

## **Loops / Iterations / Repetitive statements**

**Loops are used to repeat a block/group of statements continuously until the given condition becomes false.**

**Loops reduce program size and improves performance.**

**In loops beginning and ending points are same.**

**C-Language supports basically 2 types of loops.**

- 1. Entry control loops.**
- 2. Exit control loops.**

**In entry control loops, condition is tested first and it is true then only statements block is executed.**

**Under entry control loops we are having**

- i. While loop**
- ii. For loop**

**In exit control loop, the statements are executed first and later condition is tested.**

**Under exit control loop we are having**

- i. do while.**

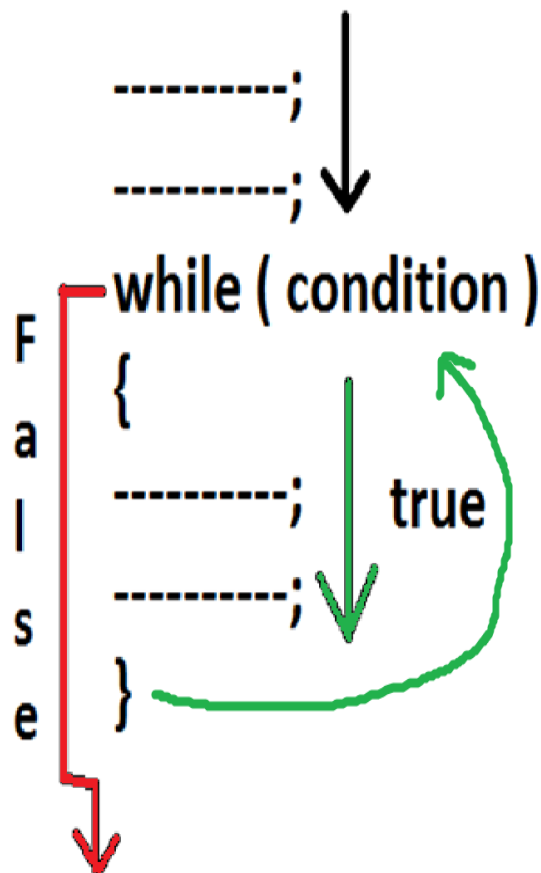
### **While loop:**

- **while is a keyword.**
- **In while loop condition is tested first and it is true then only while block statements are executed. After executing while block statements, the program execution automatically shifted/jumped to while condition at the beginning. If it is true then once again the while block**

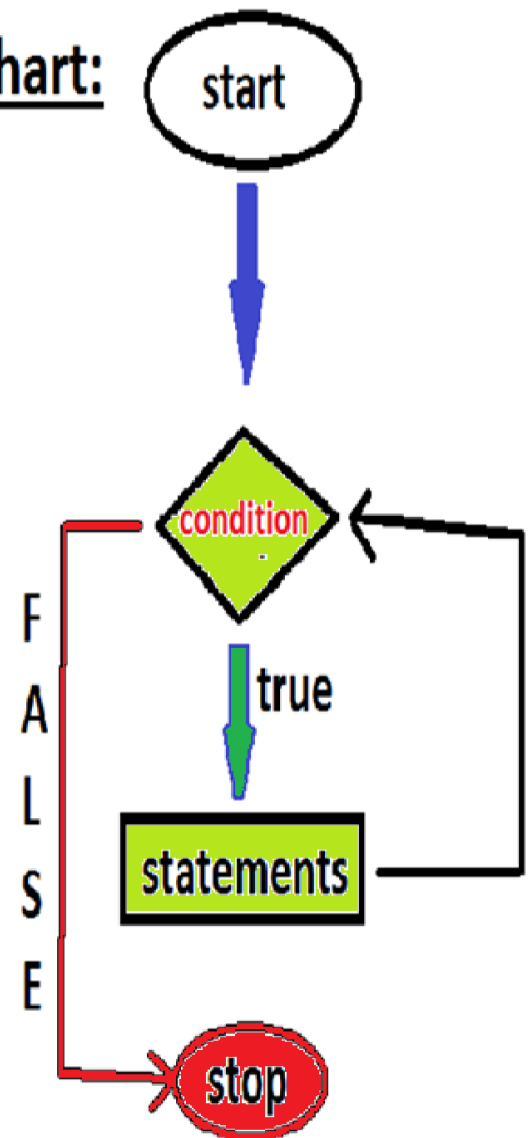
statements are repeated. Like this the process is continued until while condition becomes false.

- While is entry control loop.

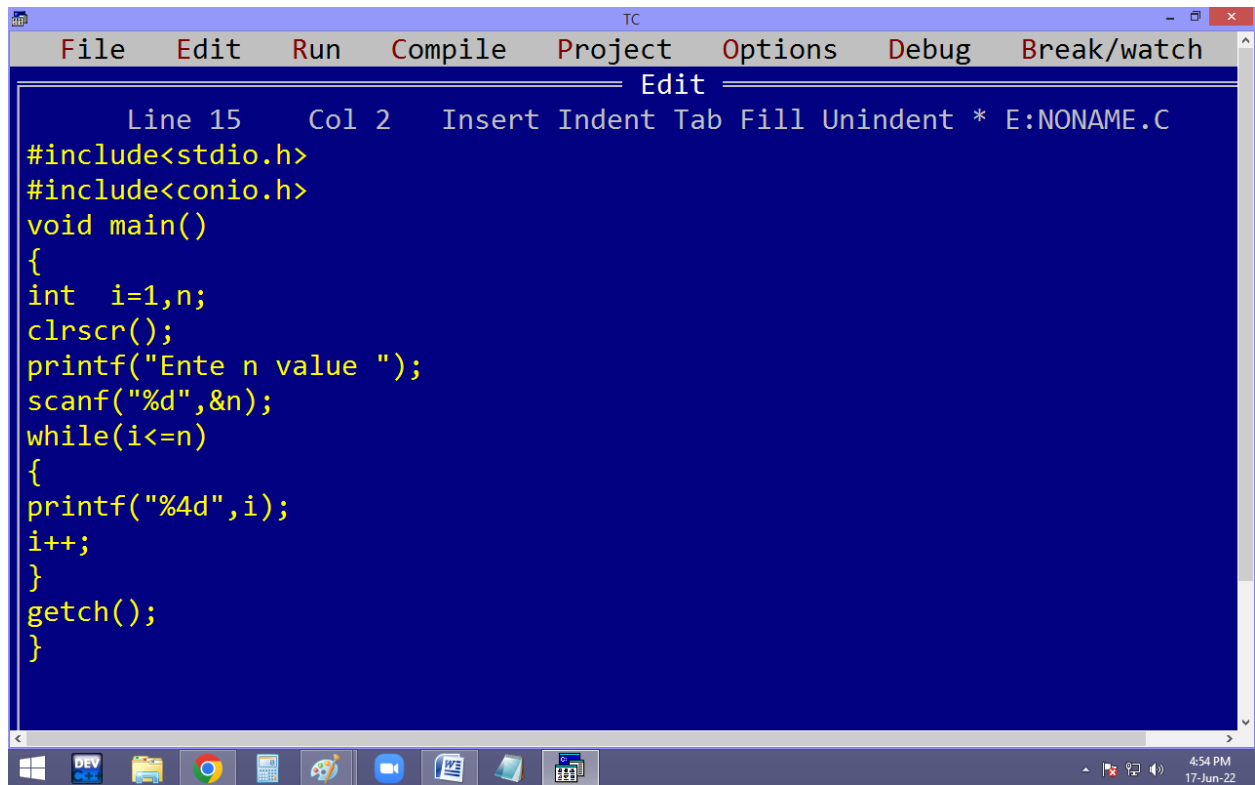
Syntax:



Flow chart:



