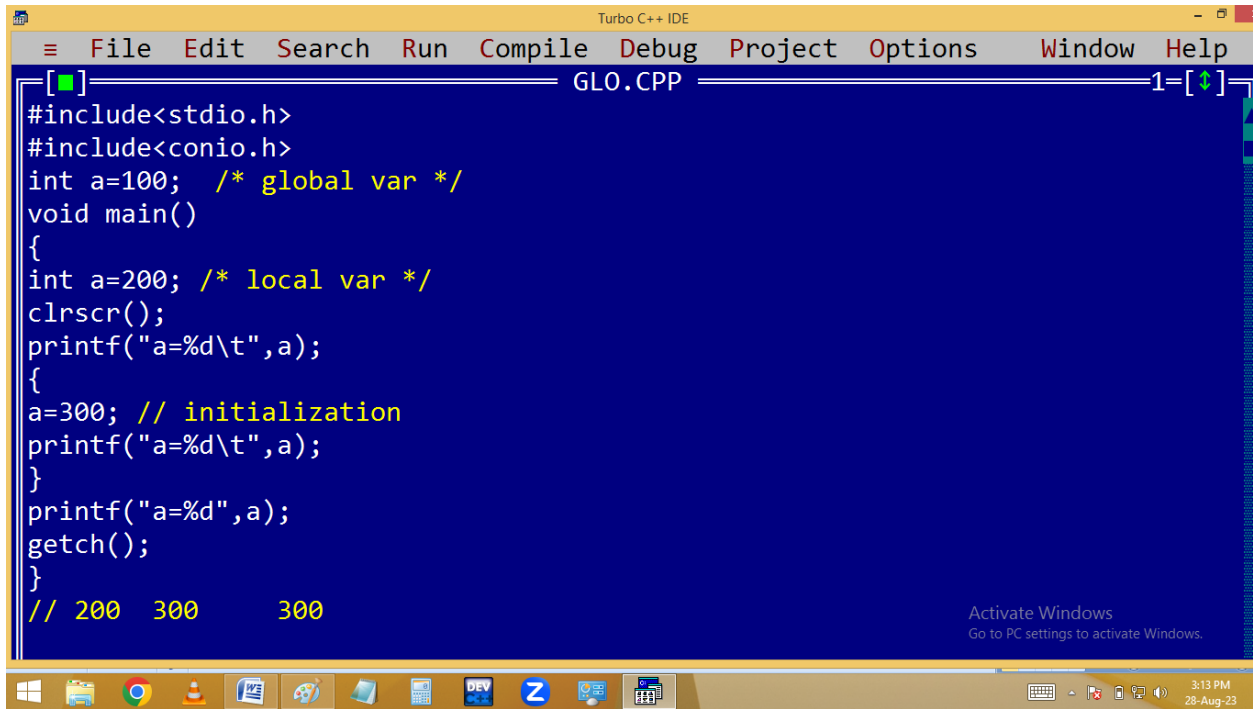
```
global a=100
local  a=200
```

The Windows taskbar is visible at the bottom, showing various application icons and the system clock indicating 3:05 PM on 28-Aug-23. An 'Activate Windows' watermark is present in the bottom right corner of the console window.

```
Turbo C++ IDE
File Edit Search Run Compile Debug Project Options Window Help
GLO.CPP 1=[↕]
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void main()
{
int a=200; /* local var */
clrscr();
printf("a=%d\t",a);
{
int a=300; // local var
printf("a=%d\t",a);
}
printf("a=%d",a);
getch();
}
// 200 300 200_

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