## Eg. printing 1..n numbers.

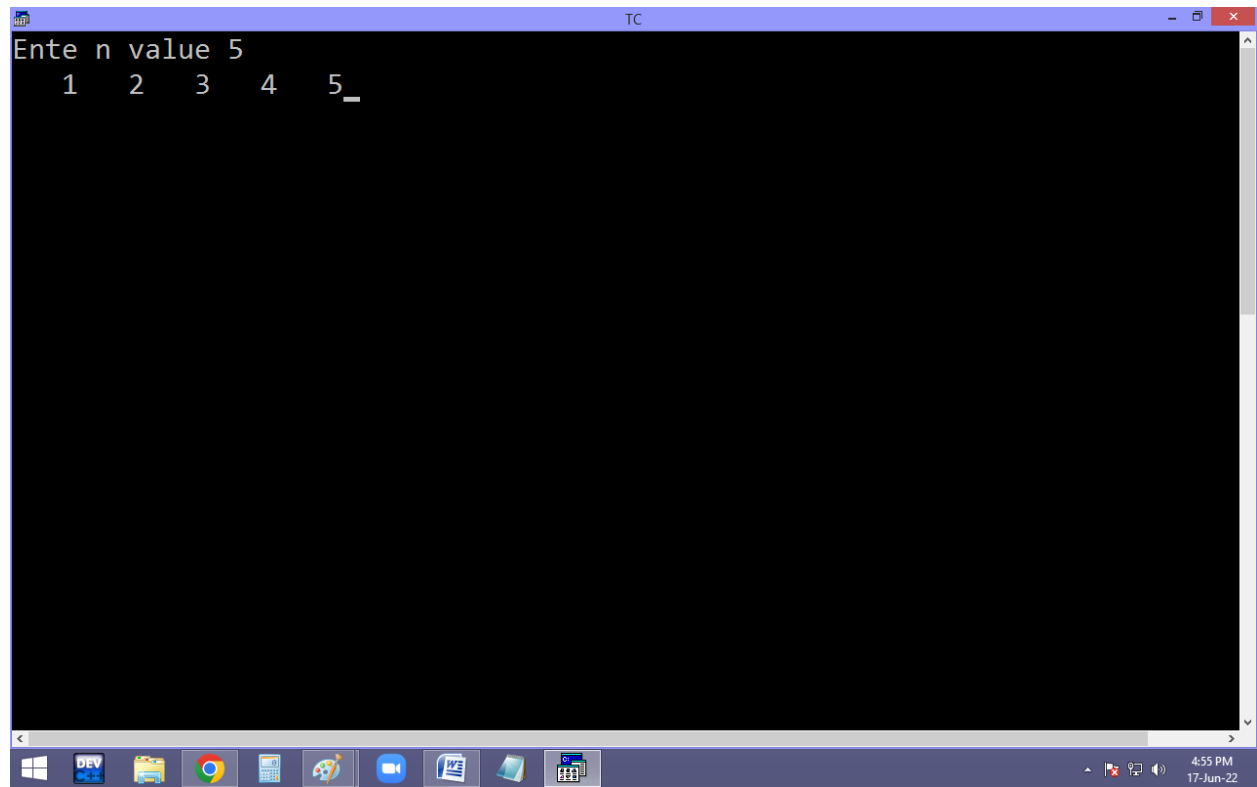


The image shows a screenshot of the Turbo C++ (TC) IDE. The window title is "TC". The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". The status bar at the top indicates "Line 15", "Col 2", and "Insert Indent Tab Fill Unindent \* E:NONAME.C". The 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 i=1,n;
    clrscr();
    printf("Ente n value ");
    scanf("%d",&n);
    while(i<=n)
    {
        printf("%4d",i);
        i++;
    }
    getch();
}
```

The Windows taskbar is visible at the bottom, showing icons for Windows, DEV, File Explorer, Google Chrome, Calculator, Paint, Zoom, Word, and a folder. The system clock in the bottom right corner shows "4:54 PM" and "17-Jun-22".

```
TC
Ente n value 5
1 2 3 4 5_
```



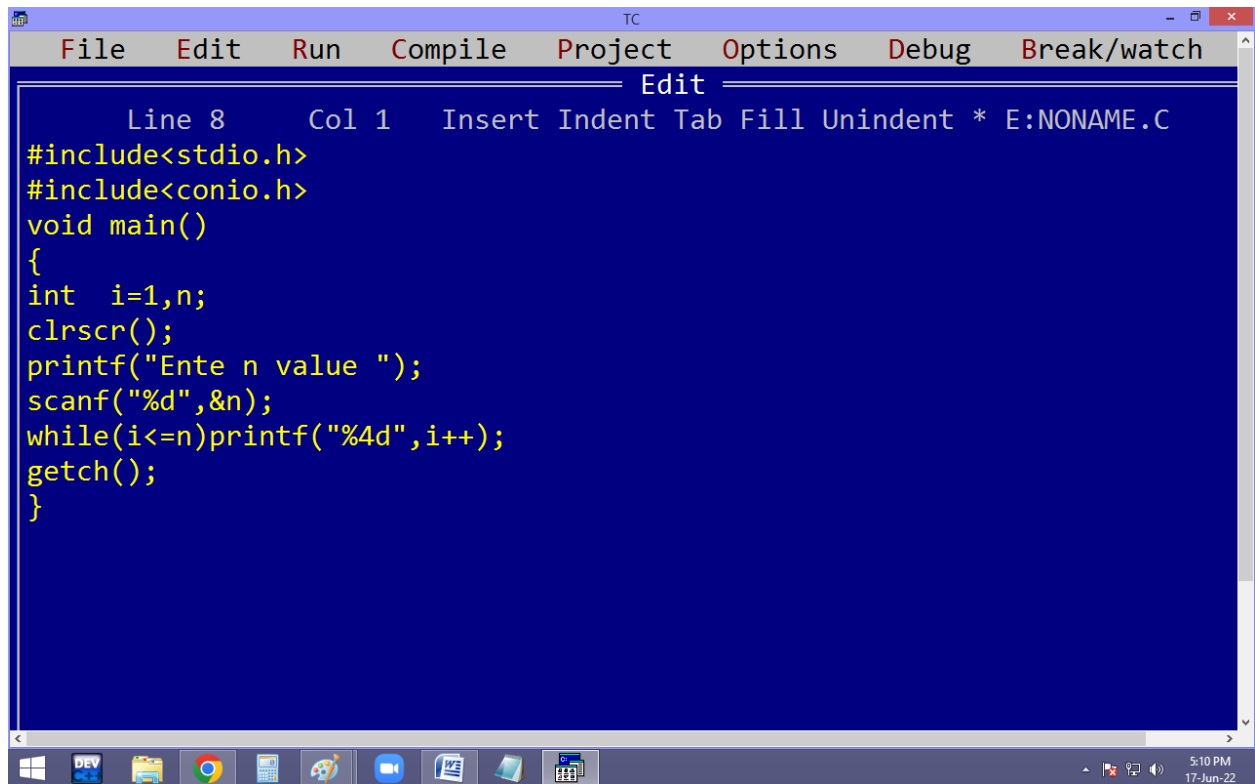
$$\frac{1}{1} = \frac{n}{5}$$

1 ✓  
2 ✓  
3 ✓  
4 ✓  
5 ✓  
6

```
while(i <= n)
```

```
{
p(i); ✓
i++; ✓
}
```

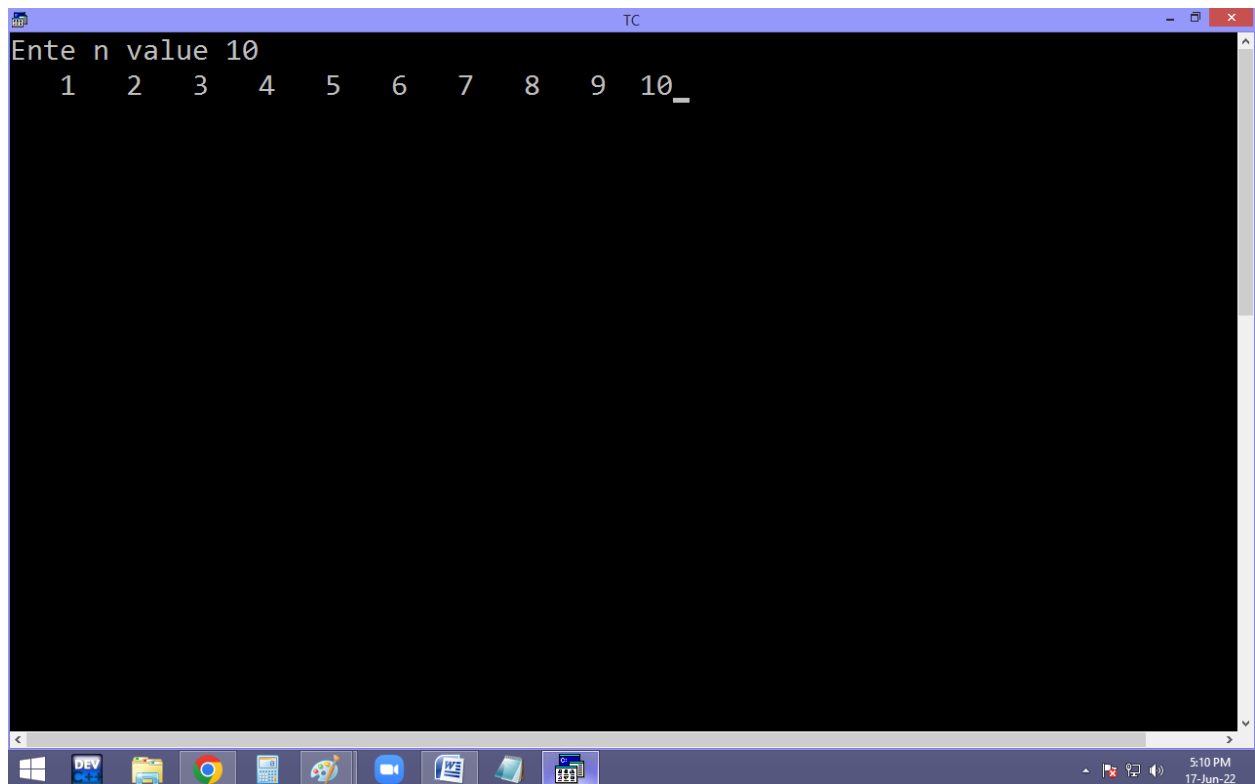
→ getch();



The screenshot shows the Turbo C++ (TC) IDE with the following menu bar: File, Edit, Run, Compile, Project, Options, Debug, Break/watch. The status bar at the top indicates "Line 8 Col 1 Insert Indent Tab Fill Unindent \* E:NONAME.C". The code in the editor is as follows:

```
Line 8 Col 1 Insert Indent Tab Fill Unindent * E:NONAME.C
#include<stdio.h>
#include<conio.h>
void main()
{
int i=1,n;
clrscr();
printf("Ente n value ");
scanf("%d",&n);
while(i<=n)printf("%4d",i++);
getch();
}
```

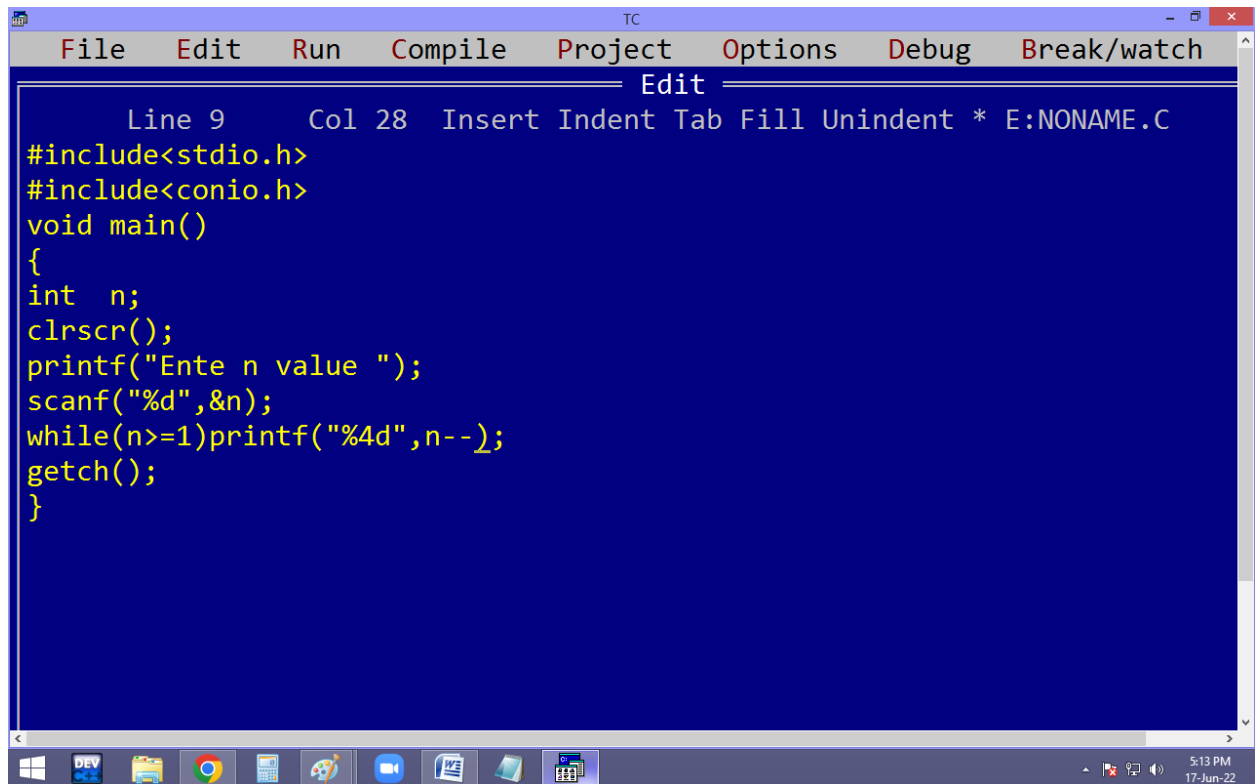
The Windows taskbar at the bottom shows the Start button and several application icons, including DEV, File Explorer, Chrome, and others. The system clock in the bottom right corner displays "5:10 PM 17-Jun-22".



The screenshot shows the Turbo C++ (TC) IDE with the output of the program. The text "Ente n value 10" is displayed on the first line. The second line shows the numbers 1 through 10, each formatted with a width of 4 characters, resulting in the output: "1 2 3 4 5 6 7 8 9 10\_".

**Printing 1..n numbers in reverse order.**

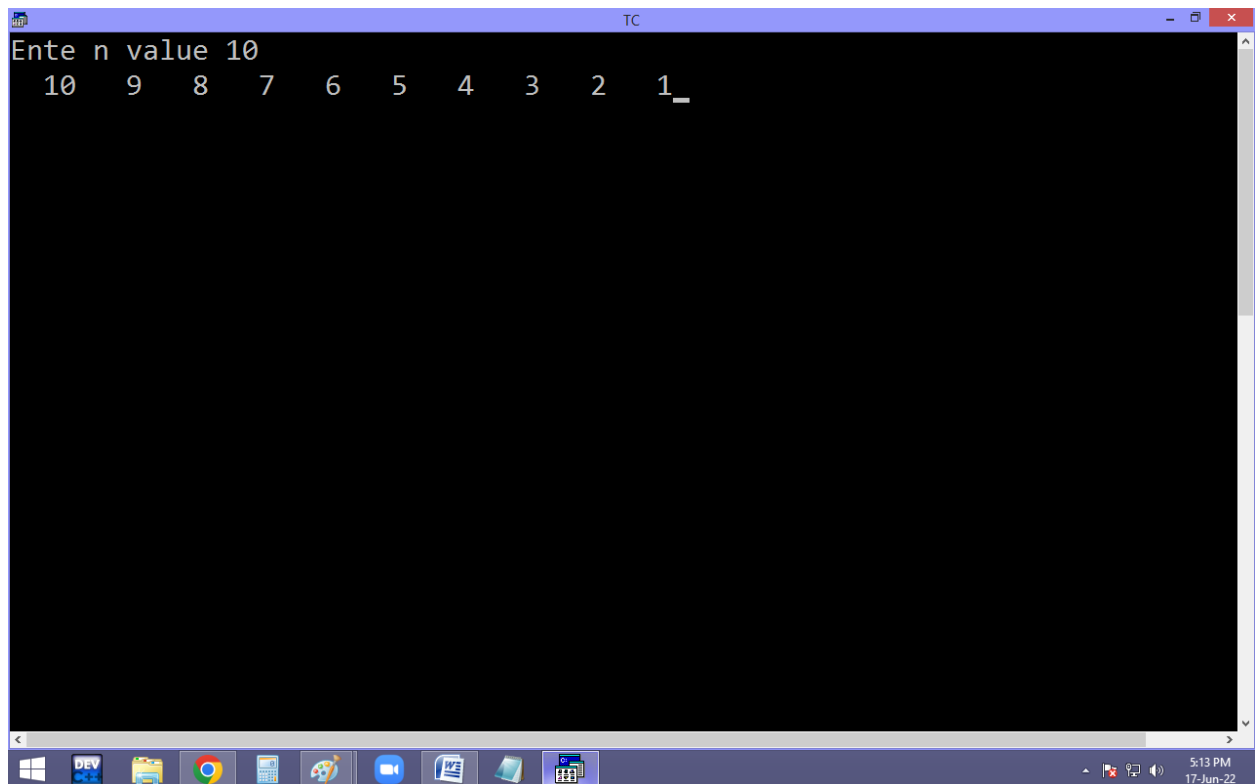




The screenshot shows the Turbo C++ (TC) IDE with the following code in the editor:

```
Line 9      Col 28  Insert Indent Tab Fill Unindent * E:NONAME.C
#include<stdio.h>
#include<conio.h>
void main()
{
    int n;
    clrscr();
    printf("Ente n value ");
    scanf("%d",&n);
    while(n>=1)printf("%4d",n--);
    getch();
}
```

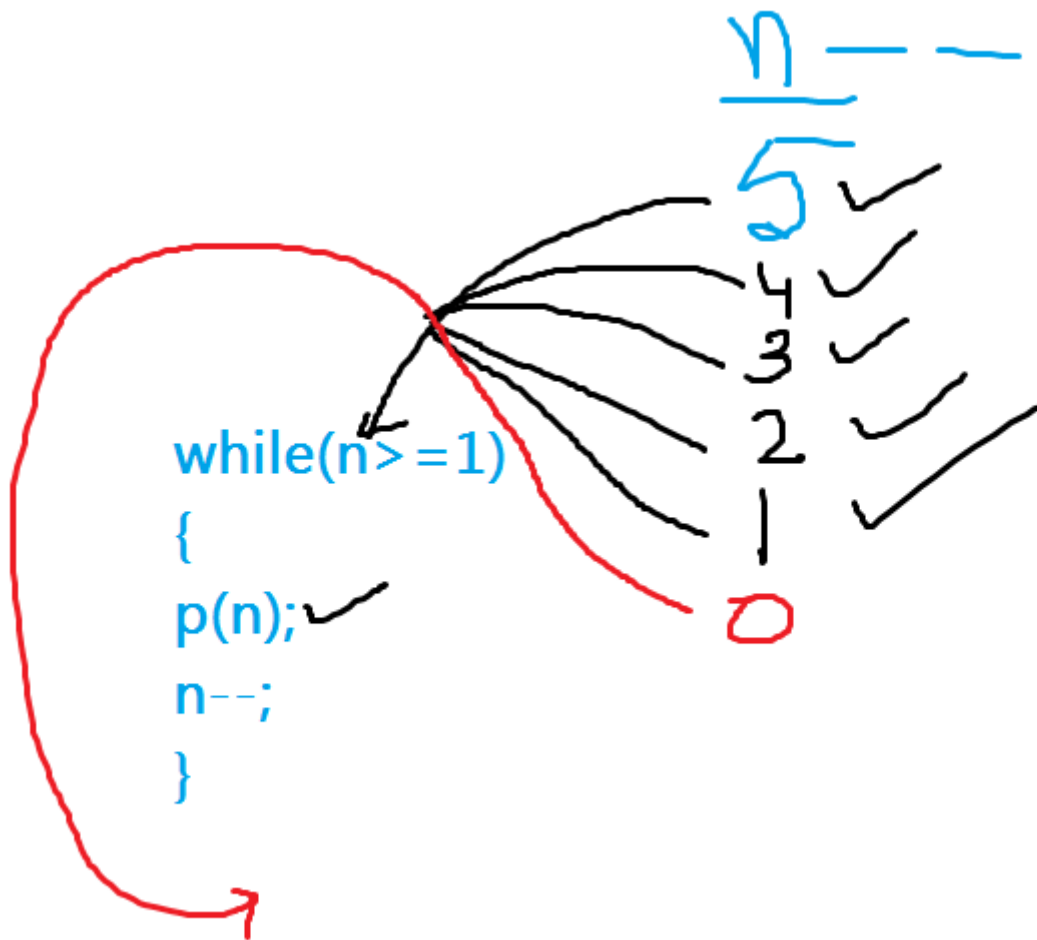
The status bar at the bottom indicates the time is 5:13 PM on 17-Jun-22.



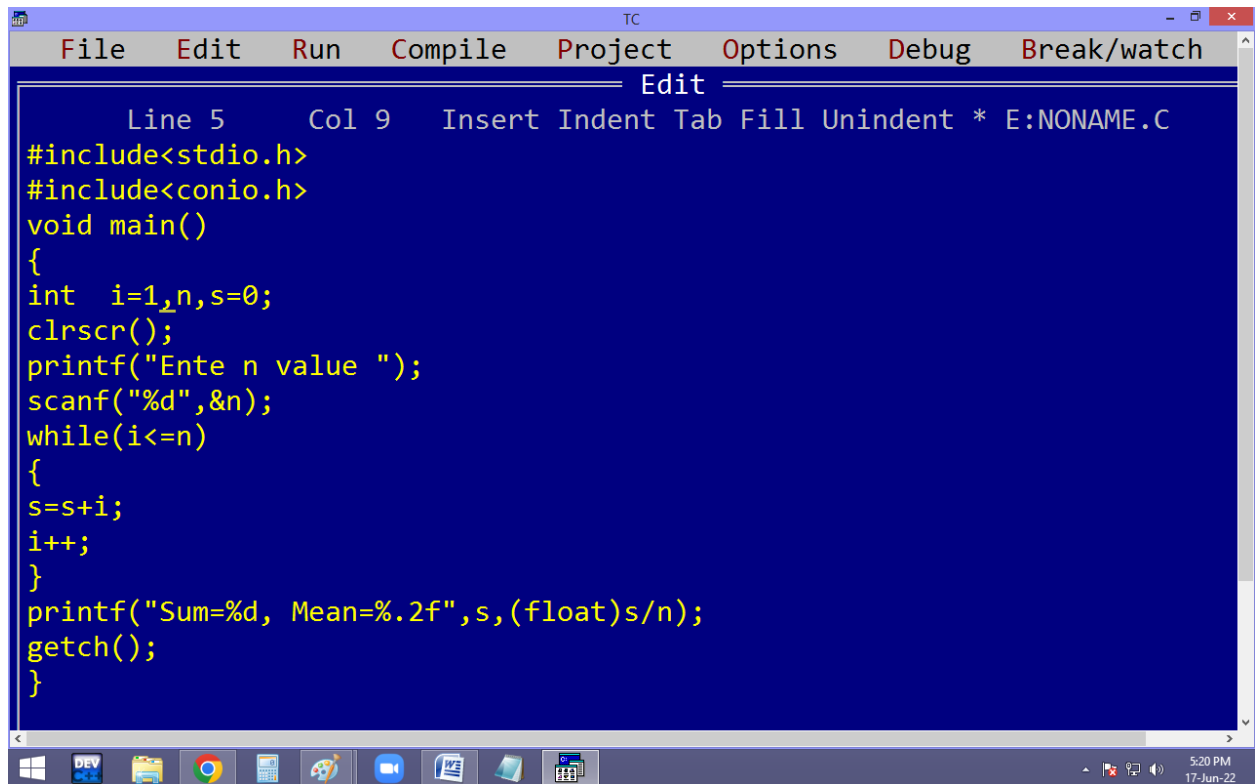
The screenshot shows the Turbo C++ (TC) IDE with the following output in the console:

```
Ente n value 10
 10   9   8   7   6   5   4   3   2   1_
```

The status bar at the bottom indicates the time is 5:13 PM on 17-Jun-22.



**Eg. printing 1..n numbers sum and mean[avg]:**

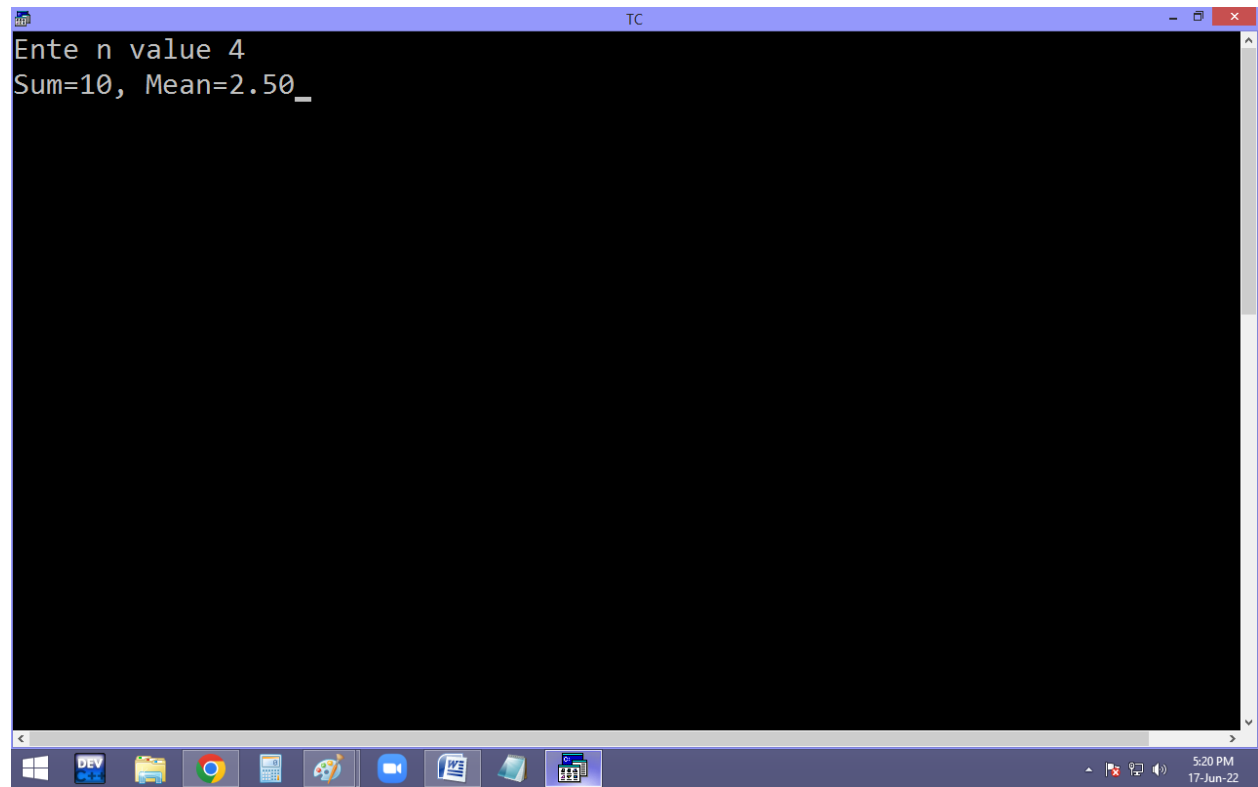


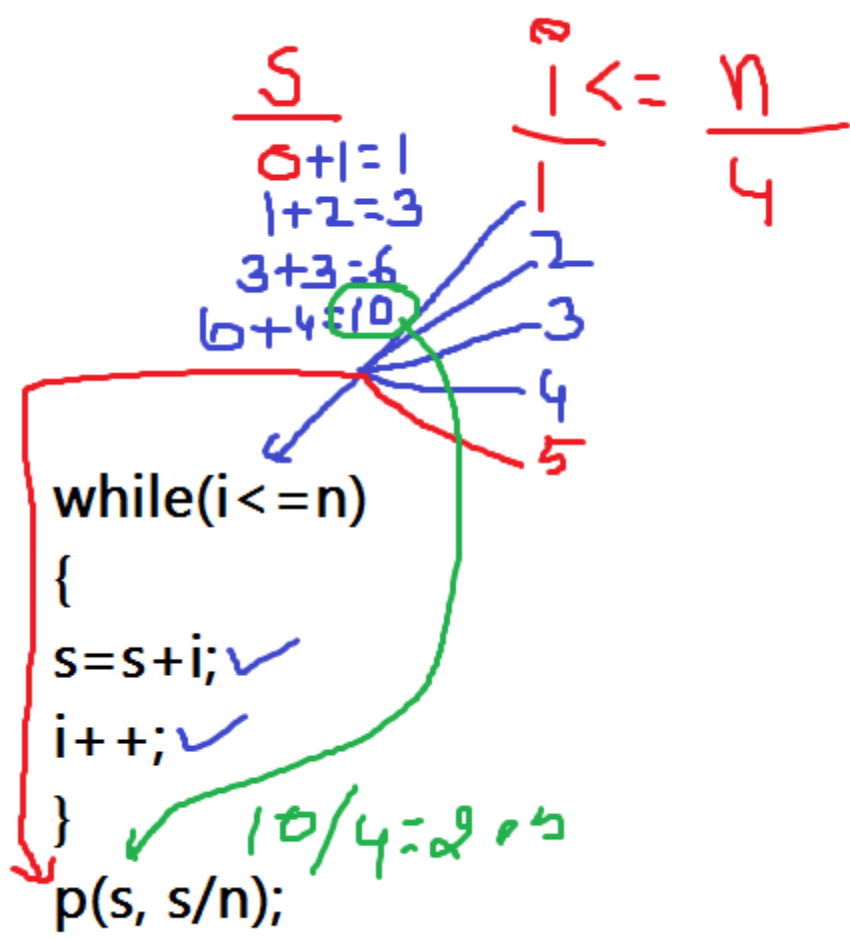
The image shows a screenshot of the Turbo C++ (TC) IDE. The window title is "TC". The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". The "Edit" menu is open, showing options: "Line 5", "Col 9", "Insert", "Indent", "Tab", "Fill", "Unindent", and "\* E:NONAME.C". The main text area has a dark blue background with yellow text. It contains the following C code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int i=1,n,s=0;
    clrscr();
    printf("Ente n value ");
    scanf("%d",&n);
    while(i<=n)
    {
        s=s+i;
        i++;
    }
    printf("Sum=%d, Mean=%.2f",s,(float)s/n);
    getch();
}
```