```
int a=100; /* global var */
void main()
{
int a=200; /* local var */
clrscr();
printf("a=%d\t",a);
{
int a=300; // local var
printf("a=%d\t",a);
} /* a deleted */
printf("a=%d",a);
getch();
}
// 200 300 200
```

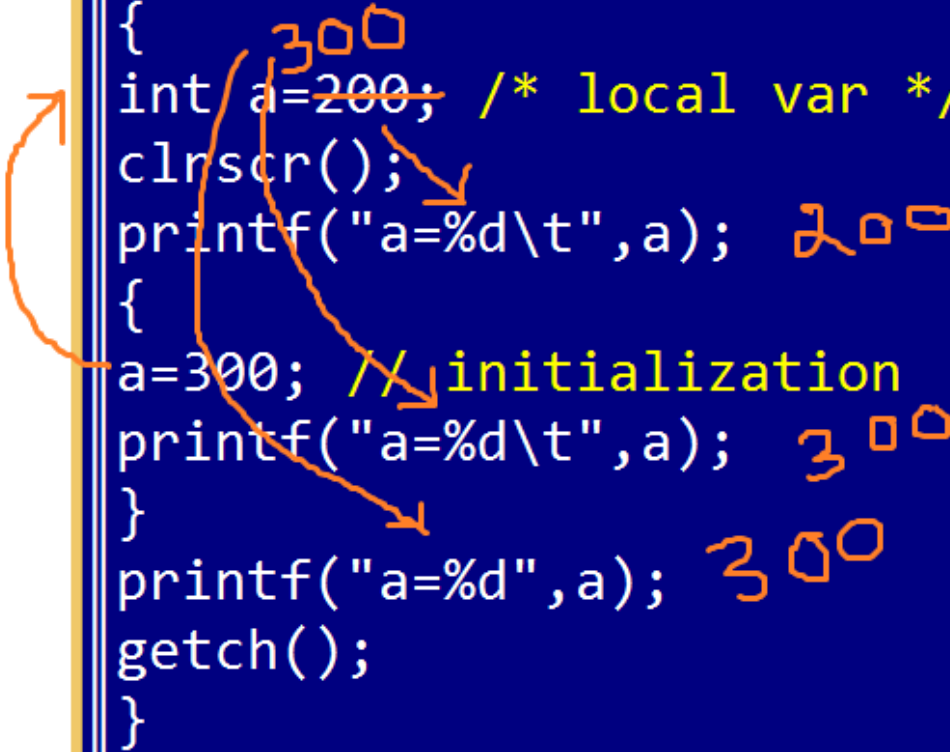


The image shows a screenshot of the Turbo C++ IDE. The title bar at the top reads "Turbo C++ IDE". The menu bar includes "File", "Edit", "Search", "Run", "Compile", "Debug", "Project", "Options", "Window", and "Help". The file name "GLO.CPP" is displayed in the title bar. The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void main()
{
int a=200; /* local var */
clrscr();
printf("a=%d\t",a);
{
a=300; // initialization
printf("a=%d\t",a);
}
printf("a=%d",a);
getch();
}
// 200 300 300
```

At the bottom right of the IDE window, 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 3:13 PM on 28-Aug-23.

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void main()
{
  int a=200; /* local var */
  clrscr();
  printf("a=%d\t",a);
  {
    a=300; // initialization
    printf("a=%d\t",a);
  }
  printf("a=%d",a);
  getch();
}
```



Turbo C++ IDE

File Edit Search Run Compile Debug Project Options Window Help

GLO.CPP 1=

```
#include<stdio.h>
#include<conio.h>
int a=100; /* global var */
void main()
{
clrscr();
printf("a=%d\t",a);
{
int a=300; // local var
printf("a=%d\t",a);
}
printf("a=%d",a);
getch();
}
// 100 300 100
```

Activate Windows
Go to PC settings to activate Windows.

3:17 PM
28-Aug-23

```
#include<conio.h>
int a=100; /* global var */
void main()
{
clrscr();
printf("a=%d\t",a);
{
int a=300; // local var
printf("a=%d\t",a);
}
printf("a=%d",a);
getch();
}
// 100 300 100
```


Turbo C++ IDE

File Edit Search Run Compile Debug Project Options Window Help

GLO.CPP 1=[↑↓]

```
#include<stdio.h>
#include<conio.h>
int a=1,b=2,c; /* global var */
void main()
{
clrscr();
{
int a=10, b=20, c; // local var
printf("%d\t",a+b+c);
}
printf("%d",a+b+c);
getch();
}
// Garbage      3 _
```

Activate Windows
Go to PC settings to activate Windows.

#include<conio.h>
int a=1,b=2,c; /* global var */
void main()
{
clrscr();
{
int a=10, b=20, c; // local var
printf("%d\t",a+b+c); 10+20+gr=gr
}
printf("%d",a+b+c); 1+2+0=3
getch();
}
// Garbage 3 _

Turbo C++ IDE

File Edit Search Run Compile Debug Project Options Window Help

GLO.CPP 1=[↕]

```
#include<stdio.h>
#include<conio.h>
int a=1,b=2,c; /* global var */
void main()
{
clrscr();
{
int a=10, b=20, c; // local var
printf("%d\t",a+b+c);
c=30;
}
printf("%d",a+b+c);
getch();
}
// Garbage      3
```

Activate Windows
Go to PC settings to activate Windows.

Turbo C++ IDE

File Edit Search Run Compile Debug Project Options Window Help

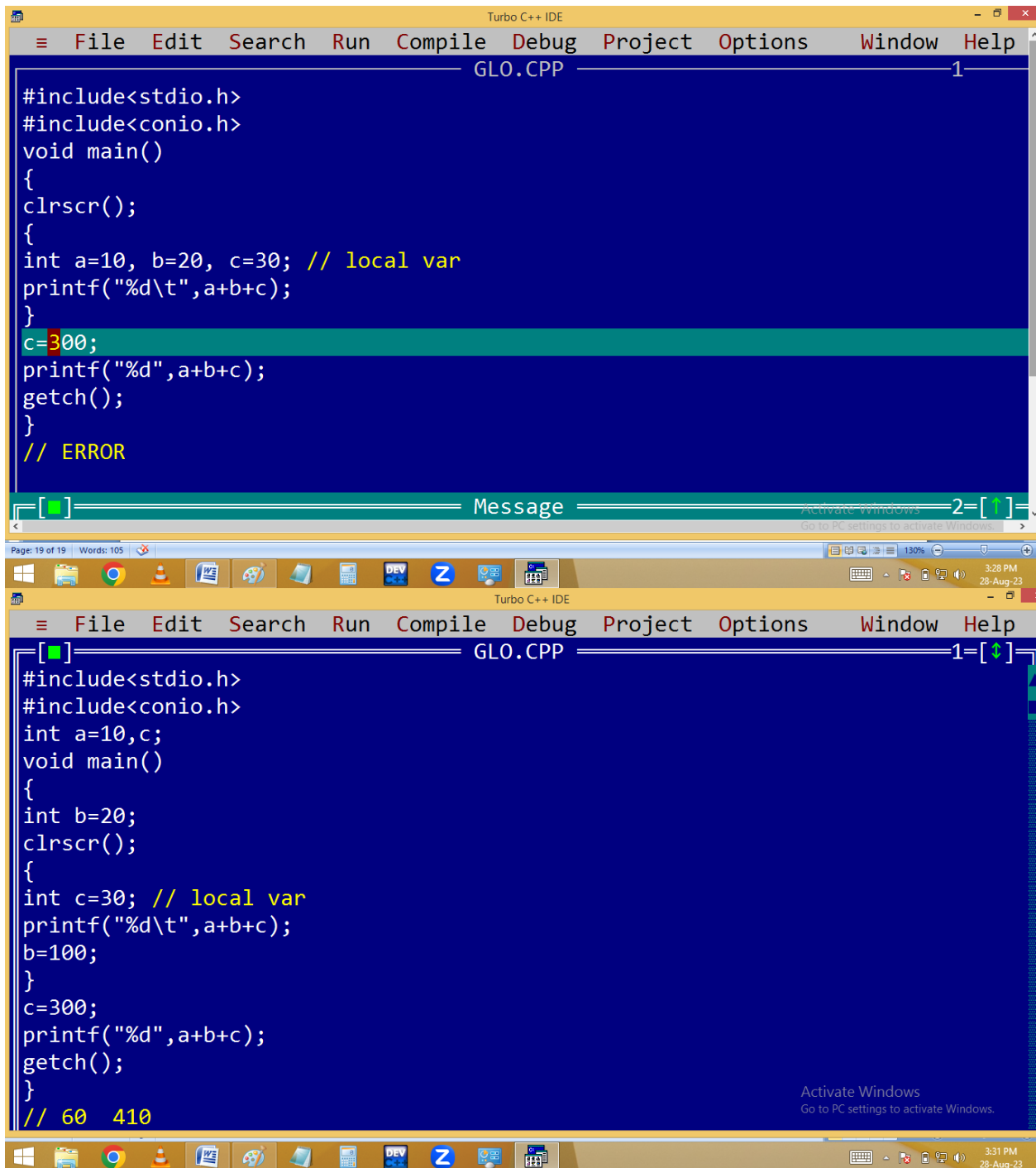
GLO.CPP 1=[↕]