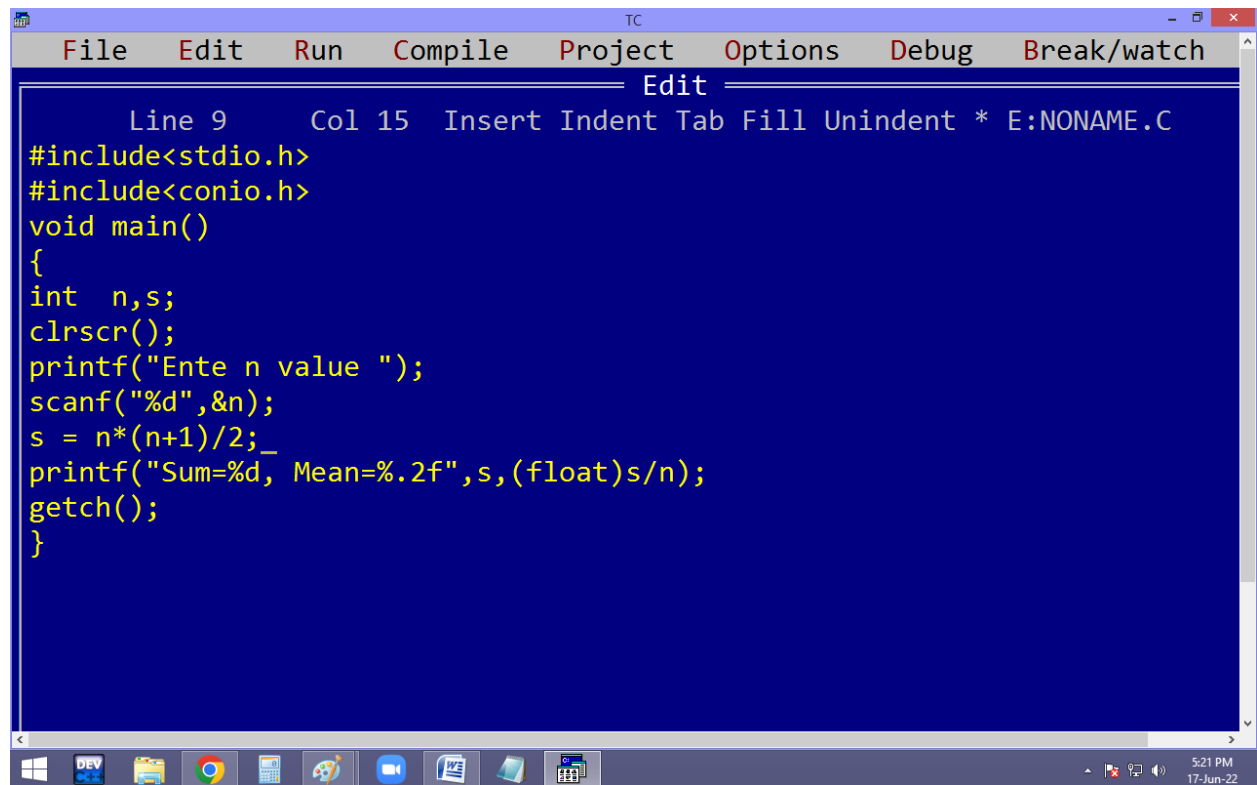
The status bar at the bottom shows the Windows taskbar with icons for "DEV", "File Explorer", "Google Chrome", "Calculator", "Paint", "Zoom", "Word", "Excel", and "Task Manager". The system clock on the right indicates "5:20 PM" and "17-Jun-22".

```
TC
Ente n value 4
Sum=10, Mean=2.50_
```





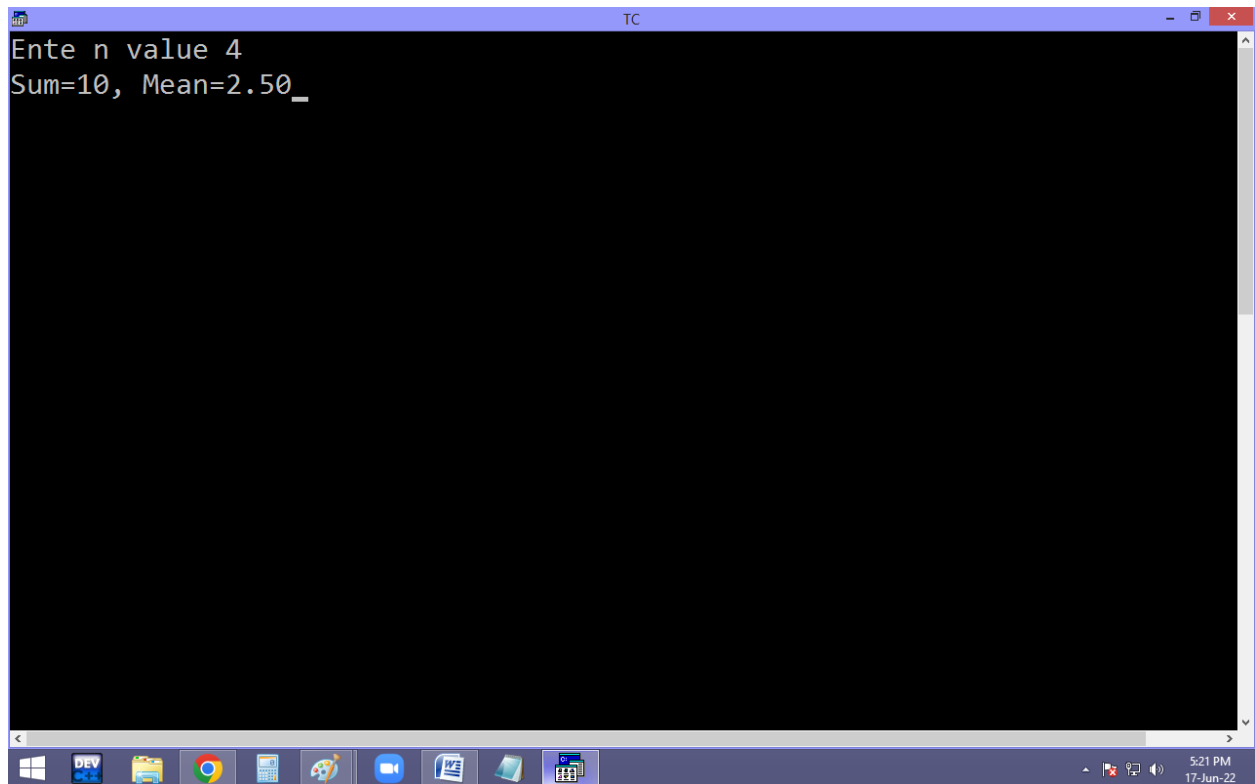
# Without using loop:



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 15' and provides editing options: Insert, Indent, Tab, Fill, Unindent, and \*. The file name is E:NONAME.C. The code in the editor is as follows:

```
Line 9 Col 15 Insert Indent Tab Fill Unindent * E:NONAME.C
#include<stdio.h>
#include<conio.h>
void main()
{
int n,s;
clrscr();
printf("Ente n value ");
scanf("%d",&n);
s = n*(n+1)/2;
printf("Sum=%d, Mean=%.2f",s,(float)s/n);
getch();
}
```

The Windows taskbar at the bottom shows icons for Windows, DEV, File Explorer, Google Chrome, Calculator, Paint, Microsoft Edge, and a calendar. The system clock in the bottom right corner displays 5:21 PM on 17-Jun-22.



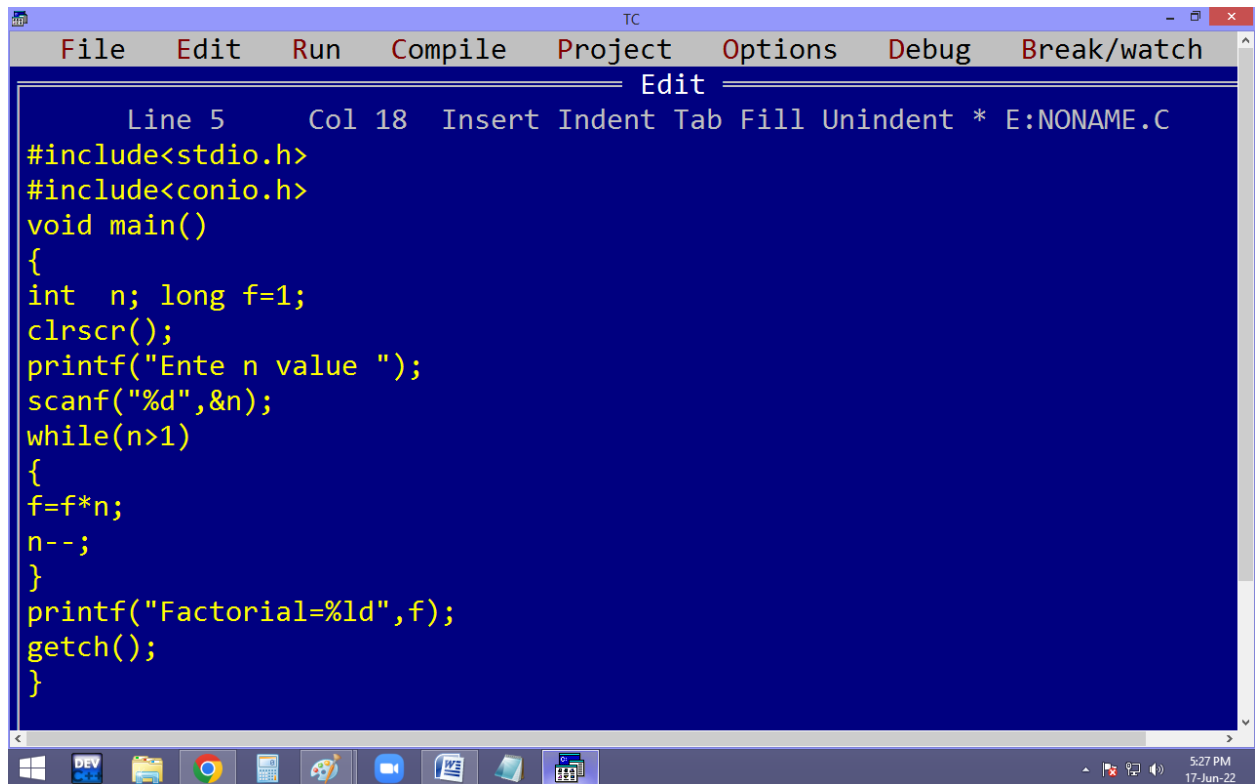
```
TC
Ente n value 4
Sum=10, Mean=2.50_
```

$$s = n * (n+1) / 2 ;$$

$$4 * 5 / 2$$

$$20/2=10$$

**Eg. finding factorial of given no.**



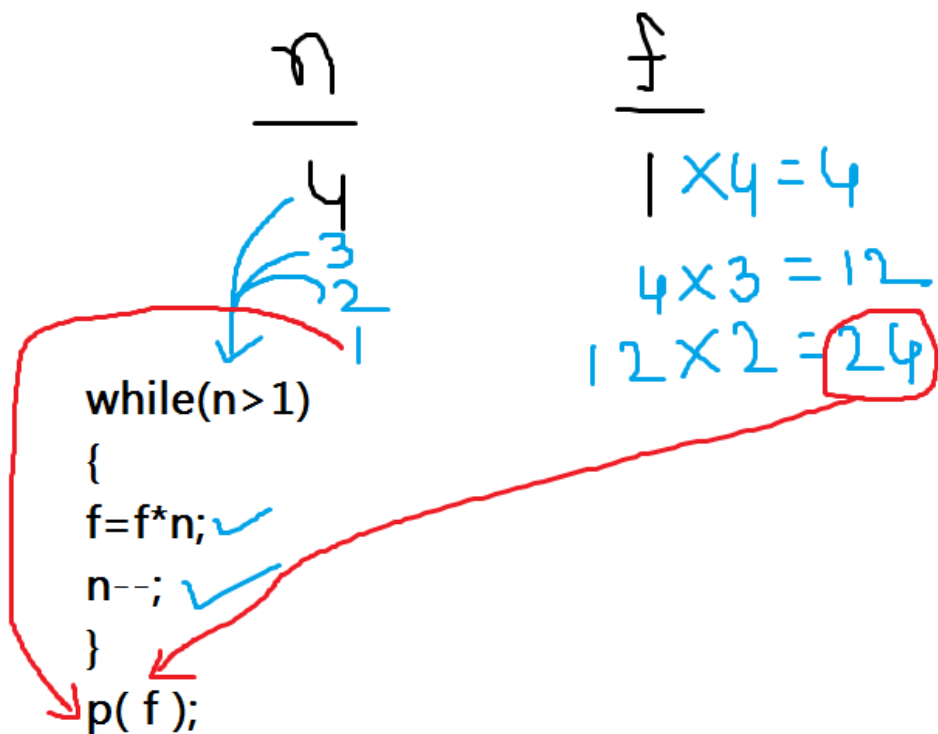
The image shows a screenshot of a Turbo C++ (TC) IDE window. The window has a menu bar with the following options: File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. Below the menu bar is a toolbar with icons for various editing and development actions. The main text area has a dark blue background with yellow text. It shows a C program for calculating the factorial of a number. The code is as follows:

```
Line 5      Col 18  Insert Indent Tab Fill Unindent * E:NONAME.C
#include<stdio.h>
#include<conio.h>
void main()
{
    int  n; long f=1;
    clrscr();
    printf("Ente n value ");
    scanf("%d",&n);
    while(n>1)
    {
        f=f*n;
        n--;
    }
    printf("Factorial=%ld",f);
    getch();
}
```

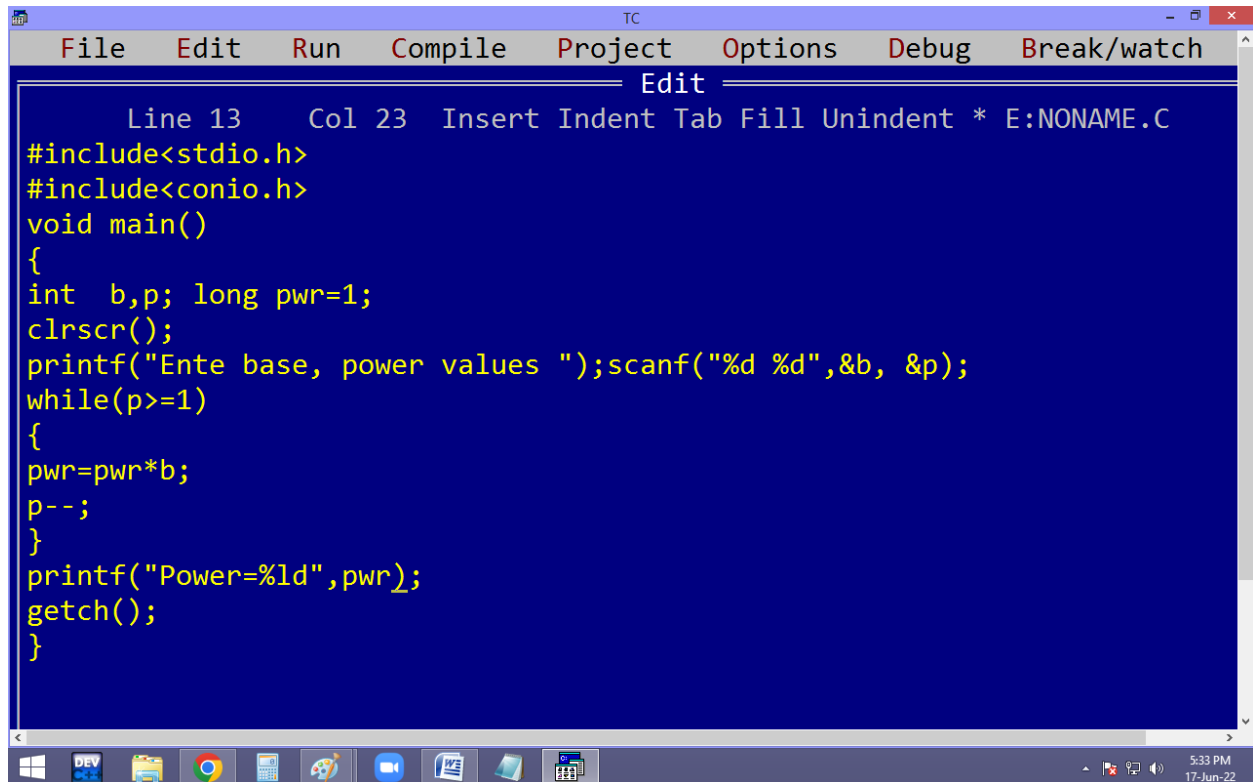
The status bar at the bottom of the window shows the system clock as 5:27 PM on 17-Jun-22. The taskbar at the very bottom displays several application icons, including Windows Explorer, Google Chrome, and other standard Windows icons.



```
TC
Ente n value 4
Factorial=24_
```