```
#include<stdio.h>
#include<conio.h>
int a=1,b=2,c; /* global var */
void main()
{
clrscr();
{
int a=10, b=20, c; // local var
printf("%d\t",a+b+c);
}
c=30;
printf("%d",a+b+c);
getch();
}
// Garbage      33
```

Activate Windows
Go to PC settings to activate Windows.

```
int a=1,b=2,c; /* global var */
void main()
{
  clrscr();
  {
    int a=10, b=20, c; // local var
    printf("%d\t",a+b+c); 10+20+gr
  }
  c=30;
  printf("%d",a+b+c); 1+2+30=33
  getch();
}
// Garbage 33
```

The diagram illustrates variable scope resolution in C. A red line connects the 'c' in the global scope to the 'c' in the main function. A blue line connects the 'c' in the local scope to the 'c' in the printf statement. A green line connects the 'c' in the local scope to the 'c' in the printf statement. A blue line connects the 'c' in the global scope to the 'c' in the printf statement.



```
int a=10,c; 300
void main()
{
  int b=20; 100
  clrscr();
  {
    int c=30; // local var
    printf("%d\t",a+b+c); 10+20+30=60
    b=100;
  }
  c=300;
  printf("%d",a+b+c); 10+100+300=410
  getch();
}
// 60 410
```

Turbo C++ IDE

File Edit Search Run Compile Debug Project Options Window Help

GLO.CPP 1=[↕]

```
#include<stdio.h>
#include<conio.h>
void main()
{
    static int a;
    clrscr();
    ++a;
    printf("a=%d",a);
    getch();
}
/* a=1 */
```

Activate Windows
Go to PC settings to activate Windows.

Turbo C++ IDE

File Edit Search Run Compile Debug Project Options Window Help

GLO.CPP 1=[↕]

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int x=100;
    static int a=x;
    clrscr();
    ++a;
    printf("a=%d",a);
    getch();
}
/* a= */
```

Activate Windows
Go to PC settings to activate Windows.

```
TC
File Edit Run Compile Project Options Debug Break/watch
Edit
Line 1 Col 16 Insert Indent Tab Fill Unindent * E:2PM.C
#include<stdio.h>
#include<conio.h>
int a,b,c=10;
void main()
{
int a,b;
clrscr();
{
int a=1, b=2,c=3;
printf("sum=%d\n",a+b+c);
}
printf("sum=%d\n",a+b+c);
getch();
}
/* 6 Garbage */
```

Activate Windows
Go to PC settings to activate Windows.

```
Line 1 Col 16 Insert Indent
#include<stdio.h>
#include<conio.h>
int a,b,c=10;
void main()
{
int a,b;
clrscr();
{
int a=1, b=2,c=3;
printf("sum=%d\n",a+b+c);
}
printf("sum=%d\n",a+b+c);
getch();
}
/* 6 Garbage */
```

$1+2+3=6$

$gr+gr+10=gr$