# Finding power value using user defined program.

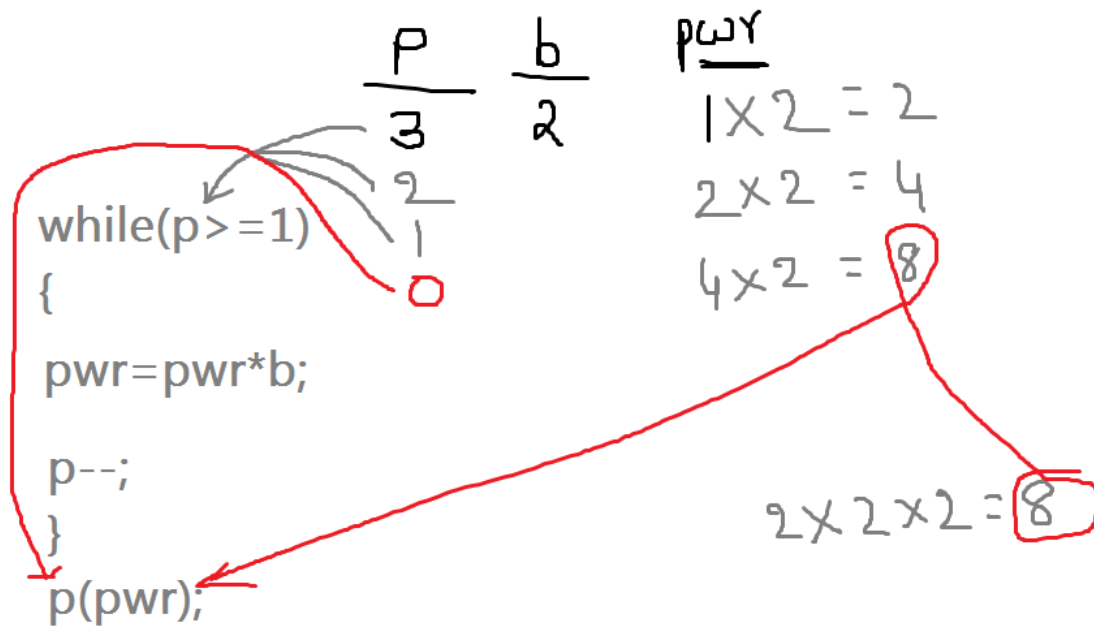


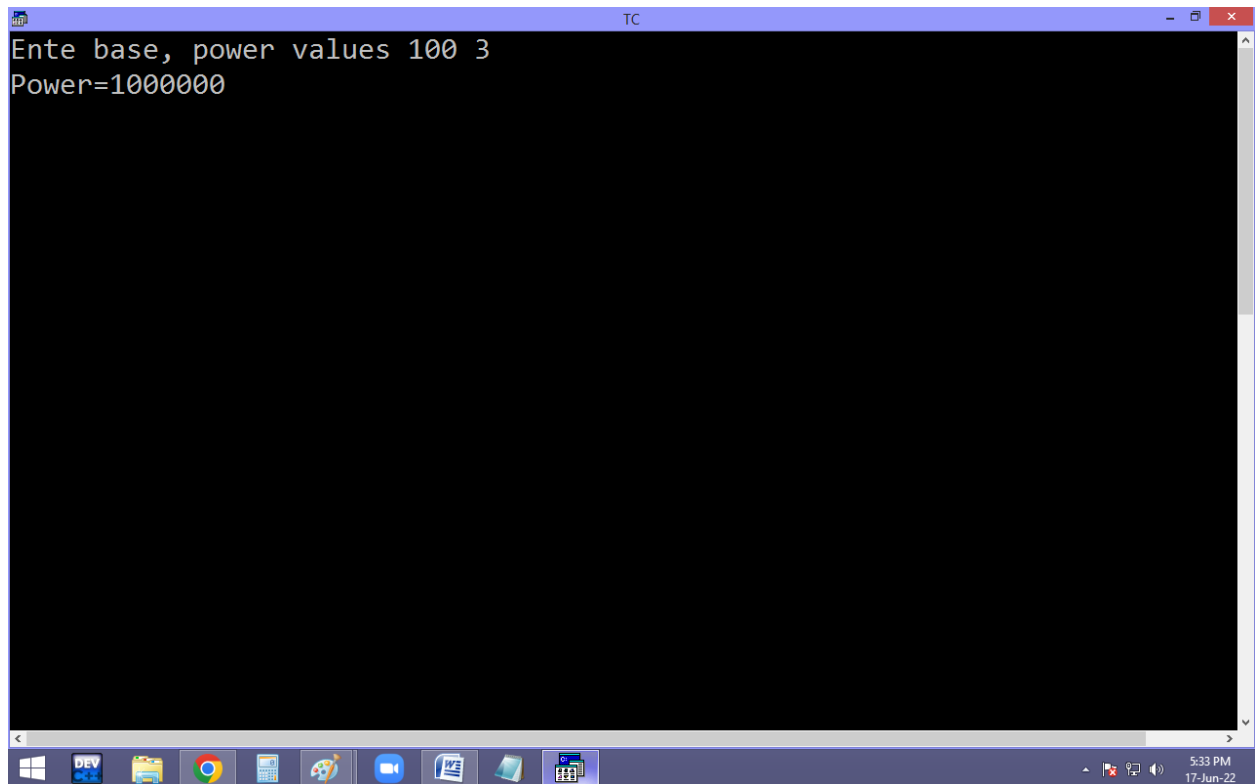
The screenshot shows the Turbo C++ (TC) IDE interface. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 13 Col 23 Insert Indent Tab Fill Unindent \* E:NONAME.C'. The main editing area has a dark blue background with yellow text. The code is as follows:

```
Line 13 Col 23 Insert Indent Tab Fill Unindent * E:NONAME.C
#include<stdio.h>
#include<conio.h>
void main()
{
int b,p; long pwr=1;
clrscr();
printf("Ente base, power values ");scanf("%d %d",&b, &p);
while(p>=1)
{
pwr=pwr*b;
p--;
}
printf("Power=%ld",pwr);
getch();
}
```

The Windows taskbar is visible at the bottom, showing icons for Windows, DEV C++, File Explorer, Google Chrome, Calculator, Paint, Zoom, Word, and a folder. The system clock in the bottom right corner shows 5:33 PM on 17-Jun-22.

```
TC
Ente base, power values 2 3
Power=8_
```



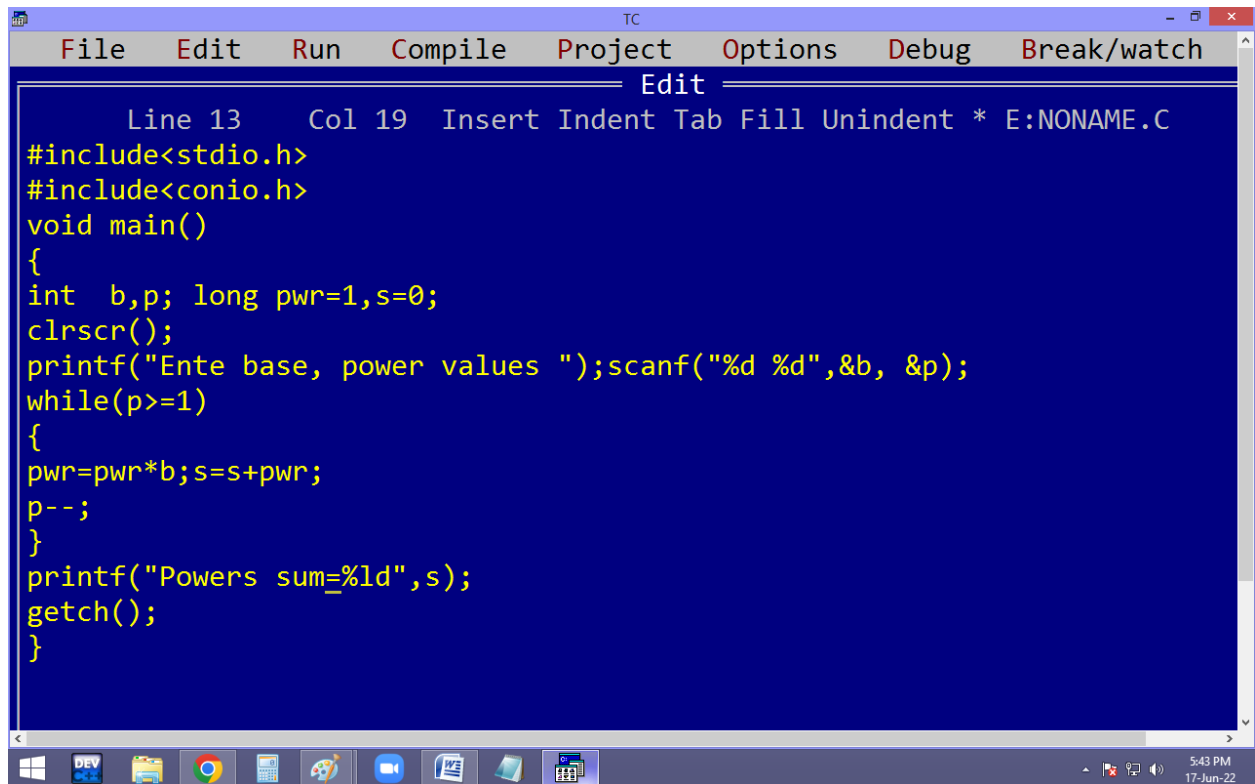


```
TC
Ente base, power values 100 3
Power=1000000
```

**Eg. finding powers sum**

$$25 = 2^1 + 2^2 + 2^3 + 2^4 + 2^5$$

$$2 + 4 + 8 + 16 + 32 = 62$$

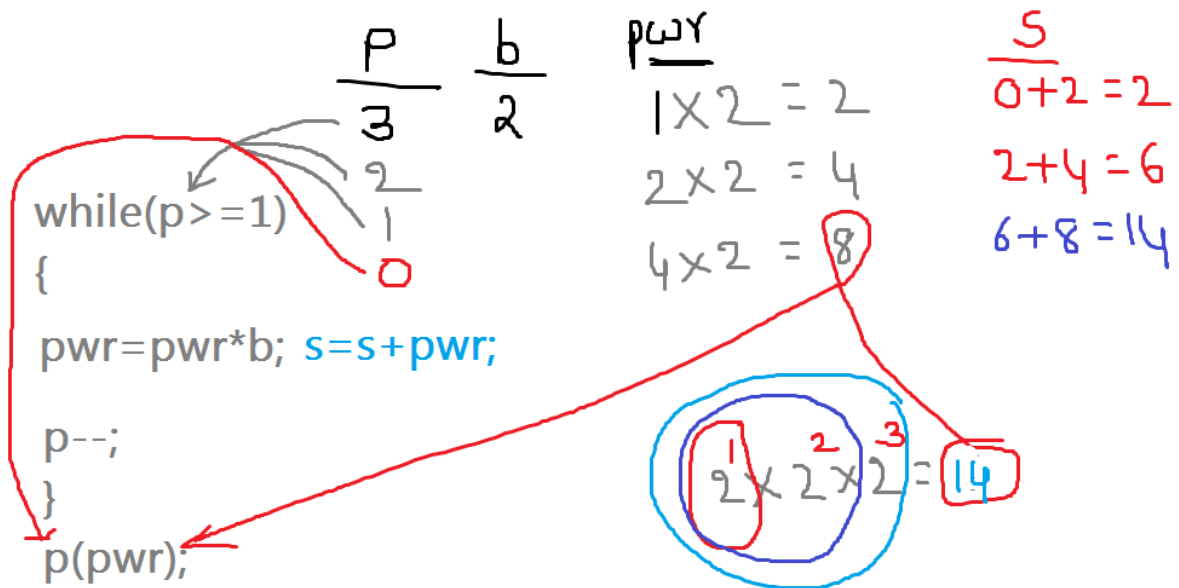


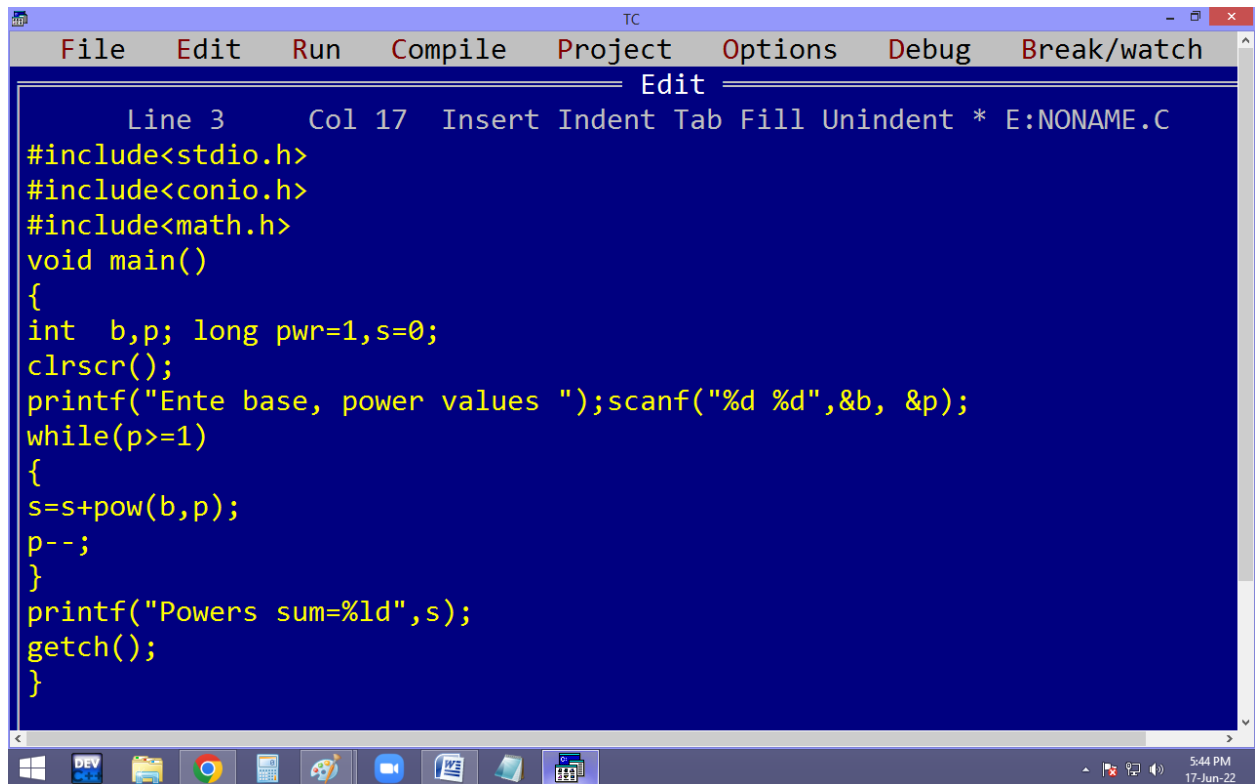
The image shows a screenshot of a Turbo C++ (TC) IDE window. The title bar reads "TC". The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". The "Edit" menu is open, showing options: "Line 13", "Col 19", "Insert", "Indent", "Tab", "Fill", "Unindent", and "\* E:NONAME.C". The main text area has a dark blue background with yellow text. It contains a C program that calculates the sum of powers of a base. The code is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int b,p; long pwr=1,s=0;
    clrscr();
    printf("Ente base, power values ");scanf("%d %d",&b, &p);
    while(p>=1)
    {
        pwr=pwr*b;s=s+pwr;
        p--;
    }
    printf("Powers sum=%ld",s);
    getch();
}
```

The Windows taskbar is visible at the bottom, showing icons for Windows, DEV C++, File Explorer, Google Chrome, Calculator, Paint, Zoom, Notepad, and a folder icon. The system tray on the right shows the time as 5:43 PM and the date as 17-Jun-22.

```
TC
Ente base, power values 2 5
Powers sum=62
```

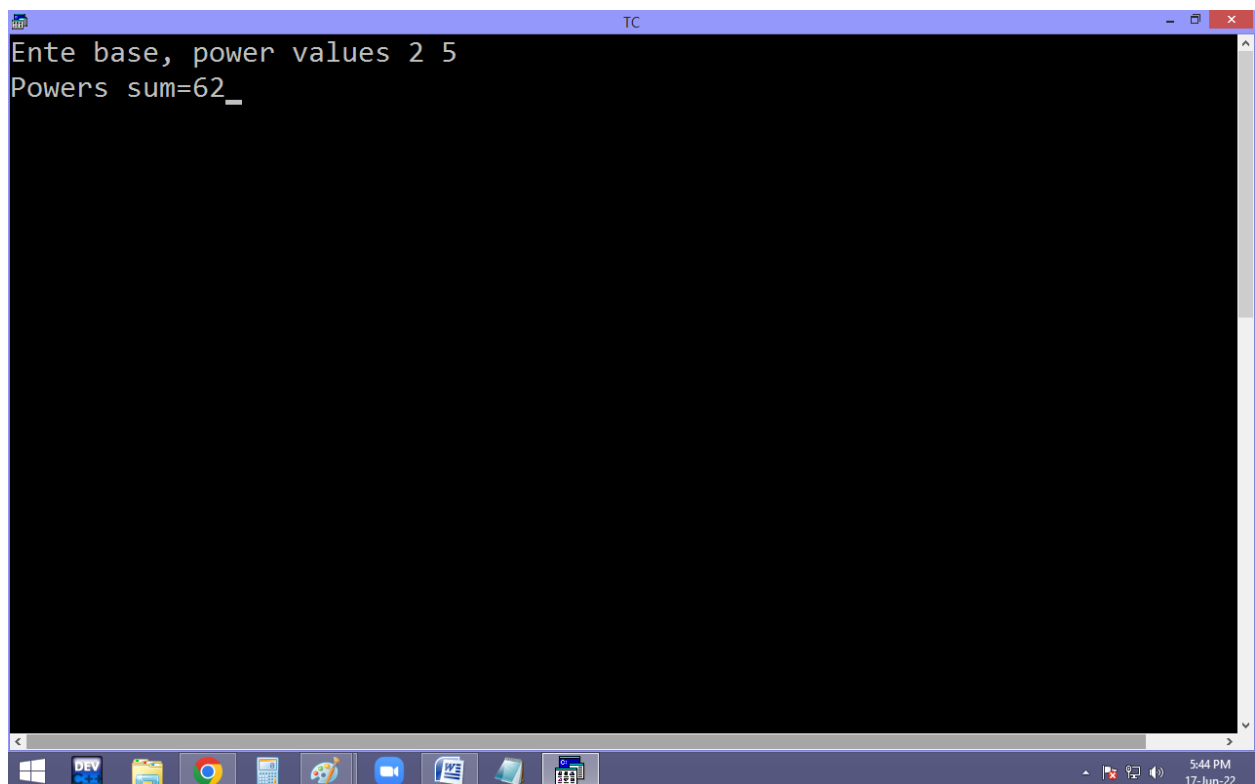




The screenshot shows the Turbo C++ (TC) IDE with a menu bar (File, Edit, Run, Compile, Project, Options, Debug, Break/watch) and a toolbar. The main window is titled "Edit" and displays the source code for a file named "E:NONAME.C". The code is as follows:

```
Line 3      Col 17  Insert Indent Tab Fill Unindent * E:NONAME.C
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    int  b,p; long pwr=1,s=0;
    clrscr();
    printf("Ente base, power values ");scanf("%d %d",&b, &p);
    while(p>=1)
    {
        s=s+pow(b,p);
        p--;
    }
    printf("Powers sum=%ld",s);
    getch();
}
```

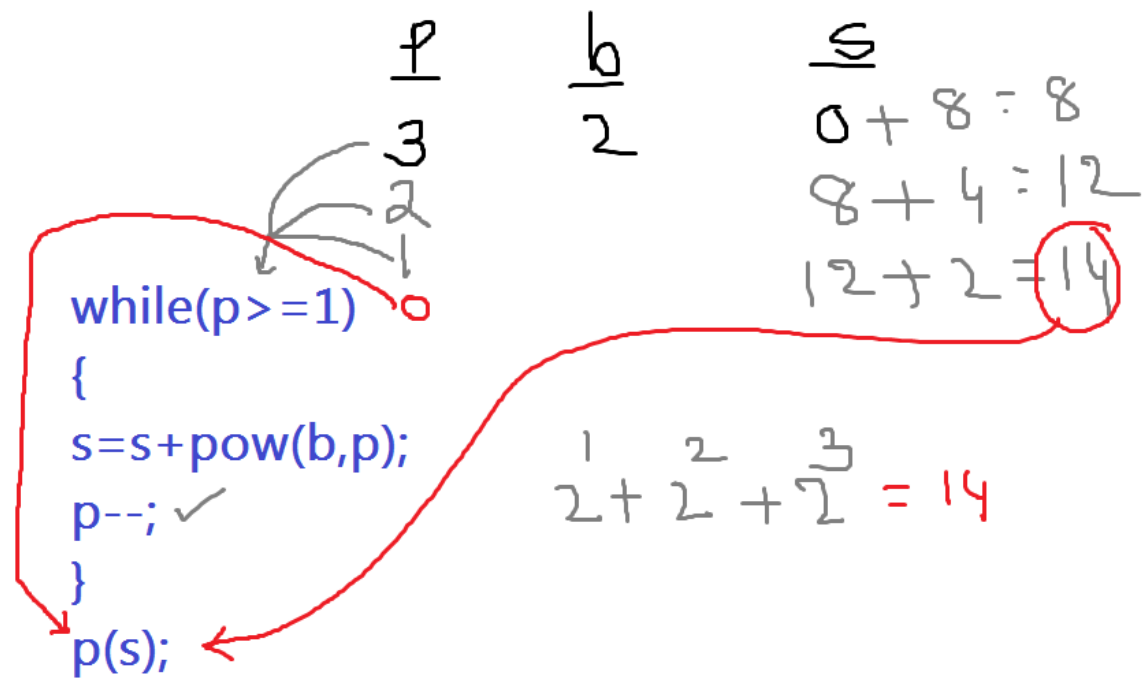
The Windows taskbar at the bottom shows the Start button and several application icons, including DEV, File Explorer, Google Chrome, and others. The system clock in the bottom right corner indicates 5:44 PM on 17-Jun-22.



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

```
Ente base, power values 2 5
Powers sum=62_
```

The Windows taskbar at the bottom is identical to the first image, showing the same application icons and system clock (5:44 PM on 17-Jun-22).



## Home work:

1. Finding no of digits in given no.

For example 379 is a 3 digit no

2. Finding digits sum

For example 286 →  $2+8+6=16$